

अध्ययन मंडल बैठक दिनांक 27.08.2024

विषय - कम्प्यूटर एप्लीकेशन

विश्वविद्यालय अन्तर्गत संचालित मास्टर ऑफ कम्प्यूटर एप्लीकेशन प्रोग्राम में राष्ट्रीय शिक्षा नीति 2020 के अनुरूप प्रथम एवं द्वितीय सेमेस्टर में निम्नानुसार परीक्षा योजना एवं मूल्यांकन पद्धति की अनुशंसा की जाती है :-

| Program : Master of Computer Application |             |                                |                  |          |         |           |           |     |     |
|------------------------------------------|-------------|--------------------------------|------------------|----------|---------|-----------|-----------|-----|-----|
| Course Type                              | Course Code | Course Title                   | Paper            | Semester | Credits | Max Marks | Min Marks | CIA | ESE |
| First Semester                           |             |                                |                  |          |         |           |           |     |     |
| DSC                                      | MCAC-01T    | Discrete Mathematics           | I                | I        | 4       | 100       | 40        | 30  | 70  |
| DSC                                      | MCAC-02T    | Data Structure With C language | II               | I        | 3       | 100       | 40        | 30  | 70  |
| DSC                                      | MCAC-02P    | Data Structure With C language | P1               | I        | 1       | 50        | 20        | 15  | 35  |
| DSC                                      | MCAC-03T    | RDBMS                          | III              | I        | 3       | 100       | 40        | 30  | 70  |
| DSC                                      | MCAC-03P    | RDBMS                          | P2               | I        | 1       | 50        | 20        | 15  | 35  |
| DSC                                      | MCAC-04T    | Operating System               | IV               | I        | 4       | 100       | 50        | 30  | 70  |
| DSC                                      | MCAC-05T    | Computer System Architecture   | V                | I        | 4       | 100       | 50        | 30  | 70  |
| Second Semester                          |             |                                |                  |          |         |           |           |     |     |
| DSC                                      | MCAC-06T    | Operation Research             | I                | II       | 4       | 100       | 40        | 30  | 70  |
| DSC                                      | MCAC-07T    | Dot Net Programming with C#    | II               | II       | 3       | 100       | 40        | 30  | 70  |
| DSC                                      | MCAC-07P    | Dot Net Programming with C#    | P1               | II       | 1       | 50        | 20        | 15  | 35  |
| DSC                                      | MCAC-08T    | Programming in Python          | III              | II       | 3       | 100       | 40        | 30  | 70  |
| DSC                                      | MCAC-08P    | Programming in Python          | P2               | II       | 1       | 50        | 20        | 15  | 35  |
| DSE                                      | MCAE-09T    | Computer Graphics              | IV<br>Elective-1 | II       | 4       | 100       | 40        | 30  | 70  |
| DSE                                      | MCAE-10T    | Soft Computing                 |                  | II       |         |           |           |     |     |
| DSE                                      | MCAE-11T    | Cyber Security                 |                  | II       |         |           |           |     |     |
| DSE                                      | MCAE-12T    | Cloud Computing                | V<br>Elective-2  | II       | 4       | 100       | 40        | 30  | 70  |
| DSE                                      | MCAE-13T    | Software Engineering           |                  | II       |         |           |           |     |     |
| DSE                                      | MCAE-14T    | Mobile Computing               |                  | II       |         |           |           |     |     |

आज दिनांक 27.08.2024 को कम्प्यूटर एप्लीकेशन अध्ययन मंडल की बैठक में निम्नलिखित अध्यक्ष/सदस्य उपस्थित हुये।

| क्र. | नाम                      | पदनाम      | अध्यक्ष/सदस्य | हस्ताक्षर |
|------|--------------------------|------------|---------------|-----------|
| 1.   | Sachin Singh Rajput      | Asst Prof. | अध्यक्ष       | Sachin    |
| 2.   | Dr. Ajay Singh<br>Thakur | Asst Prof. | Member        | Ajay      |
| 3.   | Kiran Wahu               | Asst Prof. | Member        | Kiran     |

2.7 AUG 2024

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: Master Of Computer Application                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Semester: I                                                                                                                                                                                                                                                                                                                                                                                                                                      | Session:2024-2025                        |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MCAC-01T                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Discrete Mathematics                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | After completing this course, the students will be able to:<br>1) Learn about partially ordered sets, lattices and their types.<br>2) Understand Boolean algebra and Boolean functions, logic gates. Switching circuits and their applications.<br>3) Learn about Proportions & Predicate Logics, Discrete Numeric function and Recurrence relation..<br>4) Assimilate various graph theoretic concepts and familiarize with their applications. |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                        | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                           | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| Unit                                                                                      | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                  | No. of Period                            |
| I                                                                                         | ✓ <b>Sets, Relations and Functions:</b> Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan's law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, partial order, partial order relation, functions, Injection, Surjection and Bijective mapping, Composition of functions, the characteristic functions and Mathematical induction.                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 15                                       |
| II                                                                                        | ✓ <b>Proportions &amp; Predicate Logics:</b> Proposition & prepositional functions, Logical connections Truth-values and Truth Table, tautology, contradiction, logical equivalence, the algebra of prepositional functions, the algebra of truth values, Applications (switching circuits, Basic Computer Components), Predicate logic, quantifiers, types of quantifiers, Problems on predicates and quantifiers.                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 15                                       |
| III                                                                                       | ✓ <b>Lattice:</b> Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, Lattices, sub lattices, Isotonicity, distributive inequality, Lattice homomorphism, lattice isomorphism ,complete lattice ,complemented lattice distribution lattice.<br><br><b>Discrete Numeric function and Recurrence relation:</b> Introduction to discrete numeric functions and generating functions introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions. |                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 15                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p><b>Graphs:</b> concept of graphs, Types of graph, degree of graph, isomorphism, sub graphs, operations on graphs, walk, paths, and circuits, complete graph, regular graph, bipartite graph, incidence and adjacency matrix and their properties, matrix representation of graph, Eulerian graphs, Hamiltonian graph, planner graph, application of graph, graph coloring. shortest path algorithm: Dijkstra's algorithm, Bellmen-ford algorithm, Floyd-warshall algorithm.</p> <p><b>Tree:</b> Concept of tree, properties of trees, center of tree, spanning trees, minimum spanning tree, Kruskal's and prim's algorithm for MST, cut vertices, binary tree, applications of graphs in computer science.</p> | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Sets, Relations, Quantifiers, Lattice, Shortest path algorithm, MST.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| <b>Text Books and Reference Books Recommended-</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| <ul style="list-style-type: none"> <li>• Discrete Mathematics and Its Applications, Kenneth Rosen, McGraw Hill, 8th Edition.</li> <li>• Edgar G. Goodaire &amp; Michael M. Parmenter (2018). Discrete Mathematics with Graph Theory (3rd edition). Pearson Education.</li> <li>• Rudolf Lidl &amp; Günter Pilz (1998). Applied Abstract Algebra (2nd edition). Springer.</li> <li>• Edgar G. Goodaire &amp; Michael M. Parmenter (2018). Discrete Mathematics with Graph Theory (3rd edition). Pearson Education.</li> <li>• C. L. Liu (1985). Elements of Discrete Mathematics (2nd edition). McGraw-Hill.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| <b>E-resources:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| Topics Related to Discrete Mathematics from SWAYAM/NPTEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| 1. <a href="https://onlinecourses.swayam2.ac.in/cec20 mm02/preview">https://onlinecourses.swayam2.ac.in/cec20 mm02/preview</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| 2. <a href="https://youtu.be/sPQ3ptUMIHA">https://youtu.be/sPQ3ptUMIHA</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |

| <b>PART -D: Assessment and Evaluation -Theory</b>                    |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
| Maximum Marks:                                                       | <b>100 Marks</b>                                                                                                                                                                                                                                                                         |                                                                                                                    |
| Continuous Internal Assessment(CIA):                                 | <b>30 Marks</b>                                                                                                                                                                                                                                                                          |                                                                                                                    |
| End Semester Exam (ESE):                                             | <b>70 Marks</b>                                                                                                                                                                                                                                                                          |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | <b>Internal Test / Quiz-(2): 20 +20</b><br><b>Assignment / Seminar - 10</b><br><b>Total Marks - 30</b>                                                                                                                                                                                   | <b>Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1. Objective – 10 x1= 10 Marks;</b><br><b>Q2. Short answer type- 5x4 = 20 Marks</b><br><b>Section B:</b><br><b>Descriptive answer type question.,1 out of 2 from each unit-4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: Master Of Computer Application                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Semester: I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Session:2024-2025                        |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | MCAC-02T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Data Structure With C Language                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Identify situations where computational methods and computers would be useful.</li> <li>• Given a computational problem, identify and abstract the programming task involved.</li> <li>• Develop programming skill and learn how to implement a new software.</li> <li>• Use different types of data structures, operations and algorithms.</li> <li>• Implement appropriate sorting/searching technique for any given problem.</li> <li>• Use stack. Queue, Lists, Trees and Graphs in problem solving.</li> <li>• Find suitable data structure during application development/ Problem Solving.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
| Unit                                                                                      | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No. of Period                            |
| I                                                                                         | <del>✓</del> <b>Introduction:</b> Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations, Time-Space trade-off. Abstract Data Types (ADT).<br><del>✓</del> <b>Arrays:</b> Definition, Single and Multidimensional Arrays. Traverse an array, inserting element into array, deleting an element from array,<br><del>✓</del> <b>Linked lists:</b> Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 11                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p><b>Stacks:</b> Abstract Data Type, Primitive Stack operations: Push &amp; Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion.</p> <p><b>Queues:</b> Operations on Queue, Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.</p>                                                                                                          | 11                                                                                 |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p><b>Trees:</b> Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm. AVL tree, rotation of AVL tree,</p> <p><b>Graphs:</b> Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search.</p> | 11                                                                                 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p><b>Searching :</b> Sequential search, Binary Search, Comparison and Analysis of sorting algorithms.</p> <p><b>Sorting:</b> Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.</p> <p><b>Search Trees:</b> Binary Search Trees (BST), Insertion and Deletion in BST,, introduction to m-way Search Trees, B Trees &amp; B+ Trees</p> <p><b>Hashing:</b> Hash Function, Linear probing.</p>                                                                                                                                                                             | 12                                                                                 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Arrays, Linked lists, Stacks , Queues, Trees, Graph, Searching , Sorting, Hashing. |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                    |
| <p><b>Text Books and Reference Books Recommended-</b></p> <ol style="list-style-type: none"> <li>1. Data Structures and Algorithms in C++", Michael T. Goodrich, Wiley, 2007</li> <li>2. "Fundamentals of Data Structures", Horowitz and Sahani, Computer Science Press, 1978</li> <li>3. "Data structures and Algorithms", Aefred V. Aho, Jhon E. Joperoft and J.E. Ullman.</li> <li>4. "An Introduction to Data Structures with Applications", Jean Paul Trembley and Paul Sorenson, TMH, International Student Edition, 1985.</li> <li>5. "Data Structures and Program Design in C", R. Kurse, Leung &amp; Tondo, 2nd Edition, PHI publication.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                    |

**E Resources:**

Data Structure related topics from SWAYAM/NPTEL

**1. Introduction to Data Structure**<https://www.youtube.com/watch?v=Wg7U00EAoF&list=PLBF3763AF2F1C572F&index=1>**2. Stacks**<https://www.youtube.com/watch?v=gIUSSZVWDsY&list=PLBF3763AF2E1C572F&index=2>**3. Queues and linked list**<https://www.youtube.com/watch?v=PGWZUgzDMYI&list=PLBF3763AF2E1C572F&index=3>**4. Trees**<https://www.youtube.com/watch?v=tORLeIIHtazM&list=PLBF3763AF2E1C572F&index=6>**5. Graphs**<https://www.youtube.com/watch?v=9zpSs845w/8&list=PLBF3763AF2E1C572F&index=24>**PART -D : Assessment and Evaluation -Theory****Suggested Continuous Evaluation Methods:**Maximum Marks: **100 Marks**Continuous Internal Assessment(CIA): **30 Marks**End Semester Exam (ESE): **70 Marks**

|                                                                     |                                                                                                                                                                                                                                                                                           |                                                                                                                    |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Continuous Internal Assessment (CIA):</b><br>(By Course Teacher) | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                    | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                     | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Program : Master Of Computer Application</b>                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                            | <b>Session:2024-2025</b>       |
| 1                                                                                | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>MCAC-02P</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| 2                                                                                | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Data Structure With C Language</b>                                                                                                                                                                                                                                                                                                                                                                         |                                |
| 3                                                                                | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                         | Discipline Specific Course (practical)                                                                                                                                                                                                                                                                                                                                                                        |                                |
| 4                                                                                | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                               | As per Syllabus                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| 5                                                                                | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                      | After completing this course, the students will be able to:<br>a. Analyze and compare various linear and non-linear data structures<br>b. Code, debug and demonstrate the working nature of different types of data structures and their applications<br>c. Implement, analyse, and evaluate the searching and sorting algorithms<br>d. Choose the appropriate data structure for solving real world problems |                                |
| 6                                                                                | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 Credit                                                                                                                                                                                                                                                                                                                                                                                                      | (1 Credit=30 hours Laboratory) |
| 7                                                                                | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                         | Max. Marks: 50                                                                                                                                                                                                                                                                                                                                                                                                | Min Passing Marks: 20          |
| <b>Part B: Content of the Course</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| <b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| <b>Module</b>                                                                    | <b>Topics (Course contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| <b>Lab./ Experiment Contents of Course,</b>                                      | <b>1. Design, Develop and Implement a menu driven Program in C for the following Array operations</b><br>a. Creating an Array of N Integer Elements<br>b. Display of Array Elements with Suitable Headings<br>c. Inserting an Element at a given valid Position ( <b>POS</b> )<br>d. Deleting an Element at a given valid Position( <b>POS</b> )<br>e. Exit.<br>Support the program with functions for each of the above operations |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
|                                                                                  | <b>2. Design, Develop and Implement the following menu driven Programs in C using Array operations</b><br>a. Write a program for Bubble Sort algorithm<br>b. Write a program for Merge Sort algorithm<br>c. Write a program for Radix Sort algorithm<br>d. Write a program for Insertion Sort algorithm<br>e. Write a program for Selection Sort algorithm                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
|                                                                                  | <b>3. Design, Develop and Implement the following menu driven Programs in C using Array operations</b><br>a. Write a program for Heap Sort algorithm<br>b. Write a program for Quick Sort algorithm<br>c. Write a program for linear search algorithm<br>d. Write a program for displaying a sparse matrix<br>e. Fibonacci numbers<br>f. Factorial of a number                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                               |                                |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>4.</b> Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size <b>MAX</b>)</p> <ul style="list-style-type: none"> <li>a. <b>Push</b> an Element on to Stack</li> <li>b. <b>Pop</b> an Element from Stack</li> <li>c. Demonstrate how Stack can be used to check <b>Palindrome</b></li> <li>d. Demonstrate <b>Overflow</b> and <b>Underflow</b> situations on Stack</li> <li>e. Display the status of Stack</li> <li>f. Exit</li> </ul> <p>Support the program with appropriate functions for each of the above operations</p> |
|  | <p><b>5.</b> Design, Develop and Implement a Program in C/C++ for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (<b>Remainder</b>), ^ (<b>Power</b>) and <b>alphanumeric</b> operands.</p>                                                                                                                                                                                                                                                                                                                   |
|  | <p><b>6.</b> Design, Develop and Implement a Program in C for the following Stack Applications</p> <ul style="list-style-type: none"> <li>a. Evaluation of <b>Suffix expression</b> with single digit operands and operators: +, -, *, /, %, ^</li> <li>b. Solving <b>Tower of Hanoi</b> problem with n disks</li> </ul>                                                                                                                                                                                                                                                                                                                |
|  | <p><b>7.</b> Design, Develop and Implement a menu driven Program in C/C++ for the following operations on <b>Circular QUEUE</b> of Characters</p> <ul style="list-style-type: none"> <li>a. Insert an Element on to Circular QUEUE</li> <li>b. Delete an Element from Circular QUEUE</li> <li>c. Demonstrate Overflow and Underflow situations on Circular QUEUE</li> <li>d. Display the status of Circular QUEUE</li> <li>e. Exit</li> </ul> <p>Support the program with appropriate functions for each of the above operations</p>                                                                                                    |
|  | <p><b>8.</b> Design, Develop and Implement a menu driven Program in C/C++ for the following operations on <b>Singly Linked List (SLL)</b></p> <ul style="list-style-type: none"> <li>a. Create a <b>SLL</b>.</li> <li>b. Insert at Beginning</li> <li>c. Insert at Last</li> <li>d. Insert at any random location</li> <li>e. Delete from Beginning</li> <li>f. Delete from Last</li> <li>g. Delete node after specified location</li> <li>h. Search for an element</li> <li>i. Show</li> <li>j. Exit</li> </ul>                                                                                                                        |
|  | <p><b>9.</b> Design, Develop and Implement a menu driven Program in C/C++ for the following operations on <b>Doubly Linked List (DLL)</b></p> <ul style="list-style-type: none"> <li>a. Create a <b>DLL</b>.</li> <li>b. Print all the elements in DLL in forward traversal order</li> <li>c. Print all elements in DLL in reverse traversal order</li> <li>d. Exit</li> </ul>                                                                                                                                                                                                                                                          |
|  | <p><b>10.</b> Design, Develop and Implement a menu driven Program in C/C++ for the following operations on <b>Binary Search Tree (BST)</b> of Integers</p> <ul style="list-style-type: none"> <li>a. Create a BST of N Integers: 8, 10, 3, 1, 6, 14, 7</li> <li>b. Traverse the BST in Inorder</li> <li>c. Traverse the BST in Preorder</li> <li>d. Traverse the BST in and Post Order</li> </ul>                                                                                                                                                                                                                                       |

|                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                         | <b>11.Design, Develop and Implement a Program in C/C++ for the following operations on Graph(G)</b><br>a. Create a Graph <b>N</b> using Adjacency Matrix.<br>b. Print all the nodes <b>reachable</b> from a given starting node in a digraph using <b>BFS</b> method<br>c. Print all the nodes <b>reachable</b> from a given starting node in a digraph using <b>DFS</b> method. |                                                                                                             |  |
| <b>Part - C</b>                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <b>Learning Resource: Text Books, Reference Books, Others</b>                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <b>Text Books and Reference Books Recommended-</b>                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 1. Data Structures and Algorithms in C++", Michael T. Goodrich, Wiley, 2007                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 2. "Fundamentals of Data Structures", Horowitz and Sahani, Computer Science Press, 1978                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 3. "Data structures and Algorithms", Aefred V. Aho, Jhon E. Joperoft and J.E. Ullman.                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 4. "An Introduction to Data Structures with Applications", Jean Paul Trembley and Paul Sorenson, TMH, International Student Edition, 1985.                                              |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 5. "Data Structures and Program Design in C", R. Kurse, Leung & Tondo, 2nd Edition, PHI publication.                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <b>E Resources:</b>                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| Data Structure related topics from SWAYAM/NPTEL                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 1. Introduction to Data Structure                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <a href="https://www.youtube.com/watch?v=Wg7U00EAoF&amp;list=PLBF3763AF2FIC572F&amp;index=1">https://www.youtube.com/watch?v=Wg7U00EAoF&amp;list=PLBF3763AF2FIC572F&amp;index=1</a>     |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 2. Stacks                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <a href="https://www.youtube.com/watch?v=gIUSSZVWDsY&amp;list=PLBF3763AF2E1C572F&amp;index=2">https://www.youtube.com/watch?v=gIUSSZVWDsY&amp;list=PLBF3763AF2E1C572F&amp;index=2</a>   |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 3. Queues and linked list                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <a href="https://www.youtube.com/watch?v=PGWZUgzDMYI&amp;list=PLBF3763AF2EIC572F&amp;index=3">https://www.youtube.com/watch?v=PGWZUgzDMYI&amp;list=PLBF3763AF2EIC572F&amp;index=3</a>   |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 4. Trees                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <a href="https://www.youtube.com/watch?v=tORLellHtazM&amp;list=PLBF3763AF2E1C572F&amp;index=6">https://www.youtube.com/watch?v=tORLellHtazM&amp;list=PLBF3763AF2E1C572F&amp;index=6</a> |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| 5. Graphs                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <a href="https://www.youtube.com/watch?v=9zpSs845w/8&amp;list=PLBF3763AF2EIC572F&amp;index=24">https://www.youtube.com/watch?v=9zpSs845w/8&amp;list=PLBF3763AF2EIC572F&amp;index=24</a> |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <b>ART -D: Assessment and Evaluation -Practical</b>                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| <b>Suggested Continuous Evaluation Methods:</b>                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                             |  |
| Maximum Marks:                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                  | 50 Marks                                                                                                    |  |
| Continuous Internal Assessment(CIA):                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                  | 15 Marks                                                                                                    |  |
| End Semester Exam (ESE):                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                  | 35 Marks                                                                                                    |  |
| <b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>                                                                                                                        | Internal Test / Quiz-(2): 10 Marks<br>Assignment / Seminar+ Attendance - 5<br>Total Marks – 15 Marks                                                                                                                                                                                                                                                                             | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks |  |
| <b>End Semester Exam (ESE):</b>                                                                                                                                                         | <b>Laboratory / Field Skill Performance: On spot Assessment</b><br>A. practical work - 20 Marks<br>B. Lab record – 5 Marks<br>C. Viva-voce - 10 Marks<br>Total Marks – 35 Marks                                                                                                                                                                                                  | Managed by Course teacher as per lab. status                                                                |  |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: Master Of Computer Application                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Semester: I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Session:2024-2025                        |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MCAC-03T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | RDBMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>After completing this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Learn about Database Concepts, Architecture, various Users. Data Models and Data Management which helps them to interact with various Databases.</li> <li>• Develop various Tables and Databases which helps them to develop new Software.</li> <li>• Practice various SQL commands which help them to generate new relationships among various Tables and Databases which are useful for Software Development.</li> <li>• Familiar about RDBMS Software like Oracle and SQL Server which are used as Backend for Software Development.</li> <li>• Develop new Databases for their Minor and Major Project Development which enhances their Data Storage. Data Accessibility and Data Management..</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |
| Unit                                                                                      | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | No. of Period                            |
| I                                                                                         | <p><b>RDBMS:</b> Introduction to RDBMS, Characteristics of Database Approach, Advantages of DBMS over file system, Database System Concepts and Architecture, Data Manager, Data Dictionary, Data Models, Schemas, Instances, data abstraction, data independence, Database Languages and interfaces, Database Users and DBA.</p> <p><b>Entity Relationship Model:</b> Entity types, Entity Sets, Attributes and its types, Relationship Types, Relationship sets, Participation, Weak entity Types, Entity Relationship Diagram, UML class diagram, Specialization, Generalization and aggregation. Concept and types of keys.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11                                       |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| II       | <b>Relational Algebra:</b> Introduction of relational algebra, Fundamental operations, Set operations, Unary and Binary operations, other operations. Functional Dependencies, Trivial and nontrivial dependencies, Partial dependency, transitive dependency, Attributes closure. <b>Normalization:</b> Concept of Normalization, Anomalies, Decomposition, Lossy and lossless decomposition, Normal Form, 1NF, 2NF and 3NF, Boyce-Codd Normal Forms (BCNF), Multi-valued Dependency and Fourth Normal Form, Join Dependency and 5NF. Minimal Cover            | 12 |
| III      | <b>Transactions, Concurrency Control, Recovery Techniques:</b> Basic concept; ACID properties; transaction state; implementation of atomicity and durability; concurrent executions; basic idea of serializability; view and conflict serializability Recovery Techniques Failure Classification, Storage Structure, Recovery and Atomicity Log Based Recovery, Shadow Paging, stable storage implementation, data access; recovery and atomicity - log based recovery, deferred database modification, immediate database modification, checkpoints.           | 12 |
| IV       | <b>SQL Concepts :</b> Basics of SQL, DDL,DML,DCL, structure –creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. transaction control commands – Commit, Rollback, Savepoint.<br><b>PL/SQL Concepts:</b> PL/SQL Block, Stored Procedures, Functions and Packages | 10 |
| Keywords | RDBMS, ER Model, Relational Algebra, Normalization, Transactions, PL/SQL .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |

Name and Signature of Convener & Member of BoS:

## Part - C : Learning Resources

### Text Books, Reference Books, Others

#### Text Books and Reference Books Recommended-

1. Database system concept, H. Korth and A. Silberschatz, TMH Publications.
2. Data Base Management System, Alexies & Mathews, Vikash publication.
3. Data Base Management System, C. J. Date, Narosha Publication.
4. Data Base Management System By James Matin. 5. Principles of Database System By Ullman.
6. Program Design, Peter Juliff, PHIPublications
7. The Complete Reference, Kevin Loncy, Oracle Press.
8. SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross, Pustak Kosh Publication.
9. Microsoft SQL Server Management and Administration, Ross, STM Publications

#### E-resources:

1. SWAYAM url link for DBMS and RDBMS :  
<https://youtu.be/f61.GtJut way>

|                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>2. SWAYAM url link for DBMS and RDBMS:<br/> <a href="https://youtu.be/lol.9Ve2SRw">https://youtu.be/lol.9Ve2SRw</a> ()</p> <p>3. SWAYAM url link for DBMS and RDBMS:<br/> <a href="https://swayam.gov.in/courses/4434-data-base-management-system">https://swayam.gov.in/courses/4434-data-base-management-system</a></p> |
|                                                                                                                                                                                                                                                                                                                              |

| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                                  |                                                                                                                    |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                  |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                  |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                  |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                  |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                           | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question.,1 out of 2 from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - <b>70 Marks</b></b> |                                                                                                                    |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Program : Master Of Computer Application</b>                                  |                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Session:2024-2025</b>       |
| 1                                                                                | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>MCAC-03P</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |
| 2                                                                                | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>RDBMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |
| 3                                                                                | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Discipline Specific Course (practical)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                |
| 4                                                                                | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                         | <b>As per Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |
| 5                                                                                | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                | <p>After completing this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Learn about Database Concepts, Architecture, various Users, Data Models and Data Management which helps them to interact with various Databases.</li> <li>• Develop various Tables and Databases which helps them to develop new Software.</li> <li>• Practice various SQL commands which helps them to generate new relationships among various Tables and Databases which are useful for Software development.</li> <li>• Familiar about RDBMS Software like Oracle and SQL Server which are used as Backend for Software development</li> <li>• Develop new Databases for their Minor and Major Project Development which enhances their Data Storage, Data Accessibility and Data Management.</li> </ul> |                                |
| 6                                                                                | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                  | 1 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (1 Credit=30 hours Laboratory) |
| 7                                                                                | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                   | Max. Marks: 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Min Passing Marks: 40          |
| <b>Part B: Content of the Course</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |
| <b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |
| <b>Module</b>                                                                    | <b>Note: This is tentative list; the teachers concern can add more program as per requirement.</b>                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |
| <b>Lab./ Experiment Contents of Course,</b>                                      |                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |
|                                                                                  | <p>1. Design an employee table in Oracle/SQL Server having eid(primary key) ename, edesignation, edoj, edob, eaddress, salary, econtact as fields and answer the following questions:</p> <p>a) Insert five records in above created table.</p> <p>b) Display all five records.</p> <p>c) Delete the fourth record.</p> <p>d) Update the third record of field ename as "hari".</p> <p>e) Add one new field in the table.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |

2. Design a salary table Oracle/SQL Server with one primary key and foreign key(employee table) having following fields:  
Month, working days, deptid, gross, incentive, deduction and net salary
  - a) Insert five records in above created table.
  - b) Display all five records.
  - c) Use foreign key relation and display records.
  - d) Update the second record of field deptid as 'Sales'.
  - e) Add one new field in the table.
- 3) Create a new user in Oracle/SQL Server.
- 4) Create a view in Oracle/SQL Server.
- 5) Create a new table in Oracle/SQL Server and practice for join operation.
- 6) Create a new user in Oracle/SQL Server and practice for commit and rollback command.
- 7) Create a new database in Oracle/SQL Server having atleast five tables for Hotel Management System.
- 8) Create a new database in Oracle/SQL Server having atleast four tables for Covid Vaccination Management System.
- 9) Create a new database in Oracle/SQL Server having atleast five tables for Library Management System.
- 10) Create a new table in Oracle SQL Server and practice for Group by and Order by Clause.
- 11) Create a new table in Oracle/SQL Server and practice for max(), min(), avg() and count() functions.
- 12) Create a new table in Oracle/SQL Server and practice for lower(), substr(), trim() and upper() functions.
- 13) Create a new table in Oracle/SQL Server and practice for unique and check constraint.
- 14) Create a new table in Oracle SQL Server and practice for any two date formats.
- 15) Create a new table in Oracle SQL Server and practice for using clause.
- 16) Create a new table in Oracle/SQL. Server and practice for having clause with sub queries.
- 17) Create a new table in Oracle/SQL Server and practice for alias in any table.
- 18) Create a new table in Oracle/SQL Server and practice for inner and outer join.
- 19) Create a new table in Oracle/SQL Server and practice for Drop command.
- 20) Write a PL/SQL program for addition of two numbers.
- 21) Write a PL/SQL program to find the factorial value of any entered number.
- 22) Write a PL/SQL program for swapping of two numbers.
- 23) Write a PL/SQL program to print first ten Natural Numbers.
- 24) Write a PL/SQL program to generate Even series upto five digits starting from 2 and sum all the terms.
- 25) Write a PL/SQL program to practice for implicit and explicit cursor.

| Part - C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Learning Resource: Text Books, Reference Books, Others                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>Text Books and Reference Books Recommended-</b> <ol style="list-style-type: none"> <li>1. Database system concept, H. Korth and A. Silberschatz, TMH Publications.</li> <li>2. Data Base Management System, Alexies &amp; Mathews, Vikash publication.</li> <li>3. Data Base Management System, C. J. Date, Narosha Publication.</li> <li>4. Data Base Management System By James Matin. 5. Principles of Database System By Ullman.</li> <li>6. Program Design, Peter Juliff, PHIPublications</li> <li>7. The Complete Reference, Kevin Loncy, Oracle Press.</li> <li>8. SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross, Pustak Kosh Publication.</li> <li>9. Microsoft SQL Server Management and Administration, Ross, STM Publications</li> </ol> |  |
| <b>E-resources:</b> <ol style="list-style-type: none"> <li>3. SWAYAM url link for DBMS and RDBMS :<br/><a href="https://youtu.be/f61.GtJut way">https://youtu.be/f61.GtJut way</a></li> <li>4. SWAYAM url link for DBMS and RDBMS:<br/><a href="https://youtu.be/lol.9Ve2SRw ()">https://youtu.be/lol.9Ve2SRw ()</a></li> <li>3. SWAYAM url link for DBMS and RDBMS:<br/><a href="https://swayam.gov.in/courses/4434-data- base-management-system">https://swayam.gov.in/courses/4434-data- base-management-system</a></li> </ol>                                                                                                                                                                                                                                     |  |

| PART -D: Assessment and Evaluation -Practical                        |                                                                                                                                                                                 |                                                                                                             |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                 |                                                                                                             |
| Maximum Marks: 50 Marks                                              |                                                                                                                                                                                 |                                                                                                             |
| Continuous Internal Assessment(CIA): 15 Marks                        |                                                                                                                                                                                 |                                                                                                             |
| End Semester Exam (ESE): 35 Marks                                    |                                                                                                                                                                                 |                                                                                                             |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): 10 Marks<br>Assignment / Seminar+ Attendance - 5<br>Total Marks – 15 Marks                                                                            | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Laboratory / Field Skill Performance: On spot Assessment</b><br>A. practical work - 20 Marks<br>B. Lab record – 5 Marks<br>C. Viva-voce - 10 Marks<br>Total Marks – 35 Marks | Managed by Course teacher as per lab. status                                                                |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>Program: Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                | <b>Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Session:2024-2025</b>                 |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                    | <b>MCAC-04T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                   | <b>Operating System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                    | <b>Discipline Specific Course (Theory)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                          | <b>As per Program</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                 | <p>After completing this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Describe the important computer system resources and the role of operating system in their management policies and algorithms.</li> <li>• To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.</li> <li>• Understanding of design issues associated with operating systems.</li> <li>• Understand various process management concepts including scheduling, synchronization, and deadlocks</li> <li>• To have a basic knowledge about multithreading</li> <li>• To understand concepts of memory management including virtual memory.</li> <li>• To have sound knowledge of various types of operating systems including Unix and Android.</li> <li>• Describe the functions of a contemporary operating system with respect to convenience, efficiency, and the ability to evolve.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                   | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                    | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>No. of Period</b>                     |
| I                                                                                         | <b>Introduction:</b> Evolution of operating systems (History of evolution of OS with the generations of computers), Types of operating systems, Different views of the operating system. System Calls and System Programs, concept of threads, Operating system concepts and structure, Layered Structure of Operating System. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15                                       |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|     | <b>Processes:</b> The process concept, The process control block, process life cycle, scheduler and its type, Preemptive and non-preemptive Scheduling algorithms, FCFS, SJF, SRTF, LJF, LRTE, Round Robin, Priority scheduling, Multilevel Queue, Multilevel feedback Queues, Performance evaluation of scheduling algorithms stated above                                                                                                                                                                                                                                                                                                                                         |    |
| II  | <b>Inter-process Communication and Synchronization:</b> The need for inter-process synchronization, Concept of mutual exclusion, Binary and counting semaphores, Hardware support for mutual exclusion, Queuing implementation of semaphores, Classical problems in concurrent programming, Dining Philosopher's problem, Bounded Buffer Problem, Sleeping Barber Problem, Readers and Writers problem, Critical section, Critical region and conditional critical region, Monitors and messages.<br><b>Deadlocks:</b> Concepts of deadlock, deadlock detection, deadlock characterization, Deadlock prevention, Deadlock avoidance. Banker's Algorithm, resource allocation graph. | 15 |
| III | <b>Memory Management:</b> Memory management concept, compaction, swapping, fragmentation, memory allocation, contiguous memory allocation, paging, segmentation.<br><b>Virtual memory:</b> virtual memory concept, page fault, demand paging, pure demand paging, Page replacement algorithms namely, Least recently used, Optimal page replacement, Most recently used, First in First out, Belady's anomaly, thrashing.                                                                                                                                                                                                                                                           | 15 |
| IV  | <b>File System:</b> File, file types, File systems, Directory structure, file access method, file allocation methods. <b>Disks:</b> Disk hardware, Disk scheduling algorithms (namely First come first serve, shortest seek time first, SCAN, C-SCAN, LOOK and C-LOOK algorithms)<br><b>Distributed Systems:</b> Introduction, <b>Case Studies:</b> WINDOWS and LINUX /UNIX Operating System:                                                                                                                                                                                                                                                                                       | 15 |

|          |                                                                                                  |
|----------|--------------------------------------------------------------------------------------------------|
| Keywords | System Calls, Processes, IPC, Deadlock, Memory Management, Virtual memory , File System , Disks. |
|----------|--------------------------------------------------------------------------------------------------|

Name and Signature of Convener & Member of BoS:

## Part - C : Learning Resources

### Text Books, Reference Books, Others

#### Text Books and Reference Books Recommended:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education. 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
5. M. Milenkovic, Operating Systems-Concepts and design, Tata McGraw Hill 1992.

### E Resources:

1. SWAYAM/NPTEL-ITD

<https://youtube.com/playlist?list=PLsyIUObW5M3CAGT6OdubyH6FzKDCcFB>

2. NPTEL-IIT Madras

[https://youtube.com/playlist?list=PL3-wYxbtlyCjpcfUDz-Tg\)\\_ainZ2K3MUZ](https://youtube.com/playlist?list=PL3-wYxbtlyCjpcfUDz-Tg)_ainZ2K3MUZ)

3. Coursera:

Introduction:

<https://www.coursera.org/specializations/codio-introduction-operating-systems?>

Memory Management:

<https://www.coursera.org/learn/codio-intro-to-operating-systems-2-memory-management?specialization=codio-introduction-operating-systems>

4. w3school.com [https://www.w3schools.in/operating-system/introfl:text-](https://www.w3schools.in/operating-system/introfl:text-An%20operating%20system%20falls%20under,networking%20hardware%20C%20printers%20C%20etc.)

[An%20operating%20system%20falls%20under,networking%20hardware%20C%20printers%20C%20etc.](https://www.w3schools.in/operating-system/introfl:text-An%20operating%20system%20falls%20under,networking%20hardware%20C%20printers%20C%20etc.)

5. gatevidyalay.com

<https://www.gatevidyalay.com/operating-system/>

6. javatpoint.com

<https://www.javatpoint.com/os-tutorial>

### PART -D:Assessment and Evaluation -Theory

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

|                                                                     |                                                                                                                                                                                                                                     |                                                                                                             |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Continuous Internal Assessment (CIA):</b><br>(By Course Teacher) | Internal Test / Quiz-(2): 20 +20<br>Assignment / Seminar - 10<br>Total Marks - 30                                                                                                                                                   | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks |
| <b>End Semester Exam (ESE):</b>                                     | Two section – A & B<br>Section A:<br>Q1. Objective – 10 x1= 10 Marks;<br>Q2. Short answer type- 5x4 = 20 Marks<br>Section B:<br>Descriptive answer type question.,1 out of 2 from each unit-4x10=40 Marks<br>Total Marks - 70 Marks |                                                                                                             |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                   |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|
| Program: Master Of Computer Application                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Semester: I                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          | Session:2024-2025 |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MCAC-05T                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                   |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Computer System Architecture                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                   |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |                   |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |                   |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | After completing this course, the students will be able to:<br>1. Design and Simplify Combinational and sequential circuits using basic building blocks.<br>2. Represent data in binary form, convert numeric data between different number systems and perform arithmetic operations in binary.<br>3. To understand concepts of instruction cycle, pipelining and interrupts.<br>4. To understand concepts of data communication between CPU, memory and I/O devices. |                                          |                   |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (Credit=15 hours-learning & observation) |                   |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Min Passing Marks : 40                   |                   |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                   |
| Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                   |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          | No. of Period     |
| I                                                                                  | <del>Data Representation:</del> Number system, Number Conversion, Binary Arithmetic ,Number Complements, Binary Subtraction using Two's Complement, Overflow and Underflow, Binary Codes: ASCII code, EBCDIC codes, Grey codes, Excess-3, BCD codes, Error detection and Correcting codes, Fixed point representation, Floating point representation,<br><del>Logic Gates, Boolean Algebra and Karnaugh Maps:</del> Boolean algebra, Demorgen's theorem, Minimization techniques of Boolean Expression using K-Maps, "Don't Care" Conditions.<br><del>Combinational and Sequential Circuit:</del> Introduction to Combinational and Sequential Circuit, Adders: Half adder & Full adder, Subtractor, Seven-Segment Displays Circuits, Encoder, Decoders, Multiplexers, De-multiplexers, Flip-Flop, D Latch, RS Flip Flop, J-K Flip-Flop, Master Slave Flip Flop, Registers, Counters. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          | 15                |
| II                                                                                 | <del>Register Transfer and Micro operations:</del> Register Transfer language, Register transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations and Arithmetic logic shift unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          | 5                 |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|          | <b>Basic Computer Organization and Design:</b> Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycles, Memory Reference Instructions, Input, Output and Interrupts, Design of Accumulator logic.                                                                                                                                                                                                                                                     |    |
| III      | <b>Central Processing Unit:</b> Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC. Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline.<br><b>Computer Arithmetic:</b> Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations. | 15 |
| IV       | <b>Input Output Organization:</b> Peripheral Devices, I/O interface, synchronous and asynchronous data transfer, strobe and handshaking data transfer, Modes of data transfer, Priority Interrupt, DMA, Input output processor, Serial Communication.<br><b>Memory Organization:</b> Memory Hierarchy, Main Memory, Associative Memory Cache Memory, Cache Memory mapping.                                                                                                                         | 15 |
| Keywords | Number system, K-Maps, Combinational and Sequential Circuit, RTL, Addressing Modes, RISC, DMA.                                                                                                                                                                                                                                                                                                                                                                                                     |    |

Name and Signature of Convener & Member of BoS:

### Part - C : Learning Resources

#### Text Books, Reference Books, Others

##### Text Books and Reference Books Recommended-

1. David A. Patterson and John L. Hennessy. "Computer Organization and Design : The Hardware/Software interface", 5th edition, Elsevier, 2012.
2. Mano, M. Computer System Architecture, 3rd edition, Pearson Education, 1993.
3. Mano, M. Digital Design, Pearson Education Asia, 1995.
4. Null, L., & Lobur, J. The Essentials of Computer Organization and Architecture. 5th edition. (Reprint) Jones and Bartlett Learning, 2018.
5. Stallings, W. Computer Organization and Architecture Designing for Performance 8th edition, Prentice Hall of India, 2010.

##### E-resources:

1. <http://www.geeksforgeeks.org/computer-organization-and-architecture-gq/>
2. [https://www.tutorialspoint.com/computer\\_organization/index.asp](https://www.tutorialspoint.com/computer_organization/index.asp)
3. <https://sites.google.com/site/uopcog/>

|                                                                      |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                          |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | <b>Internal Test / Quiz-(2): 20 +20</b><br><b>Assignment / Seminar - 10</b><br><b>Total Marks - 30</b>                                                                                                                                                                                   | <b>Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1. Objective – 10 x1= 10 Marks;</b><br><b>Q2. Short answer type- 5x4 = 20 Marks</b><br><b>Section B:</b><br><b>Descriptive answer type question.,1 out of 2 from each unit-4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
|                                                                                           | Program: Master Of Computer Application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Session:2024-2025</b>                 |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>MCAC-06T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Operation Research</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | After completing this course, the students will be able to:<br>1) Formulate and obtain the optimal solution for Linear Programming problems.<br>2. Determine the optimal solution for Transportation problems.<br>3. Determine the optimal solution for Assignment problems.<br>4. Determine the best strategy and value of the given game model.<br>5. Plan, schedule, and control projects using techniques like CPM/PERT .<br>6. Gaining the ability to apply OR methods to real-world decision-making scenarios |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>No. of Period</b>                     |
| I                                                                                         | <b>Operation Research</b> : Introduction to OR, the nature and impact of OR, Linear programming problems –Introduction, Formulation of LPP, graphical solutions of LPP, Duality in linear programming problems, simplex method, dual simplex method. Sensitive analysis.                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15                                       |
| II                                                                                        | <b>Transportation problems:</b> Introduction, Mathematical Model for "Transportation Problem, Types of Transportation Problem, Methods to solve Transportation Problem, Transshipment Model.<br><b>Assignment Problems</b> : Introduction, Zero-One Programming Model, Types of Assignment Problem, Hungarian Method, Branch-and-Bound Technique for Assignment Problem.<br><b>Game theory</b> : Introduction, Game with Pure Strategies, Game with Mixed Strategies, Dominance Property, Graphical Method for 2 x n or m x 2 Games, Linear Programming Approach for Game Theory. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15                                       |
| III                                                                                       | <b>Queueing theory</b> -basic structure of queuing systems, roles of the Poisson and exponential distributions, classification of queues basic results of M/M/1: FIFO systems, extension to multi-server queues.                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15                                       |

|                                                 |                                                                                                                                                                                                                                                            |    |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV                                              | CPM & PERT- Network representation, project scheduling, critical path calculations, PERT network, Crashing.<br>Dynamic Programming: Introduction, Applications of Dynamic Programming, Solution of Linear Programming Problem through Dynamic Programming. | 15 |
| Keywords                                        | LPP, Transportation Problem, Assignment Problem, Game Theory, CPM & PERT.                                                                                                                                                                                  |    |
| Name and Signature of Convener & Member of BoS: |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
|                                                 |                                                                                                                                                                                                                                                            |    |
| </                                              |                                                                                                                                                                                                                                                            |    |

|                                                   |                  |
|---------------------------------------------------|------------------|
| <b>PART -D: Assessment and Evaluation -Theory</b> |                  |
| <b>Suggested Continuous Evaluation Methods:</b>   |                  |
| Maximum Marks:                                    | <b>100 Marks</b> |
| Continuous Internal Assessment(CIA):              | <b>30 Marks</b>  |
| End Semester Exam (ESE):                          | <b>70 Marks</b>  |

|                                                                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                            | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------|
| Program: Master Of Computer Application                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Semester: II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          | Session:2024-2025      |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | MCAC-07T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                        |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Dot Net programming with C#                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |                        |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |                        |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                        |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Study and use of NET framework and object-oriented programming.</li><li>• Develop the console and GUI applications using Net programming</li><li>• Evaluate the NET framework namespace contents</li><li>• Understand the procedures, File I/O, Error handling and Message queues.</li><li>• Understand and remember the components in C# IDE, ADO.NET and also the window forms.</li></ul> |                                          |                        |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (Credit=15 hours-learning & observation) |                        |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          | Min Passing Marks : 40 |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
| Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | No. of Period          |
| I                                                                                  | <b>Getting started with .NET Framework 4.0 and C# :</b><br>Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0,.NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.<br><b>Introducing C#:</b> Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and Unboxing. Namespaces, The System namespace, .NET Array Types. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | 11                     |
| II                                                                                 | <b>Classes, Objects and Object Oriented Programming</b><br>Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Members, Properties: Read-only Property, Static Property, Indexers, Structs: Syntax of a struct and Access Modifiers for structs, System. Object Class.                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | 11                     |

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                 | <p><b>Encapsulation:</b> Encapsulation using accessors and mutators , Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods.</p> <p><b>Polymorphism:</b> Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.</p>                                                                                                                                                                                                                                                                                                                                                                                                     |    |
| III                                             | <p><b>Delegates, Events, Exception Handling and ADO.NET</b></p> <p><b>Delegates:</b> Creating and using Delegates, Multicasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers.</p> <p><b>Exception Handling:</b> The try/catch/throw/finally statement, Custom Exception System Exception, Handling Multiple Exception</p> <p><b>Data Access with ADO.NET:</b> Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO.NET, ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter.</p>                                                                          | 11 |
| IV                                              | <p><b>Graphical User Interface with Windows Forms and WPF</b></p> <p><b>Windows Forms:</b> Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, Month Calendar Control, LinkLabel Control, ListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl and Multiple Document Interface (MDI) Windows.</p> <p><b>WPF:</b> New WPF Controls, WPF Architecture: Presentation Framework, Presentation Core, WindowsBase, MIL or Milcore, Working with WPF Windows: Using XAML in WPF 4.0 Applications : Contents of XAML and WPF Applications: XAML Elements Namespace and XAML, XAML Property Syntax, Markup Extensions.</p> | 12 |
| Keywords                                        | .NET, Delegates, Events, Exception Handling and ADO.NET, Windows Forms and WPF .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| Name and Signature of Convener & Member of BoS: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |
| <b>Part - C : Learning Resources</b>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |

## Text Books, Reference Books, Others

### Text Books and Reference Books Recommended-

1. Programming in C#, E.Balagurusamy
2. Programming in C#, J. Liberty 2nd Edition – O'Reilly
3. Fergal Grimes, Microsoft NET for programmers, Shroff Publishers & Distributors (P) Ltd
4. Thuan Thai & Hoang Q Lam, NET Framework Essentials, Shroff Publishers & Distributors (P)
5. MSDN online by Microsoft

### E Resources:

- C#- <https://dotnet.microsoft.com/en-us/learn/csharp>
- ASP .NET Reference - <http://msdn.microsoft.com/en-us/library/9k6k3k4a.aspx>
- C# Reference - [http://msdn.microsoft.com/en-us/library/aa288436\(v=vs.71\).aspx](http://msdn.microsoft.com/en-us/library/aa288436(v=vs.71).aspx)
- WPF Reference – <http://www.wpftutorial.net/ReferenceArchitecture.html>
- WCF Reference – [http://msdn.microsoft.com/en-us/library/ms735119\(v=vs.90\).aspx](http://msdn.microsoft.com/en-us/library/ms735119(v=vs.90).aspx)

## PART –D : Assessment and Evaluation -Theory

### Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**

Continuous Internal Assessment(CIA): **30 Marks**

End Semester Exam (ESE): **70 Marks**

|                                                                  |                                                                                                                                                                                                                                                                                           |                                                                                                                    |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Continuous Internal Assessment (CIA): (By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                    | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                  | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |                       |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|
| Program : Master Of Computer Application                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Semester: I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                | Session:2024-2025     |
| 1                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MCAC-07P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                |                       |
| 2                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Dot Net programming with C#                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |                       |
| 3                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Discipline Specific Course (practical)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |                       |
| 4                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | As per Syllabus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |                       |
| 5                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Study and use of NET framework and object-oriented programming Develop the console and GUI applications using Net programming</li><li>• Evaluate the .NET Framework namespace contents.</li><li>• Understand the procedures, File I/O, Error handling and Message queues.</li><li>• Understand and remember the components in .NET IDE, ADO.NET and also the window forms</li><li>• Design, create, build, and debug dot net applications.</li></ul> |                                |                       |
| 6                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (1 Credit=30 hours Laboratory) |                       |
| 7                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Max. Marks: 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                | Min Passing Marks: 20 |
| Part B: Content of the Course                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |                       |
| Total No. of learning-Training/performance Periods: 30 Periods (30 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |                       |
| Module                                                                    | Topics (Course contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |                       |
| Lab./ Experiment Contents of Course,                                      | 1. Write a program to addition, subtraction, multiplication and division of any two numbers.<br>2. Write a program to find the maximum between three numbers<br>3. Write a program to check whether a number is negative, positive or zero<br>4. Write a program to check whether a year is a leap year or not.<br>5. Design an application to input marks of five subjects Physics, Chemistry, Biology, Mathematics and Computer. Calculate percentage and grade as following:<br>a. Percentage > 90%: Grade A<br>b. Percentage >= 80% Grade B<br>c. Percentage > 70% Grade C<br>d. Percentage > 60%. Grade D<br>e. Percentage >= 40%: Grade E<br>f. Percentage < 40%: Grade F<br>6. Design an application to input basic salary of an employee and calculate its Gross salary following:<br>a. Basic Salary <= 10000: HRA=20%, DA=80%<br>b. Basic Salary <= 20000 HRA =30%, DA= 90%<br>c. Basic Salary > 20000 HRA =30%, DA=95%<br>7. Design an application to input, electricity unit charges and calculate the given condition: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                |                       |

- a. For first 50 units Rs. 0.50/unit
  - b. For next 100 units Rs. 0.75/unit
  - c. For next 100 units Rs. 1.20/unit
  - d. For unit above 250 Rs. 1.50/unit
  - e. An additional surcharge of 20% is added to the bill
8. Write a program to convert decimal to binary number system using bitwise operators.
  9. Write a program to swap two numbers using the bitwise operator.
  10. Write a program to create Simple Calculator using a select case.
  11. Write a program to find the sum of all natural numbers between 1 to n
  12. Write a program to enter any number and print its reverse
  13. Write a program to enter any number and check whether the number is palindrome or not.
  14. Write a program to check whether a number is Armstrong number or not
  15. Write a program to print Fibonacci series up to n terms.
  16. Write a program to print Pascal triangles up to n rows
  17. Write a program to print all negative elements in an array
  18. Design a digital clock using timer control.
  19. Create an application that offers various food items to select from check boxes and a mode of payment using a radio button. It then displays the total amount payable.
  20. Create an application to implement the working of Context menu on textbox
  21. Write a program to illustrate all functionalities of list box and combo box
  22. Write a program for temperature conversion using a radio button
  23. Write a program to launch a rocket using Picture Box and Timer control
  24. Write a program to change the back color of any control using a scroll box.
  25. Write a program to search an element for a one dimensional array.
  26. Design a menu such that it contains submenu such as Addition, Subtraction, Scalar Multiplication, and Transpose of two metrics.
  27. Write a program to find greatest among three given number using user define procedures
  28. Write a program to check whether given number neon or not using user defined function
  29. Write a program to check whether a given number is Niven or not using procedure.
  30. Write a program to check whether a given number is duck number or not.
  31. Write a program to check whether a given number is a spy number or not.
  32. Write a program to check whether a given number.
  33. Design the following application using radio button and checkbox
  34. Develop an application which is similar to notepad using menus
  35. Develop an application for facilitating purchasing order.
  36. Develop an application for a billing system in a coffee shop
  37. Develop an application which is similar to login form.
  38. Define structure student structure student has written member for storing name roll number name of three subjects and marks with member function to store and print data.
  39. create a class circle with data member radius provide member function to calculate area driver class fare from class circle provide member function to calculate volume derived class cylinder from class is fair with additional data member for height and member function to calculate volume
  40. Write a program that implements the concept of encapsulation
  41. Write a program to demonstrate the concept of function overloading

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>42. Create a class student having a data member to store roll number name of the student name of three subject Max marks, Min marks, and obtained marks Declare an object of class. Provide facilities to input data in data members and display result of students.</p> <p>43. Create a class array having an array of integer having five elements at data member provide following facilities:<br/>a) constructor to get number in array element b) sort the elements</p> <p>44. Create a table for employees and write a programming a data set to add, delete, edit and navigate records.</p> <p>45. Write a program to access a database using ADO.NET and display key columns in the combo box or list box when an item is selected in it its corresponding records are shown in data grid control</p> <p>46. Write s program to calculate factorial of a member using user defined procedure</p> <p>Note: This is a tentative list, the teachers' concern can add more experiment as per requirement.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Part - C</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Learning Resource: Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Text Books and Reference Books Recommended-</b></p> <ol style="list-style-type: none"> <li>1. Programming in C#, E.Balagurusamy</li> <li>2. Programming in C#, J. Liberty 2nd Edition – O'Reilly</li> <li>3. Fergal Grimes, Microsoft NET for programmers, Shroff Publishers &amp; Distributors (P) Ltd</li> <li>4.Thuan Thai &amp; Hoang Q Lam, NET Framework Essentials, Shroff Publishers &amp; Distributors (P)</li> <li>5.MSDN online by Microsoft</li> </ol> <p><b>E Resources:</b></p> <ul style="list-style-type: none"> <li>• C#- <a href="https://dotnet.microsoft.com/en-us/learn/csharp">https://dotnet.microsoft.com/en-us/learn/csharp</a></li> <li>• ASP .NET Reference - <a href="http://msdn.microsoft.com/en-us/library/9k6k3k4a.aspx">http://msdn.microsoft.com/en-us/library/9k6k3k4a.aspx</a></li> <li>• C# Reference - <a href="http://msdn.microsoft.com/en-us/library/aa288436(v=vs.71).aspx">http://msdn.microsoft.com/en-us/library/aa288436(v=vs.71).aspx</a></li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                        |                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>WPF Reference –<br/><a href="http://www.wpftutorial.net/ReferenceArchitecture.html">http://www.wpftutorial.net/ReferenceArchitecture.html</a></li> <li>WCF Reference –<br/><a href="http://msdn.microsoft.com/en-us/library/ms735119(v=vs.90).aspx">http://msdn.microsoft.com/en-us/library/ms735119(v=vs.90).aspx</a></li> </ul> |                                                                                                                                                                                        |                                                                                                                             |
| <b>ART -D: Assessment and Evaluation -Practical</b>                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                        |                                                                                                                             |
| <b>Suggested Continuous Evaluation Methods:</b><br>Maximum Marks: 50 Marks<br>Continuous Internal Assessment(CIA): 15 Marks<br>End Semester Exam (ESE): 35 Marks                                                                                                                                                                                                         |                                                                                                                                                                                        |                                                                                                                             |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b>                                                                                                                                                                                                                                                                                                     | Internal Test / Quiz-(2): 10 Marks<br>Assignment / Seminar+ Attendance - 5<br>Total Marks – 15 Marks                                                                                   | Better marks out of the two<br>Test / Quiz + obtained marks<br>in Assignment shall be<br>considered against <b>15 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                                                                                                                                                                                                                                                                                                                          | <b>Laboratory / Field Skill Performance: On spot Assessment</b><br>A. practical work - 20 Marks<br>B. Lab record – 5 Marks<br>C. Viva-voce - 10 Marks<br>Total Marks – <b>35 Marks</b> | Managed by<br>Course<br>teacher as<br>per lab.<br>status                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                          |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------|
| Program: <b>Master Of Computer Application</b>                                     |                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          | <b>Session:2024-2025</b> |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                         | <b>MCAC-08T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                          |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                        | <b>Programming in Python</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                          |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                         | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                          |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                               | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |                          |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                      | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Define the structure and components of a Python program.</li><li>• Demonstrate proficiency in handling of loops and creation of functions. Identify the methods to create and manipulate lists, tuples and dictionaries.</li><li>• Discover the commonly used operations involving regular expressions and file system.</li><li>• Determine the need for scraping websites and working with CSV, JSON and other File formats</li><li>• Interpret the concepts of Object-Oriented Programming as used in Python,</li></ul> |                                          |                          |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                        | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | (Credit=15 hours-learning & observation) |                          |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                         | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          | Min Passing Marks : 40   |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                          |
| Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                          |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          | No. of Period            |
| I                                                                                  | <b>Introduction to Python Programming Language:</b> Introduction and history, Features, Installing Python, basic syntax, interactive shell and script mode, editing saving and running a script; Variables, keywords, Data Types: fundamental data types, mutable and immutable data types, Operators in Python, input and output statements, comments in the program, understanding error messages |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          | 11                       |
| II                                                                                 | <b>Lists, Tuples and Dictionaries and Control statements:</b> Control Statements (Branching: if-else, Nested if-else, Looping, Conditional Statement, Exit function, Difference between break, continue and pass). Lists, Set, Tuples Dictionaries and String Operation.                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          | 12                       |
| III                                                                                | <b>Introducing Classes and Objects:</b> Class Fundamentals, Declaring Object, Constructors, Defining Methods, method overloading, Inheritance: Inheritance basic and types, Member accessibility modifier: public, protected, private. <b>Python Exceptions Handling:</b> Exception Basics, Handling an exception, try....except...else, try-finally clause.                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          | 12                       |
| IV                                                                                 | <b>Data Handling using The Numerical Python Library (NumPy) and File Operations :</b> Python packages, Introduction to PIP, Installing Packages via PIP,                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Introduction to NumPy library, NumPy arrays and their advantage, NumPy Attributes and Mathematical, Binary and String Functions, creation of NumPy arrays; from lists using np.array(), np.zeros(), np.ones(), np.arange(), basic slicing and indexing ; concatenating and splitting array;<br>Arithmetic operations on one dimensional and two dimensional arrays. Calculating max, min, count, sum, mean, median, mode, standard deviation on NumPy arrays.<br><b>Python File Operations:</b> Reading files, Writing files in python, Understanding read functions, read, readline. Understanding write functions, write and writelines. | 10 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Tuples, Dictionaries and Sets ,Modules, Python Classes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <b>Text Books Recommended:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <ul style="list-style-type: none"><li>• T. Bodd, Exploring Python, TMH, 1st Ed, 2011</li><li>• Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist. Learning with Pyth, Freelyavailableonline 2012</li><li>• Programming Python, Mark Lutz, 4th Edition.</li><li>• Python in a nutshell, Alex Martelli, 2d Edition, O'Reilly Publications.</li></ul>                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <b>Reference Books Recommended:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <ul style="list-style-type: none"><li>• Luca Massaron John Paul Mueller, Python for Data Science For Dummies, Wiley, 2ed. 2019</li><li>• Alles B. Dowery, Think Python How to Think Like a Computer Scientist, Zed edition by O'Reilly, 2015</li><li>• Zed A. Shaw, Lears Python 3 the Hard Way (Addison-Wesley, 2016)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <b>Online Resources:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| <ul style="list-style-type: none"><li>• NPTEL URL link for Python Programming<br/><a href="https://www.youtube.com/watch?v=eoPsX7MKfe8&amp;list=PLIdgECt554OVFKXRpo_kul0XpUQKk0ycO">https://www.youtube.com/watch?v=eoPsX7MKfe8&amp;list=PLIdgECt554OVFKXRpo_kul0XpUQKk0ycO</a></li><li>• Complete NPTEL link for Basic Python Programming:<br/><a href="https://www.youtube.com/watch?v=Y3Ri2GdYfYg&amp;list=PLqftY2uRk7oXvERQEgATSr-KzAh8WLWD">https://www.youtube.com/watch?v=Y3Ri2GdYfYg&amp;list=PLqftY2uRk7oXvERQEgATSr-KzAh8WLWD</a></li><li>• File Handling: <a href="https://www.w3schools.com/python/python_file_handling.asp">https://www.w3schools.com/python/python_file_handling.asp</a></li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |

- NumPy: <https://www.w3schools.com/python/numpy/default.asp>
- Pandas: <https://www.w3schools.com/python/pandas/default.asp>
- Topics related Python from SWAYAM/NPTEL  
<https://www.youtube.com/channel/UCxulcR5XRauYn37yg-Fh6rA>  
<https://www.youtube.com/channel/UCJAgw1niUkaShdmA5aAZdQw>
- Topics related Python from Tutorials  
<https://www.javatpoint.com/python-tutorial>  
<http://docs.python.org/3/tutorial/index.html>  
<http://interactivepython.org/courselib/static/pythonds>  
<http://www.ibiblio.org/g2swap/byteofpython/read/>
- Python for Beginners:  
[https://www.w3schools.com/python/python\\_intro.asp](https://www.w3schools.com/python/python_intro.asp)  
<https://www.python.org/about/gettingstarted/>  
<https://www.javatpoint.com/python-tutorial>  
<https://www.geeksforgeeks.org/python-programming-language/>

#### **PART -D:Assessment and Evaluation -Theory**

##### **Suggested Continuous Evaluation Methods:**

Maximum Marks: **100 Marks**

Continuous Internal Assessment(CIA): **30 Marks**

End Semester Exam (ESE): **70 Marks**

|                                                                      |                                                                                                                                                                                                                                                                                           |                                                                                                                    |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                    | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------|
| Program : <b>Master Of Computer Application</b>                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                | <b>Session:2024-2025</b> |
| 1                                                                                | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>MCAC-08P</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
| 2                                                                                | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Programming in Python</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |                          |
| 3                                                                                | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Discipline Specific Course (practical)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                |                          |
| 4                                                                                | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | As per Syllabus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
| 5                                                                                | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Define the structure and components of a Python program.</li><li>• Demonstrate proficiency in handling of loops and creation of functions. Identify the methods to create and manipulate lists, tuples and dictionaries.</li><li>• Discover the commonly used operations involving regular expressions and file system.</li><li>• Determine the need for scraping websites and working with CSV, JSON and other File formats</li><li>• Interpret the concepts of Object-Oriented Programming as used in Python,</li></ul> |                                |                          |
| 6                                                                                | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (1 Credit=30 hours Laboratory) |                          |
| 7                                                                                | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Max. Marks:50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                | Min Passing Marks: 20    |
| <b>Part B: Content of the Course</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
| <b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
| <b>Module</b>                                                                    | <b>Topics (Course contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
| <b>Lab./ Experiment Contents of Course,</b>                                      | Note: This is tentative list; the teachers concern can add more program as per requirement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |
|                                                                                  | <div>1. Python program to find the union of two lists.</div> <div>2. Python program to find the intersection of two lists.</div> <div>3. Using for loop, print a table of Celsius/Fahrenheit equivalences. Let e be the Celsius temperatures ranging from 0 to 100, for each value of c, print the corresponding Fahrenheit temperature.</div> <div>4. Using while loop, produce a table of sins, cosines and tangents. Make a variable x in range from 0 to 10 in steps of 0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).</div> <div>5. Write a program that reads an integer value and prints-leap year or not a leap year.</div> <div>6. Write a program that takes a positive integer n and then produces n lines of output shown as follows.</div> <div>For example, enter a size: 5</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |                          |

```

*
* *
* * *
* * * *
* * * * *

```

7. Write a function that takes an integer n as input and calculates the value of  $1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots + \frac{1}{n!}$ .
8. Write a function that takes an integer input and calculates the factorial of that number.
9. Write a function that takes a string input and checks if it's a palindrome or not.
10. Write a list function to convert a string into a list, as in list (abc) gives [a, b, c].
11. Write a program to generate Fibonacci series.
12. Write a program to check whether the input number is even or odd.
13. Write a program to compare three numbers and print the largest one.
14. Write a program to print factors of a given number.
15. Write a method to calculate GCD of two numbers.
16. Write a program to create Stack Class and implement all its methods. (Use Lists).
17. Write a program to create Queue Class and implement all its methods. (Use Lists)
18. Write a program to implement linear and binary search on lists.
19. Write a program to sort a list using insertion sort and bubble sort.
20. Python program to remove the "i" th occurrence of the given word in a list where words repeat.
21. Python program to count the occurrences of each word in a given string sentence.
22. Python program to check if a substring is present in a given string
23. Python program to map two lists into a dictionary.
24. Python program to count the frequency of words appearing in a string using a dictionary.
25. Python program to create a dictionary with key as first character and value as words starting with that character
26. Python program to find the length of a list using recursion
27. Python program to read a file and capitalize the first letter of every word in the file.
28. Python program to read the contents of a file in reverse order.
29. Python program to create a class in which one method accepts a string from the user and another prints it.
30. Study and implementations of Database, Structured Query Language and database connectivity.

## Part - C

**Learning Resource: Text Books, Reference Books, Others**

### **Text Books Recommended:**

- T. Bodd, Exploring Python, TMH, 1st Ed, 2011
- Allen Downey, Jeffrey Elkner, Chris Meyers, How to think like a computer scientist. Learning with Pyth, Freelyavailableonline 2012
- Programming Python, Mark Lutz, 4th Edition.
- Python in a nutshell, Alex Martelli, 2d Edition, O'Reilly Publications.

### **Reference Books Recommended:**

- Luca Massaron John Paul Mueller, Python for Data Science For Dummies, Wiley, 2ed. 2019
- Allen B. Downey, Think Python How to Think Like a Computer Scientist, 2nd edition by O'Reilly, 2015
- Zed A. Shaw, Learn Python 3 the Hard Way (Addison-Wesley, 2016)

### **Online Resources:**

- NPTEL URL link for Python Programming  
[https://www.youtube.com/watch?v=eoPsX7MKfe8&list=PLIdgECt554OVFKXRpo\\_kul0XpUQKk0ycO](https://www.youtube.com/watch?v=eoPsX7MKfe8&list=PLIdgECt554OVFKXRpo_kul0XpUQKk0ycO)
- Complete NPTEL link for Basic Python Programming:  
<https://www.youtube.com/watch?v=Y3Ri2GdYfYg&list=PLqftY2uRk7oXvERQEgATSr-KzAh8WLWD>
- File Handling: [https://www.w3schools.com/python/python\\_file\\_handling.asp](https://www.w3schools.com/python/python_file_handling.asp)
- NumPy: <https://www.w3schools.com/python/numpy/default.asp>
- Pandas: <https://www.w3schools.com/python/pandas/default.asp>
- Topics related Python from SWAYAM/NPTEL  
<https://www.youtube.com/channel/UCxulcR5XRauYn37yg-Fh6rA>  
<https://www.youtube.com/channel/UCJAgw1niUkaShdmA5aAZdQw>
- Topics related Python from Tutorials  
<https://www.javatpoint.com/python-tutorial>  
<http://docs.python.org/3/tutorial/index.html>  
<http://interactivepython.org/courselib/static/pythonds>  
<http://www.ibiblio.org/g2swap/byteofpython/read/>
- Python for Beginners:  
[https://www.w3schools.com/python/python\\_intro.asp](https://www.w3schools.com/python/python_intro.asp)  
<https://www.python.org/about/gettingstarted/>  
<https://www.javatpoint.com/python-tutorial>  
<https://www.geeksforgeeks.org/python-programming-language/>

|                                                                                                                                                                  |                                                                                                                                                                                        |                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Suggested Continuous Evaluation Methods:</b><br>Maximum Marks: 50 Marks<br>Continuous Internal Assessment(CIA): 15 Marks<br>End Semester Exam (ESE): 35 Marks |                                                                                                                                                                                        |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):</b><br><b>(By Course Teacher)</b>                                                                                       | Internal Test / Quiz-(2): 10 Marks<br>Assignment / Seminar+ Attendance - 5<br>Total Marks – <b>15 Marks</b>                                                                            | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>15 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                                                                                                                  | <b>Laboratory / Field Skill Performance: On spot Assessment</b><br>A. practical work - 20 Marks<br>B. Lab record – 5 Marks<br>C. Viva-voce - 10 Marks<br>Total Marks – <b>35 Marks</b> | Managed by Course teacher as per lab. status                                                                       |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                    |                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
|------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b> |                                | <b>Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Session:2024-2025</b>                 |
| 1                                              | Course Code                    | <b>MCAE-09T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
| 2                                              | Course Title                   | <b>Computer Graphics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| 3                                              | Course Type                    | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |
| 4                                              | Pre-requisite(if any)          | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
| 5                                              | Course Learning Outcomes (CLO) | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.</li> <li>To provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the Picture definition.</li> <li>To provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.</li> <li>To describe the general software architecture of programs that use 3D computer graphics.</li> <li>To discuss hardware system architecture for computer graphics.</li> <li>To use a current 3D graphics API (e.g., OpenGL or DirectX).</li> <li>To use the underlying algorithms, mathematical concepts, supporting computer graphics.</li> </ul> |                                          |
| 6                                              | Credit Value                   | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (Credit=15 hours-learning & observation) |
| 7                                              | Total Marks                    | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Min Passing Marks : 40                   |

**PART- B: CONTENT OF THE COURSE**

**Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)**

| <b>Unit</b> | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>No. of Period</b> |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| I           | <b>Fundamentals of Computer Graphics:</b> Concepts and applications, Random and Raster scan devices, input-output devices: CRT, LCD, laser printer. Output primitives: Line drawing algorithm: DDA and Bresenham's; Circle generating algorithm: Bresenham's Midpoint algorithms, Ellipse: midpoint ellipse drawing algorithm. Antialiasing techniques: super sampling, pixel weighting, area sampling, pixel phasing Area filling: boundary fill algorithm, flood fill algorithm: Scan-line Polygon Fill Algorithm. | 15                   |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| II  | <b>Transformation, viewing, Clipping: 2-D Transformation:</b> Translation, scaling, rotation, reflection, shear, matrix representation of all homogeneous coordinates, composite transformations. Two dimensional viewing: Viewing pipeline Window-to-view port transformation. Clipping operations: Line Clipping: Cohen Sutherland and Liang-barsky, Polygon Clipping: Cohen Sutherland-Hodgeman and Weiler – Atherton Polygon clipping.                                                                                                                                                                                                                                                                                                                           | 15 |
| III | <b>3D Transformation, Visible Surface Detection and curves:</b> Visible Surface detection Algorithm: Object based and image based methods, depth comparison, A-Buffer, Back face removal, Scan-line method, Depth Sorting Method Area subdivision method. 3-D Transformation: translation, scaling, rotation, reflection. Three- dimensional object representations 3-D Viewing Projections – parallel and perspective projection. Curved lines and Surfaces: Spline representations, Interpolating and approximation curves, continuity conditions Bezier curves: concept and characteristics; BSpline curves: concept and characteristics.                                                                                                                         | 15 |
| IV  | <b>Color Models and Basic Concept of Animation:</b> Introduction of multimedia: Properties and applications, types of medium, data stream characteristics, Basic File and Data format: BMP, JPEG,GIF, TIFF. Color models: RGB, YIQ, CMY, HSV. Animation: Basic concept, animation languages, computer-based animation, methods of controlling animation, display of animation, animation techniques: onion skinning, motion cycling, masking, morphing, and transmission of animation, Multimedia Authoring tools.<br><b>Some basic compression technique:</b> runlength code, Huffman code. JPEG: Image preparation, Lossy sequential DCT –based mode, expanded Lossy DCT based mode, Lossless mode and hierarchical mode. MPEG, Huffman Encoding, LWZ compression. | 15 |

Keywords DDA,2D Transformation, 3D Transformation, Spline curve.

Name and Signature of Convener & Member of BoS:

## Part - C : Learning Resources

### Text Books, Reference Books, Others

#### TEXT BOOKS:

1. “Computer Graphics C version”, Donald Hearn and M. Pauline Baker, Pearson education.
2. “Computer Graphics Second edition”, Zhigand xiang, Roy Plastock, Schaum’s outlines, Tata Mc Graw hill edition.
3. Principles of interactive compo Graphics; W.M. Newman & Robert F Sproull.
4. Computer Graphics By Rogers TMH 3 Introductions to Computer Graphics Anirban Mukhopadhyay & Arup Chattopadhyay
5. Schaum's outlines -computer Graphics Mc Graw Hill International Edition.

#### REFERENCE BOOKS:

1. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
2. "Procedural elements for Computer Graphics", David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
4. "Principles of Computer Graphics", Shalini, Govil-Pai, Springer.
5. "Computer Graphics", Steven Harrington, TMH
6. Computer Graphics, F. S. Hill, S. M. Kelley, PHI.
7. Computer Graphics, P. Shirley, Steve Marschner & Others, Cengage Learning.
8. Computer Graphics & Animation, M. C. Trivedi, Jaico Publishing House.
9. An Integrated Introduction to Computer Graphics and Geometric Modelling, R. Goldman, CRC Press, Taylor & Francis Group.
10. Computer Graphics, Rajesh K. Maurya, Wiley India.
11. Computer Graphics, Atul P. Godse, Technical Publications

### E-Resources :

NPTEL Web Course:

1. <http://nptel.ac.in/courses/106106090/>

NPTEL Video Course:

2. 1. <http://nptel.ac.in/courses/106106090/#>

| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                           |                                                                                                                    |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                           |                                                                                                                    |
| Maximum Marks:                                                       | <b>100 Marks</b>                                                                                                                                                                                                                                                                          |                                                                                                                    |
| Continuous Internal Assessment(CIA):                                 | <b>30 Marks</b>                                                                                                                                                                                                                                                                           |                                                                                                                    |
| End Semester Exam (ESE):                                             | <b>70 Marks</b>                                                                                                                                                                                                                                                                           |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                    | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1. Objective – 10 x1= 10 Marks;</b><br><b>Q2. Short answer type- 5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                    |                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
|------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b> |                                | <b>Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Session:2024-2025</b>                 |
| 1                                              | Course Code                    | <b>MCAE-10T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
| 2                                              | Course Title                   | <b>Soft Computing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| 3                                              | Course Type                    | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| 4                                              | Pre-requisite(if any)          | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| 5                                              | Course Learning Outcomes (CLO) | After completing this course, the students will be able to: <ol style="list-style-type: none"> <li>1. List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.</li> <li>2. Explain the concepts and meta-cognitive of soft computing.</li> <li>3. Apply Soft computing techniques the solve character recognition, pattern Classification, regression and similar problems.</li> <li>4. Evaluate various techniques of soft computing to defend the best working solutions.</li> </ol> |                                          |
| 6                                              | Credit Value                   | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (Credit=15 hours-learning & observation) |
| 7                                              | Total Marks                    | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Min Passing Marks : 40                   |

**PART- B: CONTENT OF THE COURSE**

**Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)**

| <b>Unit</b> | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>No. of Period</b> |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| I           | <b>Fuzzy Logic Systems and Soft Computing Tools</b><br>Fuzzy Sets, Operation of Fuzzy Sets, Properties of Fuzzy Sets, Fuzzy Relations, Fuzzy Arithmetic, Membership Functions, Fuzzy To Crisp Conversion, Fuzzy Logic, Fuzzy Rule-Based Systems, Fuzzy Decision Making, Fuzzy Database, Fuzzy Intelligent System.<br>Soft Computing Tools: Introduction to MATLAB, Features, Matrix Operations, Curve Plotting, Toolbox Introduction, Introduction to Simulink.                                                                                                                                                                     | 15                   |
| II          | <b>Artificial Neural Networks and Perceptron Models</b><br>Introduction to Artificial Neural Network, Artificial Neuron, Classification of Artificial Neural Networks, Architecture of an Artificial Neural Network, Activation Function, Training an Artificial Neural Network ,Application of Artificial Neural Networks.<br>Perceptron and Associative Memories: Amari General Learning Rule, HEBB Learning Rule, ADLINE, Perceptron Layer Network, Associative Memory: Auto Associative Memory, Bi-directional Memory.<br>Back-Propagation Network: Architecture, Training Algorithm, Application of Back-Propagation Algorithm | 15                   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                      |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Evolutionary Computing and Genetic Algorithms</b><br>Introduction, Overview of Evolutionary Computing, Genetic Algorithms and Optimization, The Schema Theorem: The Fundamental Theorem of Genetic Algorithms, Genetic Algorithm Operators ,Integration of Genetic Algorithms with Neural Networks, Integration of Genetic Algorithms with Fuzzy Logic, Known Issues in Genetic Algorithms (GAs). | 15 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Hybrid Soft Computing and Applications</b><br>Integration of Fuzzy Logic, Neural Networks, and Genetic Algorithms, Hybrid Soft Computing Models, Real-World Applications of Soft Computing in Various Domains,<br>Case Studies in Soft Computing                                                                                                                                                  | 15 |
| Keywords    ANN, Fuzzy logic ,GA , MATLAB, Evolutionary Computing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| <b>Text Books and Reference Books Recommended-</b> <ol style="list-style-type: none"> <li>1. Principles of soft computing , S.N.Shivanandan and S.N. deepa Wiley India publication ,First Indian edition ,2008.</li> <li>2. A Comprehensive Foundation to Neural Networks , Simon Haykins , Prentice Hall</li> <li>3. Fuzzy Sets and Fuzzy Logic: Theory and Applications , G. J. Klir, and B. Yuan, PHI learning ,2011.</li> <li>4. Dr.G.Canon, Fuzzy Logic and Fuzzy Decision Making: Concepts and Applications, Galgotia Publication.</li> <li>5. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison- Wesley, 1989.</li> <li>6. Jang,Sun and Mizutani :Neuro-Fuzzy and soft computing :A computational Approach to learning and machine intelligence ,PHI learning ,2011.</li> <li>7. N.K. Sinha &amp; M. M. Gupta(Eds), Soft Computing and Intelligent Systems: Theory &amp; Applications, Academic Press, 2000.</li> </ol> <b>Online Resources:</b> <ul style="list-style-type: none"> <li>• Introduction to Soft Computing from SWAYAM-NPTEL<br/> <a href="https://www.classcentral.com/course/swayam-introduction-to-soft-computing-10053">https://www.classcentral.com/course/swayam-introduction-to-soft-computing-10053</a> </li> <li>• Introduction to Soft computing: <a href="#">What is soft computing-Javatpoint</a></li> <li>• Need for Soft Computing: <a href="#">Need for Soft Computing-Geeks for Geeks</a></li> <li>• Introduction To Soft Computing: <a href="#">Introduction To Soft Computing Course (nptel.ac.in)</a></li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                      |    |

|                                                                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART -D: Assessment and Evaluation -Theory</b>                    |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                                          | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1.</b> Objective – <b>10 x1= 10 Marks;</b><br><b>Q2.</b> Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------|
| Program: Master Of Computer Application                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Semester: II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          | Session:2024-2025      |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | MCAE-11T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                        |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Cyber Security                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                        |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                        |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                        |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Familiar with protocols, network interfaces, and Design/performance issues in local area networks and wide area networks.</li><li>• Familiar with contemporary issues in networking technologies.</li><li>• Familiar with network tools and network programming.</li><li>• Conventional encryption algorithms for confidentiality and their design principles, Public key encryption algorithms and their design principles</li><li>• Able to use of message authentication codes, hash functions , digital signature and public key certificates</li></ul> |                                          |                        |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (Credit=15 hours-learning & observation) |                        |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          | Min Passing Marks : 40 |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
| Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | No. of Period          |
| I                                                                                  | <b>INTRODUCTION &amp; CRYPTOGRAPHY:</b> Computer Security Concepts, The Challenges of Computer Security, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A model for network Security. Symmetric Encryption Principal: Cryptography, Cryptanalysis, Feistel Cipher Structure, DES, Random and Pseudorandom Numbers, Symmetric Block Modes of Operation (ECB, CBC, CFB, CTR).<br><b>Public Key Cryptography:</b> Public-Key Encryption Structure, Applications for Public Key Cryptosystem, RSA, Attacks on RSA, OAEP.<br>Hash Functions: Hash Functions Requirement, Security of Hash Functions, The SHA Secure Hash Function. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | 15                     |
| II                                                                                 | <b>MESSAGE INTEGRITY, AUTHENTICATION &amp; DIGITAL SIGNATURES</b><br><b>Message Integrity:</b> Document and Finger Printing, Message and Message Digest, Cryptographic Hash Function Criteria, Random Oracle Model, Birthday Problems and Summary of solutions.                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | 15                     |

|                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                     |    |
|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                | <b>Message Authentication:</b> Modification Detection Code, Message Authentication Code, Introduction of HMAC & CMAC. <b>Digital Signature:</b> Comparison, Process, Services, Attacks on Digital Signature                                                                                                                                                                         |    |
| III                                                                                                                            | <b>MALICIOUS SOFTWARE &amp; NETWORK SECURITY</b><br><b>Intruders:</b> Intruder Behavior Patterns, Intrusion Techniques, Intrusion Detection by Audit Records, Statistical Intrusion Detection, Distributed Intrusion Detection, Honeypot. Types of Malicious Software, Nature of Viruses, Virus Classification, Antivirus Approaches, Worms and its Propagation model, DDoS Attack. | 15 |
| IV                                                                                                                             | <b>FIREWALLS, SECURITY TOOLS &amp; CYBER SECURITY POLICIES</b><br><b>Firewall:</b> Need & Characteristics of Firewall, Types of Firewall, Firewall Basing, Firewall Location and Configuration. Introduction to Kali Linux, Tools Available in Kali Linux and Its Usage. WireShark Packet Analyzer and Its Features. Cyber Security Policy, Domain of Cyber Security Policies.      | 15 |
| Keywords                                                                                                                       | Cryptography, Digital Signature, Virus , Firewall.                                                                                                                                                                                                                                                                                                                                  |    |
| Name and Signature of Convener & Member of BoS:                                                                                |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| <b>Part - C : Learning Resources</b>                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| <b>Text Books, Reference Books, Others</b>                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| <b>Text Books and Reference Books Recommended-</b>                                                                             |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| 1 . Cryptography and Network Security By William Stallings, 4th Edition Pearson Publication.                                   |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| 2. Applied cryptography - protocols and algorithm By Buce Schneier, Springer Verlag 2003                                       |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| 3. Cryptography and Network Security By Atul Kahate , TMH Publication.                                                         |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| 4. Cryptography and Network Security By Behrouz A. Forouzan, First Edition, TMH Publication.                                   |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| 5. Network Security:Private Communication in Public World By Charlie Kaufman,Radia Perlman and Mike Speciner ,PHI Publication. |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| <b>Online Resources:</b>                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                     |    |
| •                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                     |    |

|                                                                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                            | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                   | <b>Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Session:2024-2025</b>                 |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                       | <b>MCAE-12T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                      | <b>Cloud Computing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                       | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                             | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                    | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the concepts, characteristics and benefits of cloud computing.</li> <li>• Understand the key security and compliance challenges of cloud computing.</li> <li>• Understand the concept of Cloud Security and governance.</li> <li>• Learn the Concept of Cloud Infrastructure Model.</li> <li>• Understand the cloud storage, Cloud Virtualization &amp; Micro services.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                      | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                       | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>No. of Period</b>                     |
| I                                                                                         | <b>Introduction to Cloud Computing:</b><br>Cloud Computing: Vision, Definition, Reference Model, Characteristics, Benefits and challenges, Historical Developments, The Evolution of Cloud Computing, Parallel Computing vs. Distributed Computing, Elements of Cloud Computing, Elements of Distributed Computing, Technology for Distributed Computing, Computing as a Service. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15                                       |
| II                                                                                        | <b>Virtualization</b><br>Introduction to Virtualization, Characteristics and Taxonomy of Virtualization, Levels of Virtualization, Amazon Web Services, Virtualization vs. Cloud Computing, Advantages and Disadvantages, Virtualization in the Cloud, Xen, VMware, Microsoft Hyper-V.                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15                                       |
| III                                                                                       | <b>Cloud Architecture</b><br>Service Oriented Architecture (SOA), Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Data Storage as a Service (DSaaS), Models of the Cloud and Open Cloud, Security and Organizational Aspects: Host Security and Data Security                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Migration and Industry Alignment</b><br>Migration to the Cloud: Business Model and Enterprise, People-as-Services, Benefits of Adoption, Best Practices for Adoption, Migrating Applications: Key Aspects, Migration Techniques, Phases of Migration, and Issues, Industry Alignment: Amazon Web Services, Google App Engine, Microsoft Azure, Cloud Applications: Gigs, Business and Consumer Applications, Advanced Topics: Energy Efficiency in Clouds, Third Party Cloud Services | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cloud computing, Virtualization, Cloud Architecture , IaaS, PaaS, SaaS.                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <b>Text Books Recommended:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <ul style="list-style-type: none"><li>Distributed Computing by Dolly more Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <b>Reference Books Recommended:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <ul style="list-style-type: none"><li>Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg Andrzej M. Goscinski, Wile, 2011 Cloud Computing: Principles, Systems and Applications Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.</li><li>Handbook of Cloud Computing by Anand Nayyar, Publisher: BPB Publication.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| Online Resources:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| <ul style="list-style-type: none"><li>Introduction to Cloud Computing from W3shool:<br/><a href="https://www.w3schools.in/cloud-computing/tutorials/">https://www.w3schools.in/cloud-computing/tutorials/</a></li><li>Introduction to Cloud Computing from Coursera:<br/><a href="https://www.coursera.org/learn/introduction-to-cloud">https://www.coursera.org/learn/introduction-to-cloud</a></li><li>Cloud Computing Basics<br/><a href="https://www.coursera.org/learn/cloud-computing-basics">https://www.coursera.org/learn/cloud-computing-basics</a></li><li>Cloud Computing Concepts:<br/><a href="https://www.coursera.org/learn/cloud-computing">https://www.coursera.org/learn/cloud-computing</a></li><li>Cloud Computing Specialization from Coursera.<br/><a href="http://www.coursera.org/specializations/cloud-computing">http://www.coursera.org/specializations/cloud-computing</a></li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |

|                                                                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART D - Assessment and Evaluation -Theory</b>                    |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                                 |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                                          | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1.</b> Objective – <b>10 x1= 10 Marks;</b><br><b>Q2.</b> Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Semester: II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Session:2024-2025</b>                 |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>MCAE-13T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Software Engineering</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>To plan a software engineering process life cycle, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements</li> <li>To elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project</li> <li>To analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.</li> <li>Understand basic concepts of Software UML design and implementation</li> <li>Perform software testing on various applications</li> <li>Understand and apply various software metrics on software quality products</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>No. of Period</b>                     |
| I                                                                                         | <b>Software Engineering Fundamentals &amp; Process Models</b><br>Introduction to Software Engineering, Software Engineering Principles (Layers), Software Process – Process Framework, Umbrella Activities, Process Adaptation, Software Crisis, Process Models: Waterfall Model, Prototype Model, Incremental Model, Spiral Model, RAD Model, Agile Process Model.                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15                                       |
| II                                                                                        | <b>Software Analysis, Design &amp; Quality Assurance</b><br>Software Analysis and Design: Requirement Engineering, Analysis Models – Data Flow Diagram, Data Dictionary, E-R Diagram, Decision Table, Software Requirements Specification (SRS) and its Structure, Pseudo Code, Software Design & Design Process, Design Concepts – Abstraction, Partitioning, Modularity, Information Hiding, Refinement, Refactoring, Function-Oriented Design & Object-Oriented Design, Cohesion and Coupling , Software Quality and Assurance: Software Metrics & Categories of Metrics, |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15                                       |

|                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                            | Function Point Metric, Software Quality & McCall’s Quality Factors, Software Maturity Models – CMM, CMMI, Software Quality Assurance ,ISO Standards – 9000, 9001, 9126, Software Reliability.                                                                                                                                                                                                                                                                                                             |    |
| III                                                                                                                                                                                                                                                        | <b>Coding, Testing &amp; Debugging</b><br>Programming Style & Structured Programming, Coding Standards, Internal Documentation, Software Testing: Verification and Validation, Alpha and Beta Testing, Levels of Testing – Unit, Integration, and System Testing, Testing Techniques – White Box, Black Box, Cyclomatic Complexity, Test Plan, debugging: Debugging Process, Debugging Strategies (Approaches).                                                                                           | 15 |
| IV                                                                                                                                                                                                                                                         | <b>Software Maintenance &amp; Project Management</b><br>Software Maintenance: Introduction to Software Maintenance, Categories of Maintenance, Belady and Lehman Model, Boehm Model, Project Management: Risk Management – Software Risk, Risk Identification, Project Management Concepts – People, Product, Process, Project Software Team, Software Project Planning, Software Project Estimation, Cost Estimation Models (COCOMO, COCOMO II, Putnam-SLIM, Walston and Felix), Software Reengineering. | 15 |
| Keywords                                                                                                                                                                                                                                                   | SDLC, Cohesion and coupling ,Function Point , COCOMO ,Testing.                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Text Books and Reference Books Recommended-</b>                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Text Books Recommended:</b>                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <ul style="list-style-type: none"><li>• Rajib Mall, Fundamentals of Software Engineering, 5th ed, PHI publication.</li><li>• Roger S. Pressman, Software Engineering. A practitioner's Approach, 6th edition, McGraw Hill International Edition.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Reference Books Recommended:</b>                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <ul style="list-style-type: none"><li>• Sommerville, Software Engineering, 7th edition, Pearson Education</li><li>• James Rumbaugh, Ivar Jacobson, The unified modelling language user guide Grady Booch, Pearson Education</li></ul>                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Online Resources:</b>                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <ul style="list-style-type: none"><li>• NPTEL YouTube Channel: Software Engineering Lectures by Prof Rajib Mall, IIT Kharagpur</li></ul>                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |    |

<https://youtube.com/playlist?list=PLbRMDVUMng/8oZR3DpKMvYlZKg90JVI&ITBITZUdivipNzil>

- NPTEL YouTube Channel Software Engineering Lecture Series  
[https://youtube.com/playlist?list=PL8751DA481F0F0D17&si=071fYV7IP8\\_ocTxZ](https://youtube.com/playlist?list=PL8751DA481F0F0D17&si=071fYV7IP8_ocTxZ)

| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                                   |                                                                                                                           |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                           |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                           |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                   |                                                                                                                           |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                   |                                                                                                                           |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                            | Better marks out of the two Test / Quiz <b>+</b> obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1. Objective – 10 x1= 10 Marks;</b><br><b>Q2. Short answer type- 5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                           |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                        |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------|
| Program: Master Of Computer Application                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Semester: II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          | Session:2024-2025      |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | MCAE-14T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |                        |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mobile Computing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                        |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |                        |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |                        |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• To introduce Android platform and its architecture</li><li>• To explain activity creation and Android UI designing. To be familiarized with Internet, Broadcast receivers and Internet services.</li><li>• To explore SQLite Database and content providers.</li><li>• To integrate multimedia, camera and Location based services in Android Application.</li><li>• Describe Android platform, Architecture and features.</li><li>• Design User Interface and develop activity for Android App.</li><li>• Use Internet, Broadcast receivers and Internet services in Android App.</li></ul> |                                          |                        |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (Credit=15 hours-learning & observation) |                        |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          | Min Passing Marks : 40 |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                        |
| Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                        |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          | No. of Period          |
| I                                                                                  | Introduction and Mobile Communication Systems<br>Introduction to Mobile Communication, Evolution of modern Mobile wireless communication systems, Applications of mobile communication, Requirements of Mobile communication, Satellite systems and Applications, Satellite classification, Characteristics of satellite systems, Open research topics in mobile communication. Mobile Communication Systems: Cellular Structure, Cell Cluster, Frequency Reuse, Co-channel and Adjacent Channel Interference, Enhancement of system capacity, Channel Assignment schemes in Cellular network, Cellular System Infrastructure: Registration, Handoff Parameters and Underlying support, Roaming Support Using System Backbone. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          | 15                     |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Mobile IP and Mobility Management</b><br>Mobile IP, Mobile Node, Corresponding Node, Home Network, Foreign Network, Home Agent, Foreign Agent, Care-of Address, Mobile IP Operations: Agent Discovery, Agent Solicitation, Tunneling.<br>Mobility Management in Wireless: Networks, Handoff Techniques, Handoff Detection and Assignment, Types of Handoff, Channel Reservation for Handoff calls.                                                                                                                                                                                                                                                                           | 15                                               |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Wireless Networks (LANs, PANs, and Adhoc Networks)</b><br>Introduction to IEEE 802.11, WLAN Transmission Technology, Spread Spectrum Technology, Frequency Hopping Spread Spectrum Technique, Direct Sequence Spread Spectrum Technique, WLAN System Architecture, IEEE 802.11 Logical Architecture, CSMA/CA, Home RF, Hiper LAN, Bluetooth, Advantages and Disadvantages of Wireless LAN.<br>Introduction to Mobile Adhoc Network (MANET): Characteristics of MANET, Applications of MANET, Routing, Need for Routing, Routing Classification, Table-Driven Routing Protocol – Destination Sequenced Distance Vector Routing Protocol, Cluster-Head Gateway Switch Routing. | 15                                               |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Advanced Routing in Mobile Networks</b><br>Source-Initiated On-Demand Routing: Adhoc On-Demand Distance Vector Routing, Dynamic Source Routing, Hybrid Protocol – Zone Routing Protocol, Emerging Trends and Challenges in Mobile Computing.                                                                                                                                                                                                                                                                                                                                                                                                                                 | 15                                               |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Mobile Communication, IEEE 802.11, CSMA/CA, DVR. |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"> <li>FUNDAMENTALS OF MOBILE COMPUTING :PHI Publication <b>PATTNAIK, PRASANT KUMAR ,MALL RAJIB</b></li> <li>Data Communications and Networking By Forouzan, Tata McGraw Hill Company.</li> <li>Computer Networks By A.S. Tanenbaum 3. Computer Network By S.S.Shinde ,New Age International Publisher.</li> <li>Data and computer Communication by Shashi banzal ,Firewall media</li> <li>Internetworking with TCP/IP :Principles,protocols,and Architecture Vol 1 5th Edition ,PHI publication</li> <li>Data Communications and Computer Network by Prakash C Gupta, PHI Publication.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |
| <b>Online Resources:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |

- NPTEL lecture series:

<https://www.youtube.com/watch?v=ytLkrvylf6g&list=PLsK7K7rfGYke2ZfFugu2cppvNHNrdjD-u>

**PART -D: Assessment and Evaluation -Theory**

**Suggested Continuous Evaluation Methods:**

Maximum Marks: **100 Marks**

Continuous Internal Assessment(CIA): **30 Marks**

End Semester Exam (ESE): **70 Marks**

|                                                                      |                                                                                                                                                                                                                                                                                                   |                                                                                                                    |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                            | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40 Marks</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

## अध्ययन मंडल बैठक दिनांक 15/07/2025

### विषय – कम्प्यूटर एप्लीकेशन

विश्वविद्यालय अन्तर्गत संचालित मास्टर ऑफ कम्प्यूटर एप्लीकेशन प्रोग्राम में राष्ट्रीय शिक्षा नीति 2020 के अनुरूप तृतीय एवं चतुर्थ सेमेस्टर में निम्नानुसार परीक्षा योजना एवं मूल्यांकन पद्धति की अनुशंसा की जाती है :-

| M.C.A. Third Semester  |             |                                                        |                 |        |           |           |           |     |     |
|------------------------|-------------|--------------------------------------------------------|-----------------|--------|-----------|-----------|-----------|-----|-----|
| Course Type            | Course Code | Course Title                                           | Paper           | Sem.   | Credit    | Max Marks | Min Marks | CIA | ESE |
| DSC                    | MCAC-15T    | Theory Of Computation                                  | I               | III    | 4         | 100       | 40        | 30  | 70  |
| DSC                    | MCAC-16T    | Computer Networking                                    | II              | III    | 4         | 100       | 40        | 30  | 70  |
| DSC                    | MCAC-17T    | Java Programming                                       | III             | III    | 3         | 100       | 40        | 30  | 70  |
| DSC                    | MCAC-17P    | Java Programming Lab                                   | P1              | III    | 1         | 50        | 20        | 15  | 35  |
| DSC                    | MCAC-18     | Minor Project                                          | IV              | III    | 1         | 50        | 20        | -   | 50  |
| DSE                    | MCAE-19T    | Machine Learning and Intelligent Model Design          | IV Elective - 3 | III    | 4         | 100       | 40        | 30  | 70  |
| DSE                    | MCAE-20T    | Generative Artificial Intelligence                     |                 |        |           |           |           |     |     |
| DSE                    | MCAE-21T    | Big Data Analytics                                     |                 |        |           |           |           |     |     |
| DSE                    | MCAE-22T    | Natural Language Processing                            | IV Elective - 4 | III    | 3         | 100       | 40        | 30  | 70  |
| DSE                    | MCAE-23T    | Internet of Things                                     |                 |        |           |           |           |     |     |
| DSE                    | MCAE-24T    | Data Mining and Data Warehousing                       |                 |        |           |           |           |     |     |
| Total                  |             |                                                        |                 |        | 20        | 600       | 240       | 165 | 435 |
| M.C.A. Fourth Semester |             |                                                        |                 |        |           |           |           |     |     |
| COURSE TYPE            | Course Code | Course Title                                           | Sem.            | Credit | Max Marks | Min Marks | CIA       | ESE |     |
| DSC                    | MCAC-25P    | Major Project                                          | IV              |        |           |           |           |     |     |
|                        |             | A. Synopsis                                            |                 | 2      | 50        | 20        | 50        |     |     |
|                        |             | B. First Project progress report through presentation  |                 | 2      | 50        | 20        | 50        | -   |     |
|                        |             | C. Second Project progress report through presentation |                 | 2      | 50        | 20        | 50        | -   |     |
|                        |             | D. Thesis Submission                                   |                 | 2      | 50        | 20        | -         | 50  |     |
|                        |             | E. Final Presentation                                  |                 | 3      | 100       | 40        | -         | 100 |     |
|                        |             | F. Viva-Voce                                           |                 | 1      | 50        | 20        | -         | 50  |     |
|                        |             | G. Software Project                                    |                 | 8      | 250       | 100       | -         | 250 |     |
| TOTAL                  |             |                                                        |                 | 20     | 600       | 240       | 150       | 450 |     |

टीप :- परीक्षा योजना एवं प्रश्न पत्र के प्रारूप को भी यथावत् लागू करने की अनुशंसा की जाती है। आज दिनांक 15/07/2025 को कम्प्यूटर एप्लीकेशन अध्ययन मंडल की बैठक में निम्नलिखित अध्यक्ष/सदस्य उपस्थित हुये।

क्र. नाम

पदनाम

अध्यक्ष/सदस्य

हस्ताक्षर

## Master Of Computer Application

### DEPARTMENT OF COMPUTER APPLICATION COURSE CURRICULUM

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: Master Of Computer Application                                                   |                                                                                                                                                                                                                                                                                                                                                                    | Semester: III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Session:2025-2026                        |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                        | MCAC-15T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                       | Theory of Computation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                        | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                              | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                     | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the basics of alphabets, strings, languages, and finite automata, and learn how to convert and minimize automata.</li> <li>• Explain and use regular expressions, properties of regular languages, and related theorems like the pumping lemma.</li> <li>• Work with context-free grammars (CFG), simplify them, convert to normal forms, and handle ambiguity.</li> <li>• Understand and build pushdown automata and see how they relate to context-free languages; also learn about advanced automata like linear bounded automata.</li> <li>• Learn and design Turing machines and understand how they work, including different types like multi-tape and non-deterministic machines.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                       | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                        | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
| Unit                                                                                      | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | No. of Period                            |
| I                                                                                         | <b>Finite Automata and Machine Models</b><br>Alphabet, String and language, Finite state Machines, finite automata with $\epsilon$ -moves, Conversion of NDFA to DFA, Removal of $\epsilon$ -transition from NDFA, Two way finite automata, finite automata with output, Mealy & Moore machines, Applications of finite automata, minimization of finite automata. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15                                       |
| II                                                                                        | <b>Formal Languages and Grammars</b><br>Chomsky classification of Languages, Regular Expression and Language, Properties of Regular languages, Pumping lemma for regular sets, Closure properties of regular sets, Decision algorithms for Regular sets, Myhill-Nerode theorem. Context free grammars and their properties, derivation tree,                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | simplifying CFG, ambiguity in CFG, Chomsky Normal form, Greibach Normal form, Pumping lemma for CFL, Closure properties of CFL.                                                                                                                                                                                                                                                                           |    |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Pushdown Automata, Linear Bounded Automata, and Turing Machines</b><br>Pushdown automata: Informal description, Definition, Determinism and Non determinism in PDA, Equivalence of PDA's and CFL's. Two way PDA, Concept of Linear Bounded Automata, context sensitive grammars and their equivalence, Turing machine construction, determinism and non-determinism in TM, Multi tape, multi-track TM. | 15 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Undecidability and Recursive Function Theory</b><br>Undecidability, Universal turning machine and an undecidable problem, recursive function theory, Recursively enumerable sets, recursive sets, partial recursive sets, Church's hypothesis, post correspondence problem, Russell's paradox.<br>Introduction to Compiler Design, Phases of Compiler, Lexical and Syntax Analysis.                    | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Finite Automata, Regular Languages, Context Free Grammar (CFG), Pushdown Automata (PDA), Turing Machine, Undecidability                                                                                                                                                                                                                                                                                   |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>Text Books and Reference Books Recommended-</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <ul style="list-style-type: none"><li>• <b>Theory of Computer Science, Automata Languages &amp; computation</b>, K.L.P. Mishra, N. Chandrashekharan, PHI.</li><li>• <b>Introduction to Automata Theory Language and Computation</b>, John E. Hopcroft and Jeffery D. Ullman, Narosa Publication house.</li><li>• <b>Introduction to Formal Languages, Automata Theory and Computation</b>, Kamala Krithivasan and Rama. R, Pearson.</li><li>• <b>Introduction to Automata Theory Languages and Computation</b>, John E. Hopcroft, Jeffrey, D. Ullman and Rajeev Motwani.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <b>E-resources:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                           |    |
| <ul style="list-style-type: none"><li>• <a href="http://ndl.iitkgp.ac.in/he_document/nptel/nptel/IN_N_1_C_S_a_E_9093_T_o_C_10836_10837?e=0 Theory%20of%20computation">http://ndl.iitkgp.ac.in/he_document/nptel/nptel/IN_N_1_C_S_a_E_9093_T_o_C_10836_10837?e=0 Theory%20of%20computation</a>.</li><li>• <a href="https://egyankosh.ac.in/handle/123456789/37578">https://egyankosh.ac.in/handle/123456789/37578</a></li></ul>                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                           |    |

|                                                                      |                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>PART –D : Assessment and Evaluation -Theory</b>                   |                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                           |                                                                                                                                |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                                    | Better marks out of the two<br>Test / Quiz + obtained<br>marks in Assignment shall<br>be considered against <b>30</b><br>Marks |
| <b>End Semester Exam<br/>(ESE):</b>                                  | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1.</b> Objective – <b>10 x1= 10 Marks;</b><br><b>Q2.</b> Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                                |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Semester: <b>III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
|                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Session: <b>2025-2026</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>MCAC-16T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Computer Network and Data Communication</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand and explain the fundamental concepts of data communication, network components, and transmission media.</li> <li>• Analyze and compare various network architectures, protocols, and models such as OSI and TCP/IP.</li> <li>• Demonstrate and apply error detection, error correction techniques, and flow control mechanisms.</li> <li>• Implement and evaluate IP addressing schemes, subnetting, and routing algorithms for efficient network design.</li> <li>• Understand and utilize transport and application layer services, including protocols such as TCP, UDP, HTTP, and DNS..</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>No. of Period</b>                     |
| I                                                                                         | <b>Introduction and Physical Layer:</b><br><b>Introduction:</b> Goal and application Network Hardware and Software, Protocol Hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Model, Types of computer Network: LAN, MAN, WAN, Topologies, Transmission mode. Physical Layer: Data and signal, Analog and digital Communication, Transmission Media, Concept of data transmission, Switching Techniques, Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 15                                       |
| II                                                                                        | <b>Data Link Layer:</b> Data Link Layer design issues Data link control: Framing, Flow control. Error Detection and Correction. DLC protocol: Stop and Wait Protocol, Sliding window protocol, A Simplex protocol for noisy channel,                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 15                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | medium access sublayer: Channel allocation: static and dynamic, Multiple access protocol FDDI, Data Link Layer in the Internet: SLIP, PPP. Wired and Wireless LAN protocol.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Network Layer:</b> The Network Layer Design Issue, IP addressing, Address mapping, Error reporting, Multicasting, Delivery, Forwarding and Routing. The Network Layer in the Internet: The IP Protocol. subnets, Internet control protocols, internet multicasting.<br><b>Transport Layer:</b> The Transport layer services, the concept of client and server in terms of socket addressing Quality of service, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP. | 15 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Presentation and Application Layer:</b> Network Security, Traditional Cryptography, Private key cryptography and public key cryptography, Authentication protocols, DNS, SNMP, E-mail, application layer protocols.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Data Communication, Transmission media, Line Discipline, Routing, Network Security                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <b>Text Books and Reference Books Recommended-</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <ul style="list-style-type: none"><li>• “Data Communications &amp; Networking” by Behrouz A. Forouzan.</li><li>• “Computer Networks” by Andrew S. Tanenbaum.</li><li>• “Data and Computer Communications” by William Stallings.</li><li>• “Internetworking with TCP/IP” (Vol I-III) by Douglas E. Comer</li></ul>                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <b>E-resources:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| <ul style="list-style-type: none"><li>• <b>NPTEL and Swayam:</b><br/><a href="https://egyankosh.ac.in/bitstream/123456789/35913/1/Introduction_to_Computer_and_Networking.html">https://egyankosh.ac.in/bitstream/123456789/35913/1/Introduction_to_Computer_and_Networking.html</a></li><li>• <a href="http://ndl.iitkgp.ac.in/he_document/faculty_contribution/123456789_FACCON/INLSocN34">http://ndl.iitkgp.ac.in/he_document/faculty_contribution/123456789_FACCON/INLSocN34</a></li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |

|                                                                      |                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>PART -D: Assessment and Evaluation -Theory</b>                    |                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                           |                                                                                                                                       |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                                    | Better marks out of the two<br>Test / Quiz <b>+</b> obtained<br>marks in Assignment shall<br>be considered against <b>30</b><br>Marks |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1.</b> Objective – <b>10 x1= 10 Marks;</b><br><b>Q2.</b> Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40</b><br><b>Total Marks - 70 Marks</b> |                                                                                                                                       |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |                        |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------|
| Program: Master Of Computer Application                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Semester: III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          | Session:2025-2026      |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MCAC-17T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                        |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Java Programming                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |                        |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Discipline Specific Course (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |                        |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                        |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Understand the fundamentals of object-oriented programming environment to design, code, compile, run and debug programs.</li><li>• Understand the basic principles of Creating Java Applications with console-based and GUI.</li><li>• Evaluate the Java API packages and their contents.</li><li>• Understand the procedures, File I/O operations, exception handling, and multithreading in Java.</li><li>• Understand and remember the components of Java IDEs, JDBC for database connectivity, and the development of Swing-based GUI applications.</li></ul> |                                          |                        |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (Credit=15 hours-learning & observation) |                        |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          | Min Passing Marks : 40 |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |                        |
| Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |                        |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          | No. of Period          |
| I                                                                                  | <b>Introduction to Java Programming</b><br>An overview of Java: Object Oriented Programming, Features of Java, Java Virtual Machine, Java Environment: Java Development Kit, Java Standard Library, Data Types, Variables: Declaring a variable, Dynamic Initialization, The scope and life time of variable, Type conversion and Casting: Narrowing and Widening Conversions, Numeric Promotions; Operators: Arithmetic Operators, Relational Operators, Logical Operators, Bit wise Operators, Conditional Operators, new operator, instance of operator. Control Statements: Java’s Selection statement, Iteration Statement, Jump Statement. Arrays: Declaring Array variables, constructing an Array, Initializing an Array, Multidimensional Arrays, Anonymous Arrays. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          | 12                     |
| II                                                                                 | <b>Class and Interface</b><br>Class Fundamentals, Object, Assigning Object Reference Variables; Methods: method overloading and overriding, Using objects as parameter, Constructors, Garbage collection, finalize () method. Inheritance basic, method overloading,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          | 11                     |

|                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                                                                                                                                                           | this and super keywords, Chaining constructor using this () and super ();<br>Access modifier: private, public, protected, default, private protected.<br>Interface: Defining, implementing and extending interface, variable in interface, Overview of nested class: Top level nested class and interface.                                                                                                                                                                                                                                                                                                                                                                      |    |
| III                                                                                                                                                                                                                                                                                                                                                                                       | <b>Exception Handling and Multithreading</b><br>Exception types, Uncaught Exception, Using try and catch, multiple catch, nested try block, throw, throws, and finally.<br>Multithreading: Creating Thread, Thread Priority, Synchronization, Thread Scheduler, Running & Yielding, Sleeping & Waking Up, Waiting & Notifying, Suspending & Resuming;                                                                                                                                                                                                                                                                                                                           | 11 |
| IV                                                                                                                                                                                                                                                                                                                                                                                        | <b>Event Handling and GUI Programming</b><br>Overview of Event Handling, Event Hierarchy, The Delegation Event Model, Event Classes, KeyEventClass, Sources of Events, Event Listener Interfaces, Using the Delegation Event Model, Event Adapters.<br>GUI Programming: Introduction to Swing, Features, Components and Containers, Swing Packages, Painting, Swing Component Classes: JLabel, JTextField, Swing Buttons, JTabbedPane, JScrollBar, JList, JComboBox, Trees, JTable, Swing Menus: Main Menu, PopUp Menu, ToolBar.<br>JDBC: Introduction to JDBC, JDBC Drivers Type, Connection, JDBC URLs, Driver Manager, Statement – Creating, Executing, Closing, Result Set. | 11 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                  | Object Oriented Programming, Class and Interface, Multithreading, Exceptions, Event Handling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Part - C: Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"><li>• Java: The Complete Reference, Herbert Schildt, Oracle Press</li><li>• Core Java: Volume-I &amp; Volume-II, Cay S. Horstmann &amp; Gary Cornekk, Pearson</li><li>• Programming with Java, E. Balagurusamy, McGraw Hill Education</li><li>• Core Java, Nageshwara Rao, Dreamtech Press</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>E-Resources:</b> <ul style="list-style-type: none"><li>• <b>NPTEL and Swayam:</b><br/><a href="https://onlinecourses.nptel.ac.in/noc22_cs47/preview">https://onlinecourses.nptel.ac.in/noc22_cs47/preview</a></li></ul>                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |

|                                                                  |                                                                                                                                                                                                                                                                             |                                                                                                                           |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>PART -D: Assessment and Evaluation -Theory</b>                |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| <b>Suggested Continuous Evaluation Methods:</b>                  |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| Maximum Marks: <b>100 Marks</b>                                  |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>             |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| End Semester Exam (ESE): <b>70 Marks</b>                         |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| <b>Continuous Internal Assessment (CIA): (By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                      | Better marks out of the two Test / Quiz <b>+</b> obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                  | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1. Objective – 10 x1= 10 Marks;</b><br><b>Q2. Short answer type- 5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question.,1 out of 2 from each unit-4x10=40<br><b>Total Marks - 70 Marks</b> |                                                                                                                           |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |
|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------|
| Program: <b>Master Of Computer Application</b>                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Semester: I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                | <b>Session:2025-2026</b> |
| 1                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>MCAC-17P</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |
| 2                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Java Programming</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                |                          |
| 3                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Discipline Specific Course (Practical)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |                          |
| 4                                                                         | Pre-requisite (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | As per Syllabus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |
| 5                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Design, create, build, and debug Java programs.</li><li>• Apply multithreading concepts to develop concurrent applications in Java.</li><li>• Perform file handling operations and implement exception handling in Java programs.</li><li>• Develop Java programs to connect with databases using JDBC.</li><li>• Develop console-based applications to solve real-world problems using Java.</li><li>• Create GUI applications using Java Swing and AWT components.</li></ul> |                                |                          |
| 6                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (1 Credit=30 hours Laboratory) |                          |
| 7                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Max. Marks: 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                | Min Passing Marks: 20    |
| Part B: Content of the Course                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |
| Total No. of learning-Training/performance Periods: 30 Periods (30 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |
| Module                                                                    | Topics (Course contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |
| Lab./Experiment Contents of Course,                                       | 1: Basic Java Programs and Syntax Practice <ul style="list-style-type: none"><li>• Printing outputs, data types, variables, type conversion, and operators.</li></ul> 2: Control Statements <ul style="list-style-type: none"><li>• Selection statements (if, switch)</li><li>• Iteration statements (for, while, do-while)</li><li>• Jump statements (break, continue, return)</li></ul> 3: Arrays in Java <ul style="list-style-type: none"><li>• Single-dimensional arrays</li><li>• Multi-dimensional arrays</li><li>• Anonymous arrays</li></ul> 4: Classes and Objects <ul style="list-style-type: none"><li>• Creating classes and objects</li><li>• Constructors and constructor overloading</li><li>• Method overloading and overriding</li><li>• this and super keywords</li><li>• Constructor chaining</li></ul> 5: Inheritance and Interface |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>• Single inheritance</li> <li>• Multiple inheritance using interfaces</li> <li>• Implementing and extending interfaces</li> <li>• Nested classes and interfaces</li> </ul> <p>6: Exception Handling</p> <ul style="list-style-type: none"> <li>• Basic exception handling (try-catch)</li> <li>• Multiple catch blocks</li> <li>• Nested try blocks</li> <li>• throw, throws, and finally</li> </ul> <p>7: Multithreading</p> <ul style="list-style-type: none"> <li>• Creating threads using Thread class and Runnable interface</li> <li>• Thread priorities</li> <li>• Synchronization</li> <li>• Inter-thread communication (wait, notify, notifyAll)</li> </ul> <p>8: Event Handling</p> <ul style="list-style-type: none"> <li>• Event classes and listener interfaces</li> <li>• Event adapters</li> </ul> <p>9: GUI Programming with Swing</p> <ul style="list-style-type: none"> <li>• Swing components: JLabel, JTextField, JButton, JTabbedPane, JScrollBar, JList, JComboBox, JTable, Trees, Menus</li> <li>• Layouts and containers</li> </ul> <p>10: Database Connectivity using JDBC</p> <ul style="list-style-type: none"> <li>• Connecting to database using JDBC</li> <li>• Executing queries (insert, update, delete, retrieve)</li> <li>• Displaying results using ResultSet</li> </ul> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Part - C</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Learning Resource: Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"> <li>• Java: The Complete Reference, Herbert Schildt, Oracle Press</li> <li>• Core Java: Volume-I &amp; Volume-II, Cay S. Horstmann &amp; Gary Cornekk, Pearson</li> <li>• Programming with Java, E. Balagurusamy, McGraw Hill Education</li> <li>• Core Java, Nageshwara Rao, Dreamtech Press</li> </ul> <b>E-Resources:</b> <ul style="list-style-type: none"> <li>• <b>NPTEL and Swayam:</b><br/> <a href="https://onlinecourses.nptel.ac.in/noc22_cs47/preview">https://onlinecourses.nptel.ac.in/noc22_cs47/preview</a> </li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                                                                                                                                  |                                                                                                                                                                                        |                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>PART -D: Assessment and Evaluation -Practical</b>                                                                                                             |                                                                                                                                                                                        |                                                                                                                                |
| <b>Suggested Continuous Evaluation Methods:</b><br>Maximum Marks: 50 Marks<br>Continuous Internal Assessment(CIA): 15 Marks<br>End Semester Exam (ESE): 35 Marks |                                                                                                                                                                                        |                                                                                                                                |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b>                                                                                             | Internal Test / Quiz-(2): 10 Marks<br>Assignment / Seminar+ Attendance - 5<br>Total Marks – 15 Marks                                                                                   | Better marks out of the two<br>Test / Quiz + obtained<br>marks in Assignment shall<br>be considered against <b>15</b><br>Marks |
| <b>End Semester Exam (ESE):</b>                                                                                                                                  | <b>Laboratory / Field Skill Performance: On spot Assessment</b><br>A. practical work - 20 Marks<br>B. Lab record – 5 Marks<br>C. Viva-voce - 10 Marks<br>Total Marks – <b>35 Marks</b> | Managed<br>by Course<br>teacher as<br>per lab.<br>status                                                                       |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| Program: <b>Master Of Computer Application</b>                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Semester: <b>III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Session: <b>2025-2026</b>      |
| 1                                                                                | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>MCAC - 18</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |
| 2                                                                                | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Minor-Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                |
| 3                                                                                | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Discipline Specific Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |
| 4                                                                                | Pre-requisite (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |
| 5                                                                                | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | After completing the AIML Mini Project, the students will be able to: <ul style="list-style-type: none"> <li>• Identify and define a real-world problem that can be solved using AI and Machine Learning techniques.</li> <li>• Analyze and preprocess data effectively for model development.</li> <li>• Design and implement suitable AI/ML algorithms and models to solve the identified problem.</li> <li>• Evaluate and validate the developed models using appropriate performance metrics.</li> <li>• Demonstrate the deployment or integration of the AI/ML solution into an application or system.</li> <li>• Develop teamwork, documentation, and presentation skills by working collaboratively on project tasks and communicating results effectively.</li> </ul> |                                |
| 6                                                                                | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (1 Credit=30 hours Laboratory) |
| 7                                                                                | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Max. Marks: 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Min Passing Marks: 20          |
| <b>PART- B: CONTENT OF THE COURSE</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| <b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| Module                                                                           | Important Guidelines for Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |
| <b>Lab./ Experiment Contents of Course,</b>                                      | <p>A project report has to be submitted as per the rules described below:</p> <p><b>1. Cover Page</b></p> <ul style="list-style-type: none"> <li>• University/Institute name</li> <li>• Department name</li> <li>• Title of the mini project</li> <li>• Course name and code</li> <li>• Submitted by: Student names with enrollment numbers</li> <li>• Submitted to: Faculty guide name</li> <li>• Academic session and date</li> </ul> <p><b>2. Certificate Page</b></p> <p>Certification by faculty guide, HoD, and institute, stating the work is original and completed under guidance.</p> <p><b>3. Acknowledgement</b></p> <p>Brief appreciation of faculty guide, department, and peers for their support.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                |

#### **4. Table of Contents**

Automatically generated from headings, with page numbers.

#### **5. Abstract**

Brief summary (150–250 words) covering problem statement, methodology, key results, and conclusion.

#### **6. Chapter 1: Introduction**

- Problem statement
- Objective of the project
- Scope and relevance of the project

#### **7. Chapter 2: Literature Review**

- Summary of existing research, algorithms, or applications related to your project
- References in IEEE format

#### **8. Chapter 3: Methodology**

- Dataset description (source, size, features)
- Data preprocessing steps
- Feature engineering techniques
- Model selection rationale
- Algorithm(s) used with brief explanation
- Workflow diagram or architecture diagram

#### **9. Chapter 4: Implementation**

- Implementation details (libraries, tools used)
- Hyperparameter tuning process (if any)
- Code snippets (only key functions or classes; full code in appendix or GitHub link)

#### **10. Chapter 5: Results and Discussion**

- Performance metrics (accuracy, precision, recall, F1-score, confusion matrix, ROC curve, etc.)
- Comparative analysis (if applicable)
- Screenshots of outputs, graphs, and visualizations
- Interpretation and discussion of results

#### **11. Chapter 6: Deployment (if implemented)**

- Model saving/loading process
- Deployment strategy (e.g. Flask API, Streamlit app, web integration)
- Screenshots of deployed interface

#### **12. Chapter 7: Conclusion**

- Summary of work done
- Limitations of current model
- Future scope and possible improvements

#### **13. References**

All papers, articles, and datasets cited in proper citation format (IEEE/APA as per department guidelines).

#### **14. Appendix**

- Full source code (if required)
- Additional data tables or extended results

#### **Formatting Guidelines**

- Font: Times New Roman, size 12
  - Spacing: 1.25 line spacing

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Margin: 1 inch all sides</li> <li>• Page numbering: Bottom center</li> <li>• Heading style: Consistent numbering (e.g., 1, 1.1, 1.2)</li> </ul> |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                          |
| <b>Part - C: Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                          |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                          |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"> <li>• Mitchell, Tom M. Machine Learning. 1st ed. McGraw Hill, 2017. ISBN 978-1259096952.</li> <li>• Alpaydin, Ethem. Introduction to machine learning. 4th ed. Phi, 2020. ISBN 978-8120350786</li> <li>• Campesato, Oswald. Artificial intelligence, machine learning, and deep learning. 1st ed. Mercury Learning and Information, 2020. ISBN 9781683924665</li> <li>• Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.</li> </ul><br><b>E-Resources:</b> <ul style="list-style-type: none"> <li>• <b>NPTEL and Swayam:</b> <ol style="list-style-type: none"> <li>a) <a href="https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08">https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08</a></li> <li>b) <a href="https://nptel.ac.in/domains/discipline/106?course=106_0">https://nptel.ac.in/domains/discipline/106?course=106_0</a></li> <li>c) <a href="https://onlinecourses.nptel.ac.in/noc22_cs56/preview">https://onlinecourses.nptel.ac.in/noc22_cs56/preview</a></li> </ol> </li> </ul> |                                                                                                                                                                                          |
| <b>PART -D: Assessment and Evaluation -Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                          |
| <b>Suggested Continuous Evaluation Methods:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                          |
| End Semester Exam (ESE):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 50 Marks                                                                                                                                                                                 |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                            |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Program: <b>Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Semester: <b>III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Session: <b>2025-2026</b>                  |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>MCAE – 19T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Machine Learning and Intelligent Model Design</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                            |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                            |
| 4                                                                                         | Pre-requisite (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                            |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand various supervised and unsupervised machine learning approaches.</li> <li>• Design and implement intelligent models using algorithms such as regression, classification, clustering, and neural networks.</li> <li>• Evaluate the performance of machine learning models using suitable metrics and validation techniques.</li> <li>• Develop solutions integrating intelligent model design for domain-specific problems in areas such as healthcare, finance, and smart systems.</li> </ul> |                                            |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | (1 Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Max. Marks: 100 (70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Min Passing Marks : 40                     |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                            |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                            |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>No. of Period</b>                       |
| I                                                                                         | <b>Introduction and Pre-processing</b><br>Designing a learning system, Types of machine learning: Supervised learning, Unsupervised learning, Reinforcement learning; Applications of Machine Learning. Understanding data: Types of data: Quantitative vs Qualitative data, Structured vs Unstructured vs Semi structured data; Need of data pre-processing, Splitting the dataset—Training dataset and testing dataset. Features: Feature variables, Class labels, Feature scaling—standardization and normalization. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 15                                         |
| II                                                                                        | <b>Regression and Classification</b><br>Regression for data analysis, Types of regression, Simple Linear Regression, Polynomial Regression, Performance metrics for Regression: Mean Square Error, Root Mean Square Error, Mean Absolute Error, R2_Score, etc.<br>Concept of Classification, Classification vs Regression, Performance metrics for Classification: Confusion matrix, Precision, Recall, F1-Score, Accuracy,                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12                                         |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Supervised and Unsupervised Learning Algorithms</b><br>Supervised Learning Algorithms: K-Nearest Neighbors (KNN), Naïve Bayes, Support Vector Machine (SVM), Decision Tree (DT), Artificial Neural Network (ANN) Classification.<br>Unsupervised Learning Algorithms: Introduction to clustering, Types of clustering techniques: partitioning, hierarchical and density-based clustering.                                                                                                           | 18 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Intelligent Model Design</b><br>Intelligent models, conventional approach vs. intelligent models, Steps for designing an intelligent model: Identifying the types of problem (Classification, Regression, Clustering, Optimization), Feature extraction and selection, Model selection strategies, Training-testing and validating the model, Cross-validation and hyperparameter tuning, identifying underfitting and overfitting, Model Deployment and Integration, Case studies and applications. | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Supervised Learning, Unsupervised Learning, Reinforcement Learning, Confusion Metrics, Intelligent Models.                                                                                                                                                                                                                                                                                                                                                                                              |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Part - C: Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"><li>Mitchell, Tom M. Machine Learning. 1st ed. McGraw Hill, 2017. ISBN 978-1259096952.</li><li>Alpaydin, Ethem. Introduction to machine learning. 4th ed. Phi, 2020. ISBN 978-8120350786</li><li>Campesato, Oswald. Artificial intelligence, machine learning, and deep learning. 1st ed. Mercury Learning and Information, 2020. ISBN 9781683924665</li><li>Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>E-Resources:</b> <ul style="list-style-type: none"><li><a href="https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08">https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08</a></li><li><a href="https://nptel.ac.in/domains/discipline/106?course=106_0">https://nptel.ac.in/domains/discipline/106?course=106_0</a></li><li><a href="https://onlinecourses.nptel.ac.in/noc22_cs56/preview">https://onlinecourses.nptel.ac.in/noc22_cs56/preview</a></li></ul>                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |

|                                                                  |                                                                                                                                                                                                                                                                             |                                                                                                                           |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>PART -D: Assessment and Evaluation -Theory</b>                |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| <b>Suggested Continuous Evaluation Methods:</b>                  |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| Maximum Marks: <b>100 Marks</b>                                  |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>             |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| End Semester Exam (ESE): <b>70 Marks</b>                         |                                                                                                                                                                                                                                                                             |                                                                                                                           |
| <b>Continuous Internal Assessment (CIA): (By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                      | Better marks out of the two Test / Quiz <b>+</b> obtained marks in Assignment shall be considered against <b>30</b> Marks |
| <b>End Semester Exam (ESE):</b>                                  | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1. Objective – 10 x1= 10 Marks;</b><br><b>Q2. Short answer type- 5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question.,1 out of 2 from each unit-4x10=40<br><b>Total Marks - 70 Marks</b> |                                                                                                                           |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Semester: <b>III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Session:2025-2026</b>                 |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>MCAE-20T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Generative Artificial Intelligence</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the foundational principles and concepts of generative artificial intelligence, including the underlying algorithms and techniques used in creative AI systems.</li> <li>• Apply the basic generative algorithms for creative tasks, such as image generation, text generation, and artistic expression.</li> <li>• Implement generative AI techniques in real-world scenarios through practical implementation to produce effective solutions.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>No. of Period</b>                     |
| I                                                                                         | Overview of Artificial Intelligence and its subfields, Introduction to Generative AI and its applications, Understanding creative algorithms in the context of generative systems, Introduction to machine learning and its role in generative models, Types of generative models: GANs, VAEs, and more, Exploring the principles of creative algorithms, Introduction to Large Language Models, Case studies of successful applications in various domains, designing simple creative algorithms. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15                                       |
| II                                                                                        | In-depth study of GAN architecture and components, Training and fine-tuning GANs for specific tasks, Implementing a GAN for image generation, Understanding VAE architecture and working principles, Exploring advanced generative models, Developing a VAE for data generation, Overview of generative art and design, Case studies of successful projects.                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Introduction to NLP and its role in generative models, prompt engineering for generative AI, Text generation using GPT and other language models, Building a text generation model, Industry applications of generative AI in fields like gaming, fashion, and more, Emerging trends and innovations, Exploring ethical challenges and biases in generative models, Responsible AI practices.                   | 15 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Introduction to reinforcement learning, Combining reinforcement learning with generative models, reinforcement learning-based generative model, Applications of generative AI in business strategies, Innovation and entrepreneurship with generative technologies, Developing a business proposal integrating generative AI, real-world generative AI problem, Troubleshooting and refining generative models. | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Generative Artificial Intelligence, Training and Fine-Tuning, Reinforcement Learning, Natural Language Processing. GPT.                                                                                                                                                                                                                                                                                         |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"><li>• Cryptography and Network Security By William Stallings, 4th Edition Pearson Publication.</li><li>• Applied cryptography - protocols and algorithm By Buce Schneier, Springer Verlag 2003</li><li>• Cryptography and Network Security By Atul Kahate , TMH Publication.</li><li>• Cryptography and Network Security By Behrouz A. Forouzan, First Edition, TMH Publication.</li><li>• Network Security:Private Communication in Public World By Charlie Kaufman,Radia Perlman and Mike Speciner ,PHI Publication.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| <b>Online Resources:</b> <ul style="list-style-type: none"><li>• <a href="https://onlinecourses.nptel.ac.in/noc23_cs127/preview">https://onlinecourses.nptel.ac.in/noc23_cs127/preview</a></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                 |    |

|                                                                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                        | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: <b>Master Of Computer Application</b>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Semester: <b>III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Session: <b>2025-2026</b>                |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>MCAE -21T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Big Data Analytics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
| 4                                                                                         | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the building blocks of Big Data.</li> <li>• Articulate the programming aspects of cloud computing (map Reduce etc). Also get the knowledge about the big data programming languages apache, pig, hive and spark.</li> <li>• Understand the specialized aspects of big data with the help of different big data applications.</li> <li>• Represent the analytical aspects of Big Data along with the knowledge of bigdata database such as mongodb and nosql.</li> <li>• Know the recent research trends related to Hadoop File System, MapReduce and Google File System etc.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 60 Periods (60 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>No. of Period</b>                     |
| I                                                                                         | <b>Introduction Concept of Big Data</b><br>Big Data- Define Data, Web Data, Classification of Data- Structured, Semi-Structured, and Unstructured. Big Data Definitions, Challenges of Conventional system, Why We Need Big Data, Difference between Big Data and Small Data, Importance of Big Data. Big Data Characteristics (4V's Volume, Velocity, Variety, and Veracity), Big Data Types, Big Data Handling Techniques. Complexity of Big Data, Big Data Processing Architectures, Big Data Technologies, Big Data Business Value. Big Data Analytics Application. Big Data Challenges and Future Scope. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15                                       |
| II                                                                                        | <b>Introduction to Hadoop and Hadoop Architecture</b><br>Big Data - Apache Hadoop & Hadoop Eco-system: Hadoop Core Component, Features of Hadoop, The Hadoop Distributed File System: HDFS Data                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                         |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                                                                                                                                                                                              | Storage, Hadoop MapReduce Organization, HDFS Commands, MapReduce Framework, MapReduce Programming Model, MapReduce Map task, Reduce Task and MapReduce Execution, Hadoop YARN, Hadoop2 Execution Model, Hadoop Ecosystem Tools, Hadoop Ecosystem.                                                                                                                                                       |    |
| III                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>NoSQL Big Data Management, Mongo DB</b><br>NoSQL: What is it?, Where it is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in industry, SQL vs NoSQL, NoSQL DataStore, NoSQL Data Architecture pattern, NOSQL to Manage Big Data. Data Base for the Modern Web: Introduction to MongoDB, features of MongoDB, Data Types, Mongo DB Query Language and Database Command. | 15 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Hadoop Environment, Analytics and Spark</b><br>Installing HBase, Fundamentals of HBase, Running MapReduce jobs on HBase (table input/output), Zookeeper. Visualizations: Visual Data Analysis techniques, and interaction techniques. SPARK: Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib.                    | 15 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                     | Big Data, NoSQL, MongoDB, Spark, Data Visualizations                                                                                                                                                                                                                                                                                                                                                    |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Text Books and Reference Books Recommended-</b> <ul style="list-style-type: none"><li>• Big Data Analytics, Raj Kamal and Preeti Saxena, McGrawHill Education</li><li>• Big Data: Black Book, DT Educational Services, Dreamtech Press</li><li>• Big Data Analytics, Seema Acharya &amp; Subhashini Chellappan, Wiley India</li><li>• Big Data Analytics, M. Vijayalakshmi &amp; Radha Shankarmani, Wiley India</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| <b>Online Resources:</b> <ul style="list-style-type: none"><li>• <a href="https://onlinecourses.nptel.ac.in/noc20_cs92/preview">https://onlinecourses.nptel.ac.in/noc20_cs92/preview</a></li><li>• <a href="https://nptel.ac.in/courses/106107220">https://nptel.ac.in/courses/106107220</a></li></ul>                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                         |    |

|                                                                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART -D:Assessment and Evaluation -Theory</b>                     |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                        | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| PART-A: Introduction                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                           |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------|
| Program: <b>Master Of Computer Application</b>                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Semester: <b>III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          | Session: <b>2025-2026</b> |
| 1                                                                                  | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>MCAE- 22T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          |                           |
| 2                                                                                  | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Natural Language Processing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                          |                           |
| 3                                                                                  | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |                           |
| 4                                                                                  | Pre-requisite(if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |                           |
| 5                                                                                  | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | After completing this course, the students will be able to: <ul style="list-style-type: none"><li>• Articulate natural language processing and importance of word representation.</li><li>• Build deep learning model for solving natural language problems such as language modelling, machine translation, POS tagging, Seq2Seq generation.</li><li>• Implement state-of-the-art Machine Learning and Deep Learning solutions to NLP problems in Global &amp; Indian context.</li></ul> |                                          |                           |
| 6                                                                                  | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3 Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (Credit=15 hours-learning & observation) |                           |
| 7                                                                                  | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Min Passing Marks : 40                   |                           |
| PART- B: CONTENT OF THE COURSE                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                           |
| Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                           |
| Unit                                                                               | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          | No. of Period             |
| I                                                                                  | <b>Introduction to Natural Language Processing and Linguistic Fundamentals:</b><br>Need for NLP, applications, industry demand, challenges in NLP including ambiguity in language, contextual words and phrases, homonyms, coreference, domain-specific language, low-resource languages, segmentation, stemming, lemmatization, spelling correction, synsets, hypernyms. Topics also include tokenization, N-grams, stop words, WordNet, WordNet similarity, language corpus, N-gram language models, and Hidden Markov Models. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          | 12                        |
| II                                                                                 | <b>Text Processing, Normalisation, and Word Representations:</b><br>Natural Language Toolkit (NLTK) for Indic Languages, text normalisation, script normalisation, parallel corpus, handling code-mix text, cross-lingual information retrieval. Word and sentence representation, word embedding techniques, vector space model, term frequency, Word2Vec including CBOW and Skip-gram models, word embedding for regional languages, and document-to-vector representations.                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          | 11                        |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III | <b>Deep Learning for NLP – Neural Models and Applications:</b><br>Neural networks for text data, recurrent neural networks (RNNs), vanishing and exploding gradients problem, Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), Seq2Seq modelling, bidirectional models, contextual representations, transformers, BERT, multilingual embeddings, transfer learning in word embeddings.                                                                                                 | 10 |
| IV  | <b>Advanced NLP – Topic Modelling, Machine Translation, and Text Generation:</b><br>Topic modeling, Latent Semantic Analysis (LSA), statistical machine translation, neural machine translation, self-attention for generative models, natural language generation, attention mechanisms, question answering bots, 1D-CNN for NLP, OpenAI's GPT, Google's ALBERT, Facebook's RoBERTa. Text summarization—extractive and abstractive summarization and transformer models for text summarization. | 12 |

Keywords **Linguistic Fundamentals, Normalisation, Word Representation, RNN, LSTM, Text Generation and Summarization**

Name and Signature of Convener & Member of BoS:

## Part - C : Learning Resources

### Text Books, Reference Books, Others

#### Text Books and Reference Books Recommended-

- Rao Delip and Brian McMahan, natural Language Processing with PyTorch: Build Intelligent Language Applications Using Deep Learning (1 ed.), O'Reilly Media, 2019. ISBN 9781491978238.
- Eisenstein Jacob, Introduction to natural Language Processing (1 ed.), The MIT Press; Illustrated edition, 2019. ISBN 9780262042843.

#### Online Resources:

- [https://onlinecourses.nptel.ac.in/noc23\\_cs45/preview](https://onlinecourses.nptel.ac.in/noc23_cs45/preview)
- <https://www.classcentral.com/course/swayam-natural-language-processing-7950>
- <https://www.kaggle.com/discussions/questions-and-answers/278543>
- <https://www.mygreatlearning.com/nlp/free-courses>
- <https://www.coursera.org/specializations/natural-language-processing>
- [https://www.cloudskillsboost.google/course\\_templates/40](https://www.cloudskillsboost.google/course_templates/40)

|                                                                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>PART -D: Assessment and Evaluation -Theory</b>                    |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                               |                                                                                                                    |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                        | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b> |
| <b>End Semester Exam (ESE):</b>                                      | <b>Two section – A &amp; B</b><br><b>Section A:</b><br>Q1. Objective – <b>10 x1= 10 Marks;</b><br>Q2. Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2 from each unit-4x10=40 Marks</b><br><br><b>Total Marks - 70 Marks</b> |                                                                                                                    |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: Master Of Computer Application                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Semester: III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Session:2025-2026                        |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MCAE-23T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Internet of Things                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
| 4                                                                                         | Pre-requisite (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | As per Syllabus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the basic concepts, architecture, and design principles of the Internet of Things (IoT).</li> <li>• Explain the role of devices, gateways, networking, and data management in IoT systems.</li> <li>• Describe various IoT reference models, real-world design constraints, and data visualization techniques.</li> <li>• Identify and compare different IoT protocols across data link, network, transport, and session layers.</li> <li>• Understand security challenges and solutions in IoT communication and protocols.</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |
| Unit                                                                                      | Topics (Course Contents)                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | No. of Period                            |
| I                                                                                         | <b>Overview:</b><br>IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities. An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals– Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 11                                       |
| II                                                                                        | <b>Reference Architecture:</b><br>IoT Architecture – State of the Art – Introduction, State of the art, Reference Model and architecture, IoT Reference Model – IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints – Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 12                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>IOT Data Link Layer &amp; Network Layer Protocols:</b><br>PHY/MAC Layer/3GPP MTC, IEEE 802.11, IEEE 802.15, Network Layer-IPv4, IPv6, DHCP, ICMP, RPL, CORPL, CARP transport & Session Layer Protocols: Transport Layer Transmission Control Protocol (TCP), Multipath Transmission Control Protocol (MPTCP), User Datagram Protocol (UDP), Datagram Congestion Control Protocol (DCCP), Stream Control Transmission Protocol (SCTP),Transport Layer Security (TLS), Datagram Transport Layer Security (DTLS). | 11 |
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Session Layer:</b><br>Hyper Text Transfer Protocol (HTTP), Constrained Application Protocol (CoAP), Extensible Messaging and Presence Protocol (XMPP), Service Layer Protocols & Security: Service Layer – oneM2M, European Telecommunications Standards Institute (ETSI) M2M (Machine-to-Machine), OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, Routing protocol for Low-Power and Lossy Networks (RPL), Application Layer.                                                                  | 11 |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | IoT Architecture, M2M (Machine-to-Machine) Communication, IoT Protocols Network, Transport, Session Layers, Service Layer Protocols, IoT Security.                                                                                                                                                                                                                                                                                                                                                                |    |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| <b>Part - C : Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| <b>Text Books and Reference Books Recommended-</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| <ul style="list-style-type: none"><li>From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, Academic Press, 2014.</li><li>The Internet of Things, Michael Miller, QUE publishing.</li><li>Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley.</li><li>Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Florian Michahelles, Springer.</li><li>Getting Started with the Internet of Things, Cuno Pfister, O'Reilly.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| <b>E-resources:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
| <ul style="list-style-type: none"><li><a href="http://ndl.iitkgp.ac.in/he_document/npTEL/npTEL/106105166_1ozjpedahrcocrzs1f2joiwhsvl7s_r1w?e=4 Internet%20of%20things  ">http://ndl.iitkgp.ac.in/he_document/npTEL/npTEL/106105166_1ozjpedahrcocrzs1f2joiwhsvl7s_r1w?e=4 Internet%20of%20things  </a>.</li><li><a href="https://egyankosh.ac.in/handle/123456789/100593">https://egyankosh.ac.in/handle/123456789/100593</a>.</li></ul>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |

|                                                                      |                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>PART –D : Assessment and Evaluation -Theory</b>                   |                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
| <b>Suggested Continuous Evaluation Methods:</b>                      |                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
| Maximum Marks: <b>100 Marks</b>                                      |                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
| Continuous Internal Assessment(CIA): <b>30 Marks</b>                 |                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
| End Semester Exam (ESE): <b>70 Marks</b>                             |                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
| <b>Continuous Internal Assessment (CIA):<br/>(By Course Teacher)</b> | Internal Test / Quiz-(2): <b>20 +20</b><br>Assignment / Seminar - <b>10</b><br>Total Marks - <b>30</b>                                                                                                                                                                                                        | Better marks out of the two<br>Test / Quiz <b>+</b> obtained<br>marks in Assignment shall<br>be considered against <b>30</b><br>Marks |
| <b>End Semester Exam<br/>(ESE):</b>                                  | <b>Two section – A &amp; B</b><br><b>Section A:</b><br><b>Q1.</b> Objective – <b>10 x1= 10 Marks;</b><br><b>Q2.</b> Short answer type- <b>5x4 = 20 Marks</b><br><b>Section B:</b><br>Descriptive answer type question., <b>1 out of 2</b> from each unit- <b>4x10=40</b><br><br><b>Total Marks - 70 Marks</b> |                                                                                                                                       |

**Name and Signature of Convener & Members of BoS:**

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Program: Master Of Computer Application                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                  | Semester: III                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Session:2025-2026                        |
| 1                                                                                         | Course Code                                                                                                                                                                                                                                                                                                                                                                                                      | <b>MCAC – 24T</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |
| 2                                                                                         | Course Title                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Data Mining and Data Warehousing</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          |
| 3                                                                                         | Course Type                                                                                                                                                                                                                                                                                                                                                                                                      | Discipline Specific Elective (Theory)                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| 4                                                                                         | Pre-requisite (if any)                                                                                                                                                                                                                                                                                                                                                                                           | As per Syllabus                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| 5                                                                                         | Course Learning Outcomes (CLO)                                                                                                                                                                                                                                                                                                                                                                                   | After completing this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand what data mining and data warehousing.</li> <li>• Learn how to clean, prepare, and organize data for mining.</li> <li>• Use classification, prediction, and clustering techniques to analyze data.</li> <li>• Explore how data mining is applied to text, web, multimedia, and other complex data types, and know its real-world uses</li> </ul> |                                          |
| 6                                                                                         | Credit Value                                                                                                                                                                                                                                                                                                                                                                                                     | 3 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (Credit=15 hours-learning & observation) |
| 7                                                                                         | Total Marks                                                                                                                                                                                                                                                                                                                                                                                                      | Max. Marks: 100(70+30)                                                                                                                                                                                                                                                                                                                                                                                                                                           | Min Passing Marks : 40                   |
| <b>PART- B: CONTENT OF THE COURSE</b>                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| <b>Total No. of Teaching-learning Periods (01 hour per period)- 45 Periods (45 Hours)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |
| <b>Unit</b>                                                                               | <b>Topics (Course Contents)</b>                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>No. of Period</b>                     |
| I                                                                                         | Introduction to Data Warehousing and OLAP Technology for Data Mining, Data Mining: KDD Process, Functionality, Patterns in Data, Attribute Types, Data Warehouse, Data Cube: multi-dimensional data model, Data Warehouse Architecture, Implementation and Usage (Applications), OLAP Operations, Concept of Transaction, Transactional Database, Distributed Database, Commit Protocols.                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11                                       |
| II                                                                                        | Data Preprocessing: Need, Data Mining Primitive, Languages and System Architecture, Data Cleaning, Data Integration, Data Transformation, Data Reduction, Concept Hierarchy Generation, Data Mining Query Language, Architecture of Data Mining System. Association Rule Mining, Mining Single-dimensional Boolean Association Rules from Transactional Databases (Apriori algorithm, FP-Tree growth algorithm), |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12                                       |
| III                                                                                       | Mining Multi-dimensional Association Rules from Transactional Databases and Data Warehouses, From Association Mining to Correlation Analysis. Classification, Prediction and Cluster Analysis, Classification by Decision Tree, Bayesian Classification, Other Classification methods, Prediction, Classification Accuracy,                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods. Mining Complex Types of Data & Applications and Trends in Data, Time-series and Sequence Data, Mining Spatial Databases, Mining Multimedia Databases, Data Mining Applications, Social Impact of Data Mining, Trends in Data Mining | 11                                                                                                          |
| Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Data Mining, Data Warehousing, Association Rule Mining, Classification and Prediction, Clustering                                                                                                                                                                                                                                                                            |                                                                                                             |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Part - C : Learning Resources                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Text Books, Reference Books, Others                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Text Books and Reference Books Recommended-                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| <ul style="list-style-type: none"><li>• Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber</li><li>• Data Mining Techniques, Arun K Pujari</li><li>• Data Mining Introductory and Advanced Topics, Margaret H Dunham, Pearson</li></ul>                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| E-resources:                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| <ul style="list-style-type: none"><li>• <a href="http://ndl.iitkgp.ac.in/he_document/fossee/fossee/IN_R_T_C_7_D_M_C_a_T_b_J_H_M_K_a_J_P_286_287?e=0 Data%20Mining%20and%20Data%20warehousing">http://ndl.iitkgp.ac.in/he_document/fossee/fossee/IN_R_T_C_7_D_M_C_a_T_b_J_H_M_K_a_J_P_286_287?e=0 Data%20Mining%20and%20Data%20warehousing</a></li><li>• <a href="https://egyankosh.ac.in/handle/123456789/81150">https://egyankosh.ac.in/handle/123456789/81150</a>.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| PART –D : Assessment and Evaluation -Theory                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Suggested Continuous Evaluation Methods:                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Maximum Marks: 100 Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Continuous Internal Assessment(CIA): 30 Marks                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| End Semester Exam (ESE): 70 Marks                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| Continuous Internal Assessment (CIA): (By Course Teacher)                                                                                                                                                                                                                                                                                                                                                                                                                      | Internal Test / Quiz-(2): 20 +20<br>Assignment / Seminar - 10<br>Total Marks - 30                                                                                                                                                                                                                                                                                            | Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks |
| End Semester Exam (ESE):                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Two section – A & B<br>Section A:<br>Q1. Objective – 10 x1= 10 Marks;<br>Q2. Short answer type- 5x4 = 20 Marks<br>Section B:<br>Descriptive answer type question.,1 out of 2 from each unit-4x10=40<br><br>Total Marks - 70 Marks                                                                                                                                            |                                                                                                             |

Name and Signature of Convener & Members of BoS:

**Master Of Computer Application**  
**DEPARTMENT OF COMPUTER APPLICATION**  
**COURSE CURRICULUM**

| <b>PART-A: Introduction</b>                                                      |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Program: <b>Master Of Computer Application</b>                                   |                                                                                                                                                                     | Semester: <b>IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Session: <b>2025-2026</b> |
| 1                                                                                | Course Code                                                                                                                                                         | <b>MCAC-25P</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
| 2                                                                                | Course Title                                                                                                                                                        | <b>Major Project (System Design and Implementation/Research Project)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                           |
| 3                                                                                | Course Type                                                                                                                                                         | Discipline Specific Course (Major-Project)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           |
| 4                                                                                | Pre-requisite (if any)                                                                                                                                              | As per Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                           |
| 5                                                                                | Course Learning Outcomes (CLO)                                                                                                                                      | <p>After completing the Major Project, students will be able to:</p> <ul style="list-style-type: none"> <li>• Identify and define a real-world problem relevant to their domain and propose an effective solution using appropriate technologies.</li> <li>• Analyse requirements, design system architecture, and implement solutions using technologies such as website development, window applications, web services, AI-based tools, or research methodologies.</li> <li>• Effectively preprocess and manage data where applicable to support the development and functioning of the project.</li> <li>• Design, implement, and integrate algorithms, models, or functionalities suitable for solving the identified problem efficiently.</li> <li>• Evaluate, test, and validate the developed system or application using appropriate methods, tools, and performance metrics.</li> <li>• Demonstrate deployment, integration, or practical usability of the developed solution within a real or simulated environment.</li> <li>• Develop teamwork, project management, documentation, and presentation skills by working collaboratively, maintaining professional documentation, and communicating project outcomes effectively.</li> </ul> |                           |
| 6                                                                                | Credit Value                                                                                                                                                        | 20 Credit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |
| 7                                                                                | Total Marks                                                                                                                                                         | Max. Marks: 600                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Min Passing Marks: 240    |
| <b>PART- B: CONTENT OF THE COURSE</b>                                            |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
| <b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b> |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
| <b>Module</b>                                                                    | <b>GUIDELINES FOR PROJECT WORK (MCA)</b>                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |
| <b>Lab./ Experiment Contents of Course,</b>                                      | <p>A project report has to be submitted as per the rules described. Some additional guidelines regarding the Project Report are:</p> <p><b>Number of Copies</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                           |

- The student should submit **one hardbound copy** of the Project Report with one RW/CD/DVD.

#### **Acceptance / Rejection of Project Report**

- The student must submit a project report to the Head of Department/Project Guide for approval.
- The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.

#### **Format of the Project Report**

##### **a. Paper**

- The Report shall be typed on white A4 size paper or continuous computer stationary bond for final submission.
- The Report submitted to the University must be original; subsequent copies may be photocopied on any paper.

##### **b. Typing**

- Standard letter size
- Double-spaced
- On one side of the paper only
- Using black ribbons and black carbons

##### **c. Margins**

- Left: 35 mm
- Right: 20 mm
- Top: 35 mm
- Bottom: 20 mm

##### **d. Binding**

- The Report shall be **Rexene bound in black**.
- Plastic and spiral bound Project Reports **will not be accepted**.

##### **e. Front Cover**

The front cover should contain:

- **TOP:** Title in block capitals (6mm to 15mm letters)
- **CENTER:** Full name in block capitals (6mm to 10mm letters)
- **BOTTOM:** Name of the University, year of submission, all in block capitals (6mm to 10mm letters) on separate lines with proper spacing and centering

##### **f. Blank Sheets**

- Two white blank bound papers should be provided at the beginning and end of the report: one for binding purpose and the other to be left blank.

#### **Abstract**

Every report should have an **Abstract following the Institute's Certificate**.

The abstract shall guide the reader by highlighting the important material contained in individual chapters, sections, and subsections.

#### **The report should contain the following:**

1. Certificate from Company
2. Institute Certificate: Successful completion of project by competent authority
3. Acknowledgments
4. **Abstract**
5. List of Figures
6. List of Tables
7. Nomenclature and Abbreviations

## 8. Contents of the Project Report

### **Project Report Chapters**

1. **Company Profile** (only for M.I.S. projects)
2. Introduction to the Project
3. Scope of Work
4. Existing System and Need for System
5. Operating Environment – Hardware and Software
6. Proposed System
  - 6.1 Objectives to be fulfilled
  - 6.2 User Requirements
  - 6.3 Requirements Determination Techniques and Systems Analysis Methods Employed
  - 6.4 Prototyping
  - 6.5 System Features
    - Design of Input
    - Design of Output screens and reports
    - Module specifications
    - DFDs and ERs
    - System flow charts
    - Data Dictionary
    - Structure charts
    - Database/File layouts
    - User Interfaces
    - Coding system
    - Design of Control Procedures
    - Design of Exception Handling
7. Testing Procedures and Implementation Phases
8. Acceptance Procedure
9. Post-Implementation Review
10. User Manual
  - Menu explanation
  - User guide
  - Expected problems/errors and their solutions
11. Problems Encountered
12. Drawbacks and Limitations
13. Proposed Enhancements
14. Conclusions
15. Bibliography

### **Annexure**

- Sample documents (manual or computer generated)
- Source code listing in a separate file
- Output reports

### **List of Tables**

- The Contents shall be followed by a ‘List of Tables’ indicating:
  - Table number (decimal point notation indicating chapter number and table number)
  - Table title
  - Corresponding page number(s)

- Any reference within the text shall be given by quoting relevant number, e.g. “Table 5.2”.

#### List of Figures

- Follows the ‘List of Tables’ and includes:
  - Figure numbers (decimal point notation)
  - Figure titles
  - Corresponding page number(s)

#### Nomenclature and Abbreviations

- Follows ‘List of Figures’.
- Contains list of symbols and abbreviations with their long names.
- Should include nomenclature for ERs, DFDs, STRUCTURED CHARTS, RUN CHARTS, and other symbols used.
- Each technique’s nomenclature should appear on a separate sheet.
- Accepted standard symbols should be used wherever possible.

#### Chapter Numbering

- Chapters shall be numbered in Arabic numerals.
- Sections and subsections in decimal notation.
- All chapters begin on a new page.
- Titles for chapters should be **properly centered at the top of the page with three spaces between them.**

#### Company Profile (Chapter 1)

- Highlights company details.
- Includes:
  - Mainstream activity
  - Product line
  - Details of the department where the student worked
- Should **not exceed two pages or 800 words.**
- (Relevant only for M.I.S. Projects)*

#### Introduction

- Highlights the purpose of project work.
- Defines the chapters to be followed in the Project Report.

#### Existing System and Need for System

- Brief details of any existing system in use to help the examiner understand the enhancements carried out.
- Explains the **need for computerization.**
- (Relevant only where applicable).*

#### Proposed System

- Objectives:** Clearly define in a few lines.
- User Requirements:** Stated unambiguously.
- Requirements Determination Techniques and System Analysis Methods Employed:**
  - Fact Finding Methods
  - Decision Analysis
  - Data Flow Analysis etc.
- Prototyping:** If developed prior to detailed design, provide details.
- System Features:**
  - Design of Input:** Inputs, Data Dictionary, Screens

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>○ <b>Design of Output:</b> Outputs, Reports etc.</li> <li>○ <b>Design of Control Procedures:</b> Structured charts, Module Specifications, Run charts etc.</li> <li>○ <b>Design of Exception Handling:</b> Error handling and recovery procedures</li> </ul> <p>The choice of including topics in this chapter entirely depends on the student. Students are advised to employ techniques taught during the MCA course, suitable to their project type (e.g. DFDs and structured charts for M.I.S. development projects).</p> |
| Name and Signature of Convener & Member of BoS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Part - C: Learning Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Text Books, Reference Books, Others</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Text Books and Reference Books Recommended-</b></p> <ul style="list-style-type: none"> <li>• Mitchell, Tom M. Machine Learning. 1st ed. McGraw Hill, 2017. ISBN 978-1259096952.</li> <li>• Alpaydin, Ethem. Introduction to machine learning. 4th ed. Phi, 2020. ISBN 978-8120350786</li> <li>• Campesato, Oswald. Artificial intelligence, machine learning, and deep learning. 1st ed. Mercury Learning and Information, 2020. ISBN 9781683924665</li> <li>• Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.</li> </ul> <p><b>E-Resources:</b></p> <p>1. <b>NPTEL and Swayam:</b></p> <ul style="list-style-type: none"> <li>• <a href="https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08">https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08</a></li> <li>• <a href="https://nptel.ac.in/domains/discipline/106?course=106_0">https://nptel.ac.in/domains/discipline/106?course=106_0</a></li> <li>• <a href="https://onlinecourses.nptel.ac.in/noc22_cs56/preview">https://onlinecourses.nptel.ac.in/noc22_cs56/preview</a></li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>PART -D: Assessment and Evaluation -Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Suggested Continuous Evaluation Methods:</b></p> <p>Maximum Marks: 50 Marks</p> <p>Continuous Internal Assessment(CIA): 15 Marks</p> <p>End Semester Exam (ESE): 35 Marks</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>Internal Test / Quiz-(2): 10 Marks</p> <p>Assignment / Seminar+ Attendance - 5</p> <p>Total Marks – 15 Marks</p> <p>Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>15 Marks</b></p>                                                                                                                                                                                                                                                                                                                        |
| <b>End Semester Exam (ESE):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p><b>Laboratory / Field Skill Performance: On spot Assessment</b></p> <p>A. practical work - 20 Marks</p> <p>B. Lab record – 5 Marks</p> <p>C. Viva-voce - 10 Marks</p> <p>Managed by Course teacher as per lab. status</p>                                                                                                                                                                                                                                                                                                                                         |

|  |                               |  |
|--|-------------------------------|--|
|  | Total Marks – <b>35 Marks</b> |  |
|--|-------------------------------|--|

**Name and Signature of Convener & Members of BoS:**