अध्ययन मंडल बैठक दिनाँक 15/07/2025

विषय – कम्प्यूटर एप्लीकेशन

विश्वविद्यालय अन्तर्गत संचालित मास्टर ऑफ कम्प्यूटर एप्लीकेशन प्रोग्राम में राष्ट्रीय शिक्षा नीति 2020 के अनुरूप तृतीय एंवम 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**						
		A. Synopsis		2	50	20	50	
		B. First Project progress report through presentation		2	50	20	50	-
		C. Second Project progress report through presentation	IV	2	50	20	50	-
		D. Final presentation		3	100	40	-	100
		E. Viva-Voce		1	50	20	-	50
		F. Thesis		2	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 **कम्प्युटर एप्लीकेशन** अध्ययन मंडल की बैठक में निम्नलिखित अध्यक्ष / सदस्य उपस्थित हुये।

क्र.	नाम	पदनाम	अध्यक्ष / सदस्य	हस्ताक्षर
02.	Kiran Sahu	Asst. Professor	Member	
03.	Dr. Ajay Singh T.	Asst. Professor	Member	

DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
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: • Understand the basics of alphabets, strings, languages, and finite automata, and learn how to convert and minimize automata. • Explain and use regular expressions, properties of regular languages, and related theorems like the pumping lemma. • Work with context-free grammars (CFG), simplify them, convert to normal forms, and handle ambiguity. • Understand and build pushdown automata and see how they relate to context-free languages; also learn about advanced automata like linear bounded automata. • Learn and design Turing machines and understand how they work, including different types like multi-tape and non-deterministic machines.		
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)		
Unit	Topics (Course Contents)	No. of Period
I	**Finite Automata and Machine Models** Alphabet, String and language, Finite state Machines, finite automata with ε-moves, Conversion of NDFA to DFA, Removal of ε-transition from NDFA, Two way finite automata, finite automata with output, Mealy & Moore machines, Applications of finite automata, minimization of finite automata.	15
II	**Formal Languages and Grammars** 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	**Pushdown Automata, Linear Bounded Automata, and Turing Machines** 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	**Undecidability and Recursive Function Theory** 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. 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:		

Part - C : Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

- **Theory of Computer Science, Automata Languages & computation,** K.L.P. Mishra, N. Chandrashekharan, PHI.
- **Introduction to Automata Theory Language and Computation,** John E. Hopcropt and Jeffery D. Ullman, Narosa Publication house.
- **Introduction to Formal Languages, Automata Theory and Computation,** Kamala Krithivasan and Rama. R, Pearson.
- **Introduction to Automata Theory Languages and Computation,** John E. Hopcroft, Jeffrey, D. Ullman and Rajeev Motwani.

E-resources:
- 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.
- https://egyankosh.ac.in/handle/123456789/37578

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** Assignment / Seminar - **10** 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 **Section A:** **Q1.** Objective – **10 x1= 10 Marks**; **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40** **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: III	Session:2025-2026
1	Course Code	MCAC-16T	
2	Course Title	**Computer Network and Data Communication**	
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: • Understand and explain the fundamental concepts of data communication, network components, and transmission media. • Analyze and compare various network architectures, protocols, and models such as OSI and TCP/IP. • Demonstrate and apply error detection, error correction techniques, and flow control mechanisms. • Implement and evaluate IP addressing schemes, subnetting, and routing algorithms for efficient network design. • Understand and utilize transport and application layer services, including protocols such as TCP, UDP, HTTP, and DNS..		
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)		
Unit	Topics (Course Contents)	No. of Period
I	**Introduction and Physical Layer:** **Introduction:** 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	**Data Link Layer:** 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	**Network Layer:** 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. **Transport Layer:** 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	**Presentation and Application Layer:** 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:			

Part - C : Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

- "Data Communications & Networking" by Behrouz A. Forouzan.
- "Computer Networks" by Andrew S. Tanenbaum.
- "Data and Computer Communications" by William Stallings.
- "Internetworking with TCP/IP" (Vol I-III) by Douglas E. Comer

E-resources:

- **NPTEL and Swayam:**
  https://egyankosh.ac.in/bitstream/123456789/35913/1/Introduction_to_Computer_and_Networking.html
- http://ndl.iitkgp.ac.in/he_document/faculty_contribution/123456789_FACCON/IN LSoCN34

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** Assignment / Seminar - **10** 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 **Section A:** **Q1.** Objective – **10 x1= 10 Marks;** **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40** Total Marks - **70 Marks**	

Name and Signature of Convener & Members of BoS:

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: • Understand the fundamentals of object-oriented programming environment to design, code, compile, run and debug programs. • Understand the basic principles of Creating Java Applications with console-based and GUI. • Evaluate the Java API packages and their contents. • Understand the procedures, File I/O operations, exception handling, and multithreading in Java. • Understand and remember the components of Java IDEs, JDBC for database connectivity, and the development of Swing-based GUI applications.	
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	**Introduction to Java Programming** 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	**Class and Interface** 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 (); Access modifier: private, public, protected, default, private protected. Interface: Defining, implementing and extending interface, variable in interface, Overview of nested class: Top level nested class and interface.	
III	**Exception Handling and Multithreading** Exception types, Uncaught Exception, Using try and catch, multiple catch, nested try block, throw, throws, and finally. Multithreading: Creating Thread, Thread Priority, Synchronization, Thread Scheduler, Running & Yielding, Sleeping & Waking Up, Waiting & Notifying, Suspending & Resuming;	11
IV	**Event Handling and GUI Programming** 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. 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. 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:

Part - C: Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-
- Java: The Complete Reference, Herbert Schildt, Oracle Press
- Core Java: Volume-I & Volume-II, Cay S. Horstmann & Gary Cornekk, Pearson
- Programming with Java, E. Balagurusamy, McGraw Hill Education
- Core Java, Nageshwara Rao, Dreamtech Press

E-Resources:
- **NPTEL and Swayam:**
  https://onlinecourses.nptel.ac.in/noc22_cs47/preview

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** Assignment / Seminar - **10** 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 Section A: **Q1.** Objective – **10 x1= 10 Marks**; **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40** 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:2025-2026**
1	Course Code	MCAC-17P	
2	Course Title	**Java Programming**	
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: • Design, create, build, and debug Java programs. • Apply multithreading concepts to develop concurrent applications in Java. • Perform file handling operations and implement exception handling in Java programs. • Develop Java programs to connect with databases using JDBC. • Develop console-based applications to solve real-world problems using Java. • Create GUI applications using Java Swing and AWT components.		
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
	  • Printing outputs, data types, variables, type conversion, and operators.
	2: Control Statements
	  • Selection statements (if, switch)
	  • Iteration statements (for, while, do-while)
	  • Jump statements (break, continue, return)
	3: Arrays in Java
	  • Single-dimensional arrays
	  • Multi-dimensional arrays
	  • Anonymous arrays
	4: Classes and Objects
	  • Creating classes and objects
	  • Constructors and constructor overloading
	  • Method overloading and overriding
	  • this and super keywords
	  • Constructor chaining
	5: Inheritance and Interface		

- Single inheritance
- Multiple inheritance using interfaces
- Implementing and extending interfaces
- Nested classes and interfaces

6: Exception Handling
- Basic exception handling (try-catch)
- Multiple catch blocks
- Nested try blocks
- throw, throws, and finally

7: Multithreading
- Creating threads using Thread class and Runnable interface
- Thread priorities
- Synchronization
- Inter-thread communication (wait, notify, notifyAll)

8: Event Handling
- Event classes and listener interfaces
- Event adapters

9: GUI Programming with Swing
- Swing components: JLabel, JTextField, JButton, JTabbedPane, JScrollBar, JList, JComboBox, JTable, Trees, Menus
- Layouts and containers

10: Database Connectivity using JDBC
- Connecting to database using JDBC
- Executing queries (insert, update, delete, retrieve)
- Displaying results using ResultSet

Name and Signature of Convener & Member of BoS:

Part - C

Learning Resource: Text Books, Reference Books, Others

Text Books and Reference Books Recommended-
- Java: The Complete Reference, Herbert Schildt, Oracle Press
- Core Java: Volume-I & Volume-II, Cay S. Horstmann & Gary Cornekk, Pearson
- Programming with Java, E. Balagurusamy, McGraw Hill Education
- Core Java, Nageshwara Rao, Dreamtech Press

E-Resources:
- **NPTEL and Swayam:**
  https://onlinecourses.nptel.ac.in/noc22_cs47/preview

PART -D: Assessment and Evaluation -Practical		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50 Marks		
Continuous Internal Assessment(CIA): 15 Marks		
End Semester Exam (ESE): 35 Marks		
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 Marks Assignment / Seminar+ Attendance - 5 Total Marks – 15 Marks	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **15** Marks

End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment**
	  A. practical work - 20 Marks
	  B. Lab record – 5 Marks
	  C. Viva-voce - 10 Marks
	    Total Marks – 35 Marks
		Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of BoS:

DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction

Program: **Master Of Computer Application**	Semester: III	Session:2025-2026
1	Course Code	MCAC - 18
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: • Identify and define a real-world problem that can be solved using AI and Machine Learning techniques. • Analyze and preprocess data effectively for model development. • Design and implement suitable AI/ML algorithms and models to solve the identified problem. • Evaluate and validate the developed models using appropriate performance metrics. • Demonstrate the deployment or integration of the AI/ML solution into an application or system. • Develop teamwork, documentation, and presentation skills by working collaboratively on project tasks and communicating results effectively.
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	Important Guidelines for Project
Lab./ Experiment Contents of Course,	A project report has to be submitted as per the rules described below: **1. Cover Page** • University/Institute name • Department name • Title of the mini project • Course name and code • Submitted by: Student names with enrollment numbers • Submitted to: Faculty guide name • Academic session and date **2. Certificate Page** Certification by faculty guide, HoD, and institute, stating the work is original and completed under guidance. **3. Acknowledgement** Brief appreciation of faculty guide, department, and peers for their support.

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

	• Margin: 1 inch all sides
	• Page numbering: Bottom center
	• Heading style: Consistent numbering (e.g., 1, 1.1, 1.2)

Name and Signature of Convener & Member of BoS:

Part - C: Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

1. Mitchell, Tom M. Machine Learning. 1st ed. McGraw Hill, 2017. ISBN 978-1259096952.
2. Alpaydin, Ethem. Introduction to machine learning. 4th ed. Phi, 2020. ISBN 978-8120350786
3. Campesato, Oswald. Artificial intelligence, machine learning, and deep learning. 1st ed. Mercury Learning and Information, 2020. ISBN 9781683924665
4. Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.

E-Resources:
1. **NPTEL and Swayam:**
   a) https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08
   b) https://nptel.ac.in/domains/discipline/106?course=106_0
   c) https://onlinecourses.nptel.ac.in/noc22_cs56/preview

PART -D: Assessment and Evaluation -Theory

Suggested Continuous Evaluation Methods:

End Semester Exam (ESE):   50 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: III**	**Session:2025-2026**
1	Course Code	MCAE – 19T	
2	Course Title	**Machine Learning and Intelligent Model Design**	
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: • Understand various supervised and unsupervised machine learning approaches. • Design and implement intelligent models using algorithms such as regression, classification, clustering, and neural networks. • Evaluate the performance of machine learning models using suitable metrics and validation techniques. • Develop solutions integrating intelligent model design for domain-specific problems in areas such as healthcare, finance, and smart systems.		
6	Credit Value	4 Credits	(1 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 Pre-processing** 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	**Regression and Classification** 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. Concept of Classification, Classification vs Regression, Performance metrics for Classification: Confusion matrix, Precision, Recall, F1-Score, Accuracy,	12

III	**Supervised and Unsupervised Learning Algorithms** Supervised Learning Algorithms: K-Nearest Neighbors (KNN), Naïve Bayes, Support Vector Machine (SVM), Decision Tree (DT), Artificial Neural Network (ANN) Classification. Unsupervised Learning Algorithms: Introduction to clustering, Types of clustering techniques: partitioning, hierarchical and density-based clustering.	18
IV	**Intelligent Model Design** 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:

Part - C: Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

5   Mitchell, Tom M. Machine Learning. 1st ed. McGraw Hill, 2017. ISBN 978-1259096952.

6   Alpaydin, Ethem. Introduction to machine learning. 4th ed. Phi, 2020. ISBN 978-8120350786

7   Campesato, Oswald. Artificial intelligence, machine learning, and deep learning. 1st ed. Mercury Learning and Information, 2020. ISBN 9781683924665

8   Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.

E-Resources:

d) https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08

e) https://nptel.ac.in/domains/discipline/106?course=106_0

f) https://onlinecourses.nptel.ac.in/noc22_cs56/preview

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** Assignment / Seminar - **10** 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 **Section A:** Q1. Objective – **10 x1= 10 Marks**; Q2. Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40** **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: III	Session:2025-2026
1	Course Code	MCAE-20T	
2	Course Title	**Generative Artificial Intelligence**	
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: • Understand the foundational principles and concepts of generative artificial intelligence, including the underlying algorithms and techniques used in creative AI systems. • Apply the basic generative algorithms for creative tasks, such as image generation, text generation, and artistic expression. • Implement generative AI techniques in real-world scenarios through practical implementation to produce effective solutions.	
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)		
Unit	Topics (Course Contents)	No. of Period
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:

Part - C : Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

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.

Online Resources:

* https://onlinecourses.nptel.ac.in/noc23_cs127/preview

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** Assignment / Seminar - **10** 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 **Section A:** **Q1.** Objective – **10 x1= 10 Marks**; **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question., **1 out of 2** from each unit-**4x10=40 Marks** 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: III	Session:2025-2026
1	Course Code	MCAE -21T	
2	Course Title	Big Data Analytics	
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: • Understand the building blocks of Big Data. • 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. • Understand the specialized aspects of big data with the help of different big data applications. • Represent the analytical aspects of Big Data along with the knowledge of bigdata database such as mongodb and nosql. • Know the recent research trends related to Hadoop File System, MapReduce and Google File System etc.	
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)		
Unit	Topics (Course Contents)	No. of Period
I	**Introduction Concept of Big Data** 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	**Introduction to Hadoop and Hadoop Architecture** 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		**NoSQL Big Data Management, Mongo DB** 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		**Hadoop Environment, Analytics and Spark** 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:

Part - C : Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

1. Big Data Analytics, Raj Kamal and Preeti Saxena, McGrawHill Education
2. Big Data: Black Book, DT Educational Services, Dreamtech Press
3. Big Data Analytics, Seema Acharya & Subhashini Chellappan, Wiley India
4. Big Data Analytics, M. Vijayalakshmi & Radha Shankarmani, Wiley India

Online Resources:

- https://onlinecourses.nptel.ac.in/noc20_cs92/preview
- https://nptel.ac.in/courses/106107220

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** Assignment / Seminar - **10** 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 **Section A:** **Q1.** Objective – **10 x1= 10 Marks;** **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40 Marks** 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: III	Session:2025-2026
·1	Course Code	MCAE- 22T	
2	Course Title	Natural Language Processing	
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: • Articulate natural language processing and importance of word representation. • Build deep learning model for solving natural language problems such as language modelling, machine translation, POS tagging, Seq2Seq generation. • Implement state-of-the-art Machine Learning and Deep Learning solutions to NLP problems in Global & Indian context.		
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	**Introduction to Natural Language Processing and Linguistic Fundamentals:** 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	**Text Processing, Normalisation, and Word Representations:** 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	**Deep Learning for NLP – Neural Models and Applications:** 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	**Advanced NLP – Topic Modelling, Machine Translation, and Text Generation:** 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://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

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** Assignment / Seminar - **10** 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 **Section A:** **Q1.** Objective – **10 x1= 10 Marks**; **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40 Marks** **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: 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: • Understand the basic concepts, architecture, and design principles of the Internet of Things (IoT). • Explain the role of devices, gateways, networking, and data management in IoT systems. • Describe various IoT reference models, real-world design constraints, and data visualization techniques. • Identify and compare different IoT protocols across data link, network, transport, and session layers. • Understand security challenges and solutions in IoT communication and protocols.		
6	Credit Value	3 Credit	(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	**Overview:** 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	**Reference Architecture:** 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	**IOT Data Link Layer & Network Layer Protocols:** 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	**Session Layer:** 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:

Part - C : Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

- 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.
- The Internet of Things, Michael Miller, QUE publishing.
- Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley.
- Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Florian Michahelles, Springer.
- Getting Started with the Internet of Things, Cuno Pfister, O'Reilly.

E-resources:
- http://ndl.iitkgp.ac.in/he_document/nptel/nptel/106105166_1ozjpedahrcocrzs1f2joi whsvl7s_r1w?e=4|Internet%20of%20things|||.
- https://egyankosh.ac.in/handle/123456789/100593.

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** Assignment / Seminar - **10** 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 **Section A:** **Q1**. Objective – **10 x1= 10 Marks**; **Q2**. Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40** **Total Marks -** **70 Marks**	

Name and Signature of Convener & Members of BoS:

DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
Program: Master Of Computer Application		Semester: III	Session:2025-2026
1	Course Code	MCAC – 24T	
2	Course Title	Data Mining and Data Warehousing	
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: • Understand what data mining and data warehousing. • Learn how to clean, prepare, and organize data for mining. • Use classification, prediction, and clustering techniques to analyze data. • Explore how data mining is applied to text, web, multimedia, and other complex data types, and know its real-world uses		
6	Credit Value	3 Credit	(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	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-

- Data Mining Concepts and Techniques, Jiawei Han and MichelineKamber
- Data Mining Techniques, Arun K Pujari
- Data Mining Introductory and Advanced Topics, Margaret H Dunham, Pearson

E-resources:

- 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|||.
- https://egyankosh.ac.in/handle/123456789/81150.

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** Assignment / Seminar - **10** 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 **Section A:** **Q1.** Objective – **10 x1= 10 Marks;** **Q2.** Short answer type- **5x4 = 20 Marks** **Section B:** Descriptive answer type question.,**1 out of 2** from each unit-**4x10=40** **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: IV**	**Session:2025-2026**
1	Course Code	MCAC-25P	
2	Course Title	**Major Project (System Design and Implementation/Research Project)**	
3	Course Type	Discipline Specific Course (Major-Project)	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After completing the Major Project, students will be able to: - Identify and define a real-world problem relevant to their domain and propose an effective solution using appropriate technologies. - Analyse requirements, design system architecture, and implement solutions using technologies such as website development, window applications, web services, AI-based tools, or research methodologies. - Effectively preprocess and manage data where applicable to support the development and functioning of the project. - Design, implement, and integrate algorithms, models, or functionalities suitable for solving the identified problem efficiently. - Evaluate, test, and validate the developed system or application using appropriate methods, tools, and performance metrics. - Demonstrate deployment, integration, or practical usability of the developed solution within a real or simulated environment. - Develop teamwork, project management, documentation, and presentation skills by working collaboratively, maintaining professional documentation, and communicating project outcomes effectively.	
6	Credit Value	20 Credit	
7	Total Marks	Max. Marks: 600	Min Passing Marks: 240

PART- B: CONTENT OF THE COURSE	
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)	
Module	**GUIDELINES FOR PROJECT WORK (MCA)**
Lab./ Experiment Contents of Course,	A project report has to be submitted as per the rules described. Some additional guidelines regarding the Project Report are: **Number of Copies**

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

	o **Design of Output:** Outputs, Reports etc. o **Design of Control Procedures:** Structured charts, Module Specifications, Run charts etc. o **Design of Exception Handling:** Error handling and recovery procedures 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).

Name and Signature of Convener & Member of BoS:

Part - C: Learning Resources

Text Books, Reference Books, Others

Text Books and Reference Books Recommended-

9 Mitchell, Tom M. Machine Learning. 1st ed. McGraw Hill, 2017. ISBN 978-1259096952.

10 Alpaydin, Ethem. Introduction to machine learning. 4th ed. Phi, 2020. ISBN 978-8120350786

11 Campesato, Oswald. Artificial intelligence, machine learning, and deep learning. 1st ed. Mercury Learning and Information, 2020. ISBN 9781683924665

12 Masashi Sugiyama, Introduction to Statistical Machine Learning (1 ed.), Morgan Kaufmann, 2017. ISBN 978-0128021217.

E-Resources:

2. **NPTEL and Swayam:**
   g) https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_IITMPR_08
   h) https://nptel.ac.in/domains/discipline/106?course=106_0
   i) https://onlinecourses.nptel.ac.in/noc22_cs56/preview

PART -D: Assessment and Evaluation -Theory

Suggested Continuous Evaluation Methods:

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

	Total Marks – **35 Marks**	

Name and Signature of Convener & Members of BoS: