

Scheme of B. Sc. Mathematics

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	MATH-1T	Calculus	Theory	4	50	33
	MATH-2T	Algebra	Theory	4	50	
	MATH-1P (Any One)	Lab 1 : Calculus and Algebra	Practical	2	50	17
		Project 1 : History of Mathematicians	Project	2	50	17
Second year	MATH-3T	Differential Equations	Theory	4	50	33
	MATH-4T	Real Analysis	Theory	4	50	
	MATH-2P (Any One)	Lab 2 : Differential Equations and Real Analysis	Practical	2	50	17
		Project 2 : History of Mathematicians	Project	2	50	17
Third year	MATH-5T Optional I (Any One)	Mechanics	Theory	4	50	33
		Numerical Methods	Theory	4	50	
		Linear Algebra	Theory	4	50	
		Integral Transforms and Fourier Analysis	Theory	4	50	
	MATH-6T Optional II (Any One)	Discrete Mathematics	Theory	4	50	
		Tensors and Differential Geometry	Theory	4	50	
		Number Theory	Theory	4	50	
		Probability and Statistics	Theory	4	50	
	MATH-3P (Any One)	Lab 3 : Mathematics Paper 1 and Paper 2	Practical	2	50	17
		Project 3 : History of Mathematicians	Project	2	50	17

Note: There shall be four extra credits in all the years of under graduation for internship/apprenticeship. The certificate of extra credits would be provided by the concern university and is not mandatory.

Part A: Introduction			
Program: Degree Course		Class: B.A. /B.Sc. III Year	Year: 2022 Session: 2024-2025
1	Course Code	MATH-3P (I)	
2	Course Title	I - Lab 03 - Mathematics Paper 1 and Paper 2	
3	Course Type	Practical	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	<p>This course will enable the students to</p> <ul style="list-style-type: none"> • Learn Free and Open Source Software (FOSS) tools for computer programming • Solve problem on mathematical theory studied in Mathematics Paper 1 and 2 by using FOSS software's. • Acquire knowledge of applications of Mathematics through FOSS. 	
6	Credit Value	2	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17

Part B: Content of the Course	
Total Periods: 30	
Tentative Practical List	<p>Mathematics practical with Free and open Source Software (FOSS) tools for computer programs, such as GeoGebra/Maxima/Scilab/ Octave /Python/R.</p> <p>List of Practical's: (At least 10 practical's from Paper 1 and Paper 2)</p> <ul style="list-style-type: none"> • Note: Additional practical may be included in the list at the college level as per choice of optional papers <p>Mechanics: Suggested book: Scilab Textbook Companion for Engineering Mechanics by A. K. Tayal</p> <ol style="list-style-type: none"> 1. Using the Principle of Virtual Work find the force to hold the system of pulleys in equilibrium. 2. Using the Principle of Virtual Work to determine vertical and horizontal components of reactions of end points of a frame made up with hinge joints. 3. Displacement time relationship for a traveling car. 4. Displacement time relationship for a stone dropped from top of a tower.

5. Distance travelled by a particle in the n th second.

Numerical Methods: Suggested book: Scilab Textbook Companion for Numerical Methods by B. Ram

1. Program to find solution of nonlinear equations using Bisection method.
2. Program to find smallest positive root of a cubic equation using Newton's method.
3. Program to find solution of linear system of equations using Triangularization Method.
4. Program to find solution of linear system of equations using Gauss Jacobi Method.
5. Program to find solution of linear system of equations using Gauss Seidel Method.
6. Program for value of a function at given point using Newton forward difference interpolation.
7. Program for value of a function at given point using Newton backward difference interpolation.
8. Program to find first and second order approximation of first derivative of a function.
9. Program to find integral approximation by Simpson three eight rule.
10. Program to solve initial value problem using Euler's method.

Linear Algebra: Suggested book: Scilab Textbook Companion for Linear Algebra by K. Hoffman and R. Kunze

1. Program to find matrix of differential operator with respect to standard basis on the vector space of polynomial functions of degree three or less.
2. Program to find GCD to two polynomials.
3. Program to find Characteristic Polynomial of a matrix of order 2.
4. Program to find Characteristic and minimal polynomial of a matrix.



5. Program to find Orthogonal projection in R^3 .

6. Program to find Unitary matrix.

Integral Transforms and Fourier analysis: Suggested book: Scilab Textbook Companion for Higher Engineering Mathematics by B. S. Grewal

1. Find Fourier sine integral.

2. Find Fourier transform of given function.

3. Find Fourier sine transform.

4. Find Fourier cosine transform.

Discrete Mathematics: Suggested book: Scilab Textbook Companion for Discrete Mathematics by S. Lipschutz, M. Lipson And V. H. Patil, Scilab Textbook Companion for Discrete Mathematics And Its Applications by K. H. Rosen

1. Use of Adjacency matrix

2. Use of Path matrix

Probability and Statistics: Suggested book: Scilab Textbook Companion for Probability And Statistics For Engineers And Scientists by S. M. Ross

1. Program for application of Bayes's theorem.

2. Program to obtain probability of union of events.

3. Program for probability of equality likely events

4. Program for applications of Binomial distribution.

5. Program to obtain probability using Poisson distribution.

6. Program for probabilities of a uniform random variable.

7. Program to make scatter plot of two sets of data.

8. Program to fit a linear curve to a given set of data and to determine the sum of squares of the residuals.

Number Theory: Suggested book: Scilab Textbook Companion for Discrete Mathematics And Its Applications by K. H. Rosen

1. To find the quotient and remainder when an integer is divided by

145













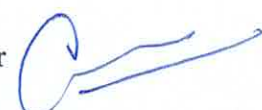


	another integer.
	2. To find prime factorization of a given integer.
	3. Test that a given integer is prime or not.
	4. To find the greatest common divisor of two integers using recursion.
	5. To find the greatest common divisor of two integers using Euclidean algorithm.

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
SUPPORT FROM THE GOVT FOR STUDENTS AND TEACHERS IN UNDERSTANDING AND LEARNING FOSS TOOLS:		
As a national level initiative towards learning FOSS tools, IIT Bombay for MHRD, government of India is giving free training to teachers interested in learning open source software's like scilab, maxima, octave, geogebra and others. (Website: http://spoken-tutorial.org;)		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 50		
Continuous Comprehensive Evaluation (CCE): Not Applicable		
University Exam (UE): 50 Marks		
Internal Assessment:		
Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable

135

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | |
|--|---|--|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - | Chairman  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - | Member  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - | Member  |
| 4. Ram Laxhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - | Member  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - | Member  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - | Member  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - | Member  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - | Member  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - | Member  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - | Member  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - | Member  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - | Member  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - | Member  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - | Member  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - | Member  |

Part A: Introduction			
Program: Degree Course		Class: B.A./ B.Sc. III Year	Year: 2022 Session: 2024-2025
1	Course Code	MATH-3P (II)	
2	Course Title	II - Project 03 - History of Mathematician	
3	Course Type	Project	
4	Pre-requisite (if any)	No	
5	Course Learning Outcomes (CLO)	<p>Studying history of mathematicians help students:</p> <ul style="list-style-type: none"> • Develop a deeper understanding of the mathematics they have already studied by seeing how it was developed over time and in various places. • Know the rich intellectual heritage of the country. • Develop an appreciation of mathematics and build positive attitude towards mathematics increasing student's motivation decreasing anxiety related the subject. • To acquire knowledge about development of mathematics in ancient , medieval and modern period of history. 	
6	Credit Value	2	
7	Total Marks	Max. Marks: 50	Min Passing Marks : 17
















Part B: Content of the Course	
Total Periods: 30	
Project List	<p>Course Objectives:</p> <p>An elective course designed to acquire special / advance knowledge, such as supplement study / support study to a project work and a candidate study such a course on his own with an advisory support by a teacher / faculty member.</p> <p>Project:</p> <p>Contributions and biographies of Indian Mathematicians Swami Bharti Krishna Tirth and Ramanujan, Madhav and Neelkanth Somyaji and contribution involved in contents of the paper of opted by student. (Any 10 Mathematicians)</p>

Part C - Learning Resource		
Text Books, Reference Books, Other Resources		
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): Not Applicable University Exam(UE): 50 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test/Assignment/Presentation	Not Applicable



Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | | |
|--|---|----------|---|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - | Chairman |  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - | Member |  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - | Member |  |
| 4. Ram Lakhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - | Member |  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - | Member |  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - | Member |  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - | Member |  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - | Member |  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - | Member |  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - | Member |  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - | Member |  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - | Member |  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - | Member |  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - | Member |  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - | Member |  |

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(I)	
2	Course Title	Mechanics	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> Familiarize with subject matter, which has been the single centre, to which were drawn mathematicians, physicists, astronomers and engineers together. Understand necessary conditions for the equilibrium of particles acted upon by various forces and learn the principle of virtual work for a system of coplanar forces acting on a particle. Determine the centre of gravity of materialistic systems and discuss the equilibrium of a uniform cable hanging freely under its own weight. Deal with the kinematics and kinetics of the rectilinear and planar motions of a particle including the constrained oscillatory motions of particle. Learn that a particle moving under a central force describes a plane curve and know the Kepler's laws of the planetary motions, which were deduced by him long before the mathematical theory given by Newton. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : 17

175

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Statics: Coplanar forces, Couples, Moment of force and a couple about a point and a line, Equilibrium of a particle and of a system of particles; Work and potential energy, Principle of virtual work for a system of coplanar forces acting on a particle, Forces which can be omitted in forming the equations of virtual work.	12
II	Centre of Gravity and Common Catenary: Concepts of Centre of mass and Centre of gravity, Centre of gravity of an uniform arc, plane area and solids of revolution; Common catenary, Approximations of a catenary.	12
III	Rectilinear Motion: Simple harmonic motion and its geometrical representation, Motion under inverse square law, Motion in resisting media, Concept of terminal velocity, Motion of varying mass.	12
IV	Motion in a Plane: Kinematics and kinetics of motion, Expressions for velocity and acceleration in cartesian, polar and intrinsic coordinates; Motion in a vertical circle, projectile and cycloidal motion.	12
V	Central Orbits: Equation of motion under a central force, Differential equation of an orbit, (p, r) equation of an orbit, Apses and apsidal distances, Areal velocity, Characteristics of central orbits, Kepler's laws of planetary motion.	12

TSM

Part C - Learning Resource

Text Books, Reference Books:

1. R. S. Varma (1962). *A Text Book of Statics*. Pothishala Pvt. Ltd.
2. P.L. Srivastava (1964). *Elementary Dynamics*. Ram Narain Lal, Beni Prasad Publishers Allahabad.
3. J. L. Synge & B. A. Griffith (1949). *Principles of Mechanics*. McGraw-Hill.
4. S.L. Loney (2006). *An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies*. Read Books.
5. A. S. Ramsey (2009). *Statics*. Cambridge University Press.
6. A. S. Ramsey (2009). *Dynamics*. Cambridge University Press.

E-Resources

1. Suggested Equivalent **online courses**: Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/playlist?list=PLwdnzlV3ogoXUbQmP-T2gPhYXeEcXP6U8>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

TSM

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

1. Dr. Premrata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur
2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa
3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota
4. Ram Lakhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda
5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai
6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon
7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg
8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur
9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur
10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur
11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai
12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod
13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir
14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh
15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat

- Chairman

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(II)	
2	Course Title	Numerical Methods	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> Obtain numerical solutions of algebraic and transcendental equations. Find numerical solutions of system of linear equations and to check the accuracy of the solutions. Learn about various interpolating and extrapolating methods to find numerical solutions. Solve initial and boundary value problems in differential equations using numerical methods. Apply various numerical methods in real life problems. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : ...

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Numerical methods for solving algebraic and transcendental equations: Round-off error and computer arithmetic, Local and global truncation errors, Algorithms and convergence; Bisection method, false position method, fixed point iteration method, Newton's method and secant method for solving equations.	12
II	Numerical Methods for Solving Linear Systems: Partial and scaled partial pivoting, LU decomposition and its applications, Thomas method for tridiagonal systems; Gauss-Jacobi, Gauss-Seidel and successive over-relaxation (SOR) methods.	12
III	Interpolation: Lagrange and Newton interpolations, Piecewise linear interpolation, Cubic spline interpolation, Finite difference	12

	operators, Gregory-Newton forward and backward difference interpolations.	
IV	Numerical Differentiation and Integration: First order and higher order approximation for first derivative, Approximation for second derivative; Numerical integration: Trapezoidal rule, Simpson's rule and its error analysis, Bulirsch-Stoer extrapolation methods, Richardson extrapolation.	12
V	Initial and Boundary Value Problems of Differential Equations: Euler's method, Runge-Kutta methods, Higher order one step method, Multi-step methods; Finite difference method, Shooting method, Real life examples: Google search engine, 1D and 2D simulations, Weather forecasting.	12

Part C - Learning Resource

Text Books and Reference Books:

1. Brian Bradie , *A Friendly Introduction to Numerical Analysis*. Pearson. 2006
2. C. F. Gerald & P. O. Wheatley. *Applied Numerical Analysis* (7th edition), Pearson Education, India. 2008
3. M.K. Jain, S. R. K. Iyengar & R. K. Jain. *Numerical Methods for Scientific and Engineering Computation* (6th edition). New Age International Publishers. 2012
4. Robert J. Schilling & Sandra L. Harris. *Applied Numerical Methods for Engineers Using MATLAB and C*. Thomson-Brooks/Cole. 1999

E- Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=pOtnzAXlXvI&list=PL3pGy4HtqwD0CWdFuygdF-gk0ORk5EFZg>

Part D: Assessment and Evaluation
















Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | |
|--|---|--|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - | Chairman  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - | Member  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - | Member  |
| 4. Ram Laxhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - | Member  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - | Member  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - | Member  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - | Member  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - | Member  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - | Member  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - | Member  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - | Member  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - | Member  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - | Member  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - | Member  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - | Member  |

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(III)	
2	Course Title	Linear Algebra	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> • Learn about properties of linear transformation and isomorphism theorems. • Understand the concept of polynomials and their prime factorization. • Find canonical form of linear transformations. • Obtain various variants of diagonalisation of linear transformations. • Apply Cauchy-Schwarz inequality for deriving metric on inner product spaces and obtain orthonormal basis using Gram-Schmidt orthogonalisation. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Properties of Linear Transformation: Vector spaces, Linearly independent and dependent sets, Bases and dimension, Linear transformation, Linear functional, Dual spaces and second dual space, Transpose of linear transformation, Algebra of linear transformations, Isomorphism theorems.	12

TAM

II	Polynomials: Algebras, The algebra of polynomials, Lagrange interpolation, Vandermonde matrix, Polynomial ideals, Taylor's formula, The prime factorization of a polynomial, Algebraically closed fields.	12
III	Elementary Canonical Forms: Determinant functions, Characteristic values of a linear transformation, Cayley-Hamilton theorem for linear transformations, Annihilating polynomials, Invariant subspaces, Minimal and characteristic polynomials.	12
IV	Diagonalisation and Jordan Canonical Form: Diagonalisability of linear transformations, Direct sum decomposition, Invariant direct sums, The primary decomposition theorem, Triangular form, Jordan canonical form, trace and transpose.	12
V	Inner Product Spaces: Definition and examples of inner product space, orthogonality, Cauchy-Schwarz inequality, Gram-Schmidt orthogonalisation, Diagonalisation of symmetric matrices, Hermitian, Unitary and normal operators.	12

Part C - Learning Resource

Text Books, Reference Books,

1. I. M. Gel'fand. *Lectures on Linear Algebra*. Dover Publications. 1989
2. Kenneth Hoffman & Ray Kunze. *Linear Algebra* (2nd edition). Prentice-Hall. 2015
3. Nathan Jacobson. *Basic Algebra I* (2nd edition). Dover Publications. 2009
4. Nathan Jacobson *Basic Algebra II* (2nd edition). Dover Publications. 2009.
5. Serge Lang *Introduction to Linear Algebra* (2nd edition). Springer India. 2005.
6. Gilbert Strang. *Linear Algebra and its Applications* (2nd edition). Elsevier. 2014

E- Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=9h_Q-R6sXbM&list=PL7oBzLzHZ1wXQvQ938Wgl-soq09GywgOw

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
















Maximum Marks:

50 Marks

TS

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | |
|--|------------|---|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - Chairman |  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - Member |  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - Member |  |
| 4. Ram Lakhani Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - Member |  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - Member |  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - Member |  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - Member |  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - Member |  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - Member |  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - Member |  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - Member |  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - Member |  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - Member |  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - Member |  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - Member |  |

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 5T(IV)	
2	Course Title	Integral Transforms and Fourier Analysis	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<p>This Course will enable the students to:</p> <ul style="list-style-type: none"> • Know about piecewise continuous functions, Dirac delta function, Laplace transforms and its properties. • Solve ordinary differential equations using Laplace transforms. • Explain Parseval's identity, Plancherel's theorem and applications of Fourier transforms to boundary value problems. • Learn Fourier series, Bessel's inequality, term by term differentiation and integration of Fourier series. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Laplace Transforms: Integral transform, Kernel of an integral transform, Reduction of integral transform into Laplace transform, Linearity, Existence theorem, Laplace transforms of derivatives and integrals, Shifting theorems, Change of scale property, Laplace transforms of periodic functions, Dirac's delta function.	12
II	Further Properties of Laplace Transforms and Applications: Differentiation and integration of transforms, Convolution theorem, Integral equations, Inverse Laplace transform, Lerch's theorem, Linearity property of inverse Laplace transform, Translations theorems of inverse Laplace transform, Inverse	12

125

	transform of derivatives, Applications of Laplace transform in obtaining solutions of ordinary differential equations and integral equations.	
III	Fourier Transforms: Fourier and inverse Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier sine and cosine transforms, Linearity property, Change of scale property, Shifting property, Modulation theorem, Relation between Fourier and Laplace transforms.	12
IV	Solution of Equations by Fourier Transforms : Solution of integral equation by Fourier sine and cosine transforms, Convolution theorem for Fourier transform, Parseval's identity for Fourier transform, Plancherel's theorem, Fourier transform of derivatives, Applications of infinite Fourier transforms to boundary value problems, Finite Fourier transform, Inversion formula for finite Fourier transforms.	12
V	Fourier Series: Fourier cosine and sine series, Fourier series, Differentiation and integration of Fourier series, Absolute and uniform convergence of Fourier series, Bessel's inequality, The complex form of Fourier series.	12

Part C - Learning Resource

Text Books, Reference Books:

1. James Ward Brown & Ruel V. Churchill. *Fourier Series and Boundary Value Problems*. McGraw-Hill Education. 2011
2. Charles K. Chui. *An Introduction to Wavelets*. Academic Press 1992
3. Erwin Kreyszig. *Advanced Engineering Mathematics* (10th edition). Wiley. 2011
4. Walter Rudin. *Fourier Analysis on Groups*. Dover Publications. 2017
5. A. Zygmund. *Trigonometric Series* (3rd edition). Cambridge University Press. 2002

Other Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=FGjMZ1uMRrs&list=PLhSp9OSVmeyJ5N-JUEZj7uS6lAT9a79nD>

Part D: Assessment and Evaluation
















Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | | |
|--|---|----------|---|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - | Chairman |  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - | Member |  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - | Member |  |
| 4. Ram Lakhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - | Member |  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - | Member |  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - | Member |  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - | Member |  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - | Member |  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - | Member |  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - | Member |  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - | Member |  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - | Member |  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - | Member |  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - | Member |  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - | Member |  |

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(I)	
2	Course Title	Discrete Mathematics	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Learn about partially ordered sets, lattices and their types. • Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications. • Solve real-life problems using finite-state and Turing machines. • Assimilate various graph theoretic concepts and familiarize with their applications. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Partially Ordered Sets: Definitions, examples and basic properties of partially ordered sets (poset), Order isomorphism, Hasse diagrams, Dual of a poset, Duality principle, Maximal and minimal elements, Least upper bound and greatest upper bound, Building new poset, Maps between posets.	12
II	Lattices: Lattices as posets, Lattices as algebraic structures, Sublattices, Products and homomorphisms; Definitions, examples and properties of modular and distributive lattices; Complemented, relatively complemented and sectionally complemented lattices.	12
III	Boolean Algebras and Switching Circuits: Boolean algebras, De Morgan's laws, Boolean homomorphism, Representation theorem; Boolean polynomials, Boolean polynomial functions, Disjunctive	12

135

	and conjunctive normal forms, Minimal forms of Boolean polynomials, Quine-McCluskey method, Karnaugh diagrams, Switching circuits and applications.	
IV	Finite-State and Turing Machines: Finite-state machines with outputs, and with no output; Deterministic and nondeterministic finite-state automaton; Turing machines: Definition, examples, and computations.	12
V	Graphs: Definition, examples and basic properties of graphs, Königsberg bridge problem; Subgraphs, Pseudographs, Complete graphs, Bipartite graphs, Isomorphism of graphs, Paths and circuits, Eulerian circuits, Hamiltonian cycles, Adjacency matrix, Weighted graph, Travelling-salesman problem, Shortest path, Dijkstra's algorithm.	12

Part C - Learning Resource

Text Books and Reference Books:

1. B. A. Davey & H. A. Priestley . *Introduction to Lattices and Order* (2nd edition). Cambridge University Press. 2002
2. Edgar G. Goodaire & Michael M. Parmenter. *Discrete Mathematics with Graph Theory* (3rd edition). Pearson Education. 2018
3. Rudolf Lidl & Günter Pilz. *Applied Abstract Algebra* (2nd edition). Springer. 1998
4. Kenneth H. Rosen. *Discrete Mathematics and its Applications: With Combinatorics and Graph Theory* (7th edition). McGraw-Hill. 2012
5. C. L. Liu *Elements of Discrete Mathematics* (2nd edition). McGraw-Hill. 1985

E-Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=hklHg9oMkGA&list=PLwdnzlV3ogoVxVxCTII45pDVM1aoYoMHf>

Part D: Assessment and Evaluation













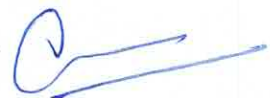


Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | |
|--|------------|---|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - Chairman |  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - Member |  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - Member |  |
| 4. Ram Lakhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - Member |  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - Member |  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - Member |  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - Member |  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - Member |  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - Member |  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - Member |  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - Member |  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - Member |  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - Member |  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - Member |  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - Member |  |

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session: 2024-2025
1	Course Code	Paper – MATH – 6T(II)	
2	Course Title	Tensors and Differential Geometry	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Explain the basic concepts of tensors. • Understand role of tensors in differential geometry. • Learn various properties of curves including Frenet - Serret formulae and their applications. • Know the Interpretation of the curvature tensor, Geodesic curvature, Gauss and Weingarten formulae. • Understand the role of Gauss's Theorema Egregium and its consequences. • Apply problem-solving with differential geometry to diverse situations in physics, engineering and in other mathematical contexts. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Tensors: Contravariant and covariant vectors, Transformation formulae, Tensor product of two vector spaces, Tensor of type (r, s) , Symmetric and skew-symmetric properties, Contraction of tensors, Quotient law, Inner product of vectors.	12
II	Further Properties of Tensors: Fundamental tensors, Associated covariant and contravariant vectors, Inclination of two vectors and orthogonal vectors, Christoffel symbols, Law of transformation of Christoffel symbols, Covariant derivatives of covariant and contravariant vectors, Covariant differentiation of tensors, Curvature tensor, Ricci tensor, Curvature tensor identities.	12
III	Curves in \mathbb{R}^2 and \mathbb{R}^3: Basic definitions and examples, Arc length, Curvature and the Frenet-Serret formulae, Fundamental existence and uniqueness theorem for curves, Non-unit speed curves.	12

TS

IV	Surfaces in \mathbb{R}^3: Basic definitions and examples, The first fundamental form, Arc length of curves on surfaces, Normal curvature, Geodesic curvature, Gauss and Weingarten formulae, Geodesics, Parallel vector fields along a curve and parallelism.	12
V	Geometry of Surfaces: The second fundamental form and the Weingarten map; Principal, Gauss and mean curvatures; Isometries of surfaces, Gauss's Theorema Egregium, The fundamental theorem of surfaces, Surfaces of constant Gauss curvature, Exponential map, Gauss lemma, Geodesic coordinates, The Gauss-Bonnet formula and theorem.	12

Part C - Learning Resource

Text Books, Reference Books:

1. Christian Bär. *Elementary Differential Geometry*. Cambridge University Press. 2010
2. Manfredo P. do Carmo. *Differential Geometry of Curves & Surfaces* (Revised and updated 2nd edition). Dover Publications. 2016
3. Alfred Gray. *Modern Differential Geometry of Curves and Surfaces with Mathematica* (4th edition). Chapman & Hall/CRC Press, Taylor & Francis. 2018
4. Richard S. Millman & George D. Parkar. *Elements of Differential Geometry*. Prentice-Hall. 1977
5. R. S. Mishra. *A Course in Tensors with Applications to Riemannian Geometry*. Pothishala Pvt. Ltd. 1965
6. Sebastián Montiel & Antonio Ross. *Curves and Surfaces*. American Mathematical Society. 2009

E-Resources

1. Suggested Equivalent **online courses**: Web link NPTEL/ SWAYAM/ MOOCs
2. <https://www.youtube.com/watch?v=OyQj-RWLuV4>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

1. Dr. Premlata Verma

Asst. Prof.

Govt. Bilasa Girls PG College, Bilaspur

2. Prof. R.R. Sahu

Asst. Prof.

Govt. MMR PG College, Champa

3. Mr. Yetendra Upadhyay

Asst. Prof.

Govt. N.K. College, Kota

4. Ram Lakhani Pandey

Asst. Prof.

Dr. B.R. Ambedkar Govt. College, Baloda

5. Dr. Arun Kumar Mishra

Professor

Govt. DT PG College, Utai

6. Dr. Shabnam Khan

Professor

Govt. Digvijay PG College, Rajnandgaon

7. Dr. Padmavati

Professor

Govt. VYT PG Auto. College, Durg

8. Dr. Anjali Chandravanshi

Asst. Prof.

Govt. J.Y. Chhattisgarh College, Raipur

9. Manisha Gupta

Asst. Prof.

GNA Govt. PG College, Bhatapara, Raipur

10. Mrs. Sangeeta Pandey

Asst. Prof.

R.G. Govt. PG College, Ambikapur

11. Dr. S.K. Bohre

Asst. Prof.

I.G. Govt. PG College, Vaishalinagar, Bhilai

12. Dr. Samir Dashputre

Asst. Prof.

Govt. College, Arjunda, Balod

13. Dr. Chandrajeet Singh Rathore

Asst. Prof.

Govt. Jajwalyadev Naveen Girls PG College, Janjgir

14. Dr. Shri Nath Gupta

K. Govt. Arts & Science College, Raigarh

15. Dr. Raghu Nandan Patel

Asst. Prof.

Govt. MLS College, Seepat

- Chairman

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

- Member

Part A: Introduction			
Program: Degree Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(III)	
2	Course Title	Number Theory	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Some of the open problems related to prime numbers, viz., Goldbach conjecture etc. • About number theoretic functions and modular arithmetic. • Public crypto systems, in particular, RSA. 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks : 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Distribution of Primes and Theory of Congruencies: Linear Diophantine equation, Prime counting function, Prime number theorem, Goldbach conjecture, Fermat and Mersenne primes, Congruence relation and its properties, Linear congruence and Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.	12
II	Number Theoretic Functions: Number theoretic functions for sum and number of divisors, Multiplicative function, The Mobius inversion formula, The greatest integer function. Euler's phi-function and properties, Euler's theorem.	12
III	Primitive Roots: The order of an integer modulo n , Primitive roots for primes, Composite numbers having primitive roots; Definition of quadratic residue of an odd prime, and Euler's criterion.	12

T8

IV	Quadratic Reciprocity Law and Public Key Encryption: The Legendre symbol and its properties, Quadratic reciprocity, Quadratic congruencies with composite moduli.	12
V	Applications: Public key encryption, RSA encryption and decryption, Some important application.	12

Part C - Learning Resource

Text Books and Reference Books

1. David M. Burton. *Elementary Number Theory* (7th edition). McGraw-Hill. 2007
2. Gareth A. Jones & J. Mary Jones. *Elementary Number Theory*. Springer. 2005
3. Neville Robbins. *Beginning Number Theory* (2nd edition). Narosa. 2007

E- Resources

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=u7cBLb0b7pk&list=PLOzRYVm0a65fuj_5fuj1BLeQNULrM4Irlj

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:













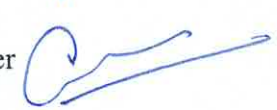


Maximum Marks:

50 Marks

TS

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | | |
|--|---|----------|---|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - | Chairman |  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - | Member |  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - | Member |  |
| 4. Ram Lakhan Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - | Member |  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - | Member |  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - | Member |  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - | Member |  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - | Member |  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - | Member |  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - | Member |  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - | Member |  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - | Member |  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - | Member |  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - | Member |  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - | Member |  |

Part A: Introduction			
Program: Certificate Course		Class: B. A. / B.Sc. Part III	Year: 2022 Session:2024-2025
1	Course Code	Paper – MATH – 6T(IV)	
2	Course Title	Probability and Statistics	
3	Course Type	Theory	
4	Pre-requisite (if any)	No	
5	Course Learning Outcome (CLO)	<ul style="list-style-type: none"> • Understand the basic concepts of probability. • Appreciate the importance of probability distribution of random variables and to know the notion of central tendency. • Establish the joint distribution of two random variables in terms their correlation and regression. • Understand Correlation , Regression, Partial and Multiple correlation. • Study Attributes, Chi-square distribution and sampling. • Learn Curve Fitting , Interpolation, Extrapolation and Finite Differences 	
6	Credit Value	4	
7	Total Marks	Maximum Marks : 50	Minimum Passing Marks :

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Periods
I	Probability and Random Variables: Axiomatic and empirical definitions of probability, Independent and dependent events, Conditional probability and Baye's theorem; Discrete and continuous random variables and their probability distributions, Cumulative distribution function, n^{th} Moments, Moment generating function, Characteristic function.	12

TH

II	Univariate Distributions: Discrete distributions: Bernoulli trials and Bernoulli distribution, Binomial and Poisson distributions; Continuous distributions: Uniform, Geometric, Gamma, Exponential, Beta and normal distributions; Normal approximation to the binomial distribution, Central limit theorem.	12
III	Curve Fitting , Interpolation, Extrapolation and Finite Differences: Method of least squares, Normal equation, Fitting of the curve of the type $y = ab^x$ and $y = ax^b$. Methods of Interpolation , Newton's Binomial Method, Lagrange's Interpolation Formula, Gauss's forward and backward formula, Stirling formula, Bessel's formula, Everett's formula, Divided difference table, Newton's divided difference formula.	12
IV	Correlation, Regression, Partial and Multiple Correlation: Correlation, Karl Pearson's Coefficient of correlation, Correlation of ranks, Correlation coefficient, Regression, Line of regression, Equations to the line of regression, Schwarz's Inequality, Moment of Bivariate Distribution. Multiple Correlation, Partial Correlation, Distribution of two, three and more variable, Regression Coefficient , Residuals, Standard deviation of the residuals, Multiple correlation and Partial correlation coefficient.	12
V	Attributes, Chi-square distribution and sampling: Attributes, Positive and Negative Attributes, Testing, Condition for consistence in attributes, Independence , Criterion of Independence, Association, complete association, coefficient of association, degree of association, Chi-square distribution, Origin of sampling, Essentials of sampling, Random sampling, Large samples, simple sampling, comparison of large sample, sample from different populations, level of significance, testing the significance of an observed coefficient of correlation and rank of correlation coefficient, Fisher's z-test, Small samples, t-distribution, Fisher's z-distribution, Snedecore's F-distribution.	12

Part C - Learning Resource

Text Books and Reference Books:

1. David Applebaum. *Probability and Information: An Integrated Approach*. Cambridge University Press. 1996
2. Robert V. Hogg, Joseph W. McKean & Allen T. Craig *Introduction to Mathematical Statistics* (7th edition), Pearson Education. 2013
3. Irwin Miller & Marylees Miller (2014). *John E. Freund's Mathematical Statistics with Applications* (8th edition). Pearson. Dorling Kindersley Pvt. Ltd. India.
4. Jim Pitman (1993). *Probability*, Springer-Verlag.
5. Sheldon M. Ross (2014). *Introduction to Probability Models* (11th edition). Elsevier.
6. A. M. Yaglom and I. M. Yaglom (1983). *Probability and Information*. D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi.

19

7. M. Ray and Sar Swarup Sharma, (1988); *Mathematical Statistics*, 8th edition Ram Prasad and Sons Agra

Other Resources:

1. Suggested Equivalent **online courses:** Web link NPTEL/ SWAYAM/ MOOCs
2. https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

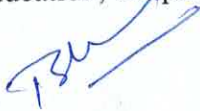










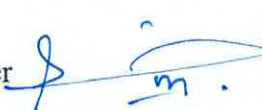
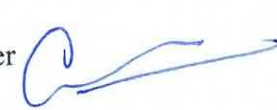


Maximum Marks:

50 Marks

TS

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Mathematics) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

- | | | |
|--|---|--|
| 1. Dr. Premlata Verma
Asst. Prof.
Govt. Bilasa Girls PG College, Bilaspur | - | Chairman  |
| 2. Prof. R.R. Sahu
Asst. Prof.
Govt. MMR PG College, Champa | - | Member  |
| 3. Mr. Yetendra Upadhyay
Asst. Prof.
Govt. N.K. College, Kota | - | Member  |
| 4. Ram Lakhani Pandey
Asst. Prof.
Dr. B.R. Ambedkar Govt. College, Baloda | - | Member  |
| 5. Dr. Arun Kumar Mishra
Professor
Govt. DT PG College, Utai | - | Member  |
| 6. Dr. Shabnam Khan
Professor
Govt. Digvijay PG College, Rajnandgaon | - | Member  |
| 7. Dr. Padmavati
Professor
Govt. VYT PG Auto. College, Durg | - | Member  |
| 8. Dr. Anjali Chandravanshi
Asst. Prof.
Govt. J.Y. Chhattisgarh College, Raipur | - | Member  |
| 9. Manisha Gupta
Asst. Prof.
GNA Govt. PG College, Bhatapara, Raipur | - | Member  |
| 10. Mrs. Sangeeta Pandey
Asst. Prof.
R.G. Govt. PG College, Ambikapur | - | Member  |
| 11. Dr. S.K. Bohre
Asst. Prof.
I.G. Govt. PG College, Vaishalinagar, Bhilai | - | Member  |
| 12. Dr. Samir Dashputre
Asst. Prof.
Govt. College, Arjunda, Balod | - | Member  |
| 13. Dr. Chandrajeet Singh Rathore
Asst. Prof.
Govt. Jajwalyadev Naveen Girls PG College, Janjgir | - | Member  |
| 14. Dr. Shri Nath Gupta
K. Govt. Arts & Science College, Raigarh | - | Member  |
| 15. Dr. Raghu Nandan Patel
Asst. Prof.
Govt. MLS College, Seepat | - | Member  |