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Class: B.Sc. III Year	Subject: Mathematics	Session: 2023-2024
Course Title	Numerical Methods and Scientific Computation	
Course Code	S3-MATH 1T	
Course Type	Discipline Specific Elective (DSE) (Group- A, Paper - I)	
Course Learning Outcomes (CLO) -	The course will enable the students: 1. Understand numerical methods to find the solution of a system of linear equations. 2. Compute interpolation value for real data. 3. Find quadrature by using various numerical methods. 4. Solve system of linear equations by using various numerical techniques. 5. Obtain solutions of ordinary differential equations by using numerical methods.	
Credit Value	6	
Total Marks	Max. Marks: 30 + 70	

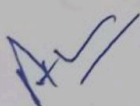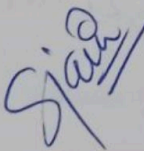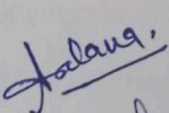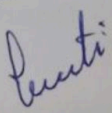| Topics	No. of Lectures
Methods for solving Algebraic and Transcendental Equations: 1.1 Ramanujan 1.2 Bisection 1.3 Regula Falsi 1.4 Secant 1.5 Newton-Raphson	18

Interpolation and Numerical Integration:
 2.1 Lagrange Interpolation
 2.2 Finite difference operators
 2.3 Interpolation formula using Differences
     2.3.1 Gregory-Newton Forward Difference Interpolation
     2.3.2 Gregory-Newton Backward Difference Interpolation
 2.4 Numerical Integration
     2.4.1 Newton-Cote's formulae
     2.4.2 Trapezoidal rule
     2.4.3 Simpson's 1/3 Rule
     2.4.4 Simpson's 3/8 Rule
     2.4.5 Gauss Integration
	24

Methods to Solve System of Linear Equations:
 3.1 Direct method for solving system of linear equations
     3.1.1 Gauss elimination
     3.1.2 LU decomposition
	24

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3.1.3 Cholesky decomposition 3.2 Iterative method 3.2.1 Jacobi 3.2.2 Gauss-Seidel	

Numerical Solution of Ordinary Differential Equations:
 	
4.1 Single step methods
    4.1.1 Picard
    4.1.2 Taylor's series
    4.1.3 Euler
    4.1.4 Runge-Kutta
4.2 Multistep methods
    4.2.1 Predictor-corrector
    4.2.2 Modified Euler
    4.2.3 Milne-Simpson
	24

Text Books:

1. S. S. Sastry: Introductory Methods of Numerical Analysis, Prentice Hall India Learning Private Limited, Fifth edition, 2012.
2. E. Balagurusamy: Numerical Methods, Tata McGraw Hill Publication, 2017
3. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके

Reference Books:

1. M.K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International(P) Ltd.,1999
2. Saxena H. C.: Finite Differences & Numerical Analysis, S Chand, 2010

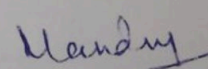| Assessment and Evaluation	
Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **30 Marks** External Exam: **70 Marks**	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	**Total Marks: 30**
External Assessment:	**Total Marks: 70**

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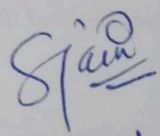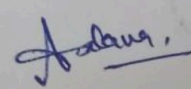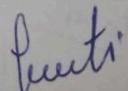Head
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Class: B.Sc. III Year	Subject: Mathematics	
Course Title	Elements of Discrete Mathematics	Session 2023-2024
Course Type	Discipline Specific Elective (DSE) (Group- A, Paper - II)	
Course Code	S3-MATH 2T	
Course Learning Outcomes (CLO) -	The course will enable the students: 6. Apply the Boolean algebra, Switching circuits and their applications. 7. Minimizing the Boolean Function using Karnaugh Map. 8. Understand the lattices and their types. 9. Graphs, their types and its application in study of shortest path algorithms. 10. Test whether two given graphs are isomorphic. 11. Understand the Eulerian and Hamiltonian graphs. 12. Represent graphs using adjacency and incidence matrices.	
Credit Value	6	
Total Marks	Max. Marks: 30 + 70	

Unit	Topics	No. of Lectures
1	1.1 Indian Logic 1.1.1 Origins 1.1.2 The schools Vaisheshika 1.1.3 Catuskoti 1.1.4 Nyaya 1.1.5 Jain Logic 1.1.6 Buddhist Logic 1.1.7 Navya-Nyaya 1.1.8 Influence of Indian Logic on Modern Logic 1.1.9 Boolean Logic and Indian Thoughts 1.2 Relations 1.2.1 Binary, Inverse, Composite and Equivalence relation 1.2.2 Equivalence classes and its properties 1.2.3 Partition of a set 1.2.4 Partial order relation 1.2.5 Partially ordered and totally ordered sets 1.2.6 Hasse diagram 1.3 Lattices 1.3.1 Definition and examples	18

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	1.3.2 Dual, bounded, distributive and complemented lattices		24

II	2.1 Boolean Algebra
	  2.1.1 Definition and properties
	  2.1.2 Switching circuits and its applications
	  2.1.3 Logic gates and circuits
	2.2 Boolean functions
	  2.2.1 Disjunctive and conjunctive normal forms
	  2.2.2 Bool's expansion theorem
	2.3 Minimize the Boolean function using Karnaugh Map
			24

III	Graphs: 3.1 Definition and types of graphs 3.2 Subgraphs 3.3 Walk, path and circuit 3.4 Connected and disconnected graph 3.5 Euler graph 3.6 Hamiltonian path and circuit 3.7 Dijkstra's Algorithm for shortest paths in weighted graph		24

IV	Tree:
	4.1 Trees and properties
	4.2 Rooted, Binary and Spanning tree
	4.3 Rank and nullity of a graph
	4.4 Kruskal's and Prim's Algorithm
	4.5 Cut- set and Its Properties
	4.6 Fundamental Circuits and Cut- set
	4.7 Planar graphs
	4.8 Kuratowski's two graph
	4.9 Matrix representation of graph
	  4.9.1 Incidence
	  4.9.2 Adjacency
	  4.9.3 Circuit
	  4.9.3 Cut – Set
	  4.9.4 Path		

	Text Books
	  1. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill Education, 1st Edition 2017
	  2. Satinder Bal Gupta, C. P. Gandhi: Discrete Structures, Laxmi Publication, 2010
	  3. C. L. Liu: Elements of Discrete Mathematics, McGraw Hill Education, 4th Edition 2017		

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4. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science, Prentice Hall India Learning Private Limited, 1997.
5. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके

Reference Books:

1. Seymour Lipschutz and Mark Lipson: Discrete Mathematics (Schaums Outline), McGraw Hill Education, 3rd Edition 2017
2. Edgar G. Goodaire and Michael M. Parmenter. Discrete Mathematics with Graph
3. Theory, Pearson Education Pt. Ltd., Indian Reprint 2003

Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks: 100	
Continuous Comprehensive Evaluation (CCE): **30 Marks**	
External Exam: **70 Marks**	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	**Total Marks: 30**
External Assessment:	**Total Marks: 70**

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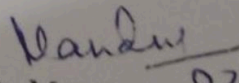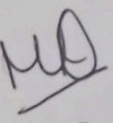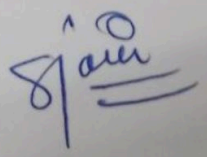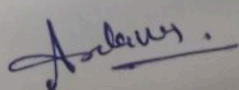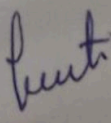
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B.Sc. III Year	Subject: Mathematics	Session 2023-2024
Course Code	S3- MATH3D	
Course Title	Probability and Statistics	
Course Type	Discipline Specific Elective (DSE) (Group-B, Paper-I)	
Pre-requisite (if any)	To study this course, a student must have had the subject Mathematics in Diploma Course or equivalent	
Course Learning Outcomes (CLO)	This course will enable the students to: 1. Describe and calculate the mean deviation, standard deviation, range, quartiles and percentiles 2. Understand and use the terminology of probability 3. Determine whether two events are mutually exclusive and independent. 4. Calculated probabilities using the addition and multiplication rule 5. Recognize and understand discrete and continuous probability distribution functions, binomial. Uniform and exponential probability distribution 6. Calculate and interpret the correlation coefficient 7. Understand the basic concepts of linear regression and correlation. Interpret the Student's t probability distribution, chi-square goodness-of-fit, F and Z test.	
Credit Value	6	
Total Marks	Max. Marks: 30 + 70	

Unit		Topics	No. of Lectures
I	1.1	Indian Contribution in Statistics:	24
	1.1.1	P. C. Mahalanobis	
	1.1.2	C. Radhakrishna Rao	
	1.1.3	Samanta Chandra Sekhar Harichandan	
	1.1.4	J. K. Ghose	
	1.1.5	P. Maiti	
	1.2	Theory of Probability	
	1.2.1	Event and Sample space	
	1.2.2	Probability of an event	
	1.2.3	Addition and Multiplication theorem of probability	
	1.2.4	Inverse probability	
	1.2.5	Baye's theorem	

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	1.2.6 Continuous probability 1.2.7 Probability density function and its applications 1.2.8 Standard deviation of various continuous probability distributions 1.2.9 Mathematical expectation 1.2.10 Expectation of sum and product of random variables	24

II	Dispersion and Distribution:
	2.1 Measures of dispersion
	  2.1.1 Range and interquartile range
	  2.1.2 Mean deviation and Standard deviation
	  2.1.3 Moments Skewness and Kurtosis
	2.2 Moment generating function
	2.3 Theoretical distribution with their properties and uses
	  2.3.1 Binomial
	  2.3.2 Poisson
	  2.3.3 Rectangular
	  2.3.4 Exponential
		18

III	Curve fitting and Correlation: 3.1 Methods of least square 3.2 Curve fitting 3.3 Correlation and regression 3.4 Partial and multiple correlations (up to three variables only)	24
IV	Sampling: 4.1 Sampling of large samples 4.2 Null and alternative hypothesis 4.3 Errors of first and second kinds 4.4 Level of significance and critical region 4.5 Tests of significance based on chi-square (χ^2), t. F and Z distribution.	

Text Books:

1 H. C. Saxena and J. N. Kapoor: Mathematics Statistics, S, Chand and Company. 2010.

2   E. Rukmangadachari: Probability and Statistics, Pearson Education India: First edition, 2012

3   M. Ray, Har Swarup Sharma, S. S. Chaudhary: Mathematics Statistics, Ram Prasad publication, 2022

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Reference Books:

1 Vijay K Rohatgi, A. K. Md. Ehlance Saleh: An Introduction to Probability and Statistics, Wiley: 3rd edition, 2015

2 S. C. Gupta and V. K. Kapoor: Fundamentals of Mathematics Statistics, Sultan Chand & Sons, 2014

Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE): **30 Marks**

External Exam: **70 Marks**

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B.Sc. III Year		
Course Code	**Subject: Mathematics**	**Session 2023-2024**
Course Title	S3-MATH4D	
Course Type	**Integral Transform**	
Pre-requisite (if any)	**Discipline Specific Elective (DSE) (Group-B, Paper-II)**	
	To study this course, a students must have had the subject Mathematics in Diploma Course or equivalent.	
Course Learning Outcomes (CLO)	The course will enable the students: 1. Understanding about Laplace transform and its properties. 2. Solve ordinary differential equations using Laplace transform. 3. Familiarize with Fourier transform of functions. Relation between Laplace and Fourier transform. 4. Explain Parseval's identity and applications of Fourier transform to boundary value problems. 5. Apply the concept of the course in real life problems.	
Credit Value	6	
Total Marks	Max. Marks: 30 + 70	

Unit	Topics	No. of Lectures
I	Laplace Transform: 1.1 Linearity property 1.2 Existence theorem 1.3 Shifting theorem 1.4 Change of scale property 1.5 Laplace transform of derivatives and integrals 1.6 Differentiation and integration of the Laplace transforms 1.7 Multiplication and division by 't' 1.8 Periodic function	25
II	Inverse Laplace Transform: 2.1 Linearity property 2.2 Shifting theorem 2.3 Change of scale property 2.4 Inverse Laplace transforms of derivatives and integrals 2.5 Multiplication and division by powers of p 2.6 Convolution theorem	25

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	2.7 Heaviside expansion theorem		15
III	Application of Laplace Transform: 3.1 Solution of ordinary differential equation with constant coefficients 3.2 Solution of ordinary differential equation with variable coefficients		25
IV	Fourier Transform: 4.1 Linearity property 4.2 Shifting theorem 4.3 Change of scale property 4.4 Modulation 4.5 Convolution theorem 4.6 Fourier transform of derivatives 4.7 Relations between Fourier transform and Laplace transform 4.8 Parseval's identity for Fourier transform 4.9 Solution of differential equation using Fourier transform		

Text Books:

1. Lokenath Debnath, Dambaru Bhatta: Integral Transforms and Their Applications, Chapman and Hall/ CRC; 3rd Edition 2014
2. Sreenadh S. Ranganatham S. Prasad M. V. S. S. N. & Babu, Ramesh V.; Fourier Series and Integral Transforms. S. Chand Publishing, 2014
3. A. N. Srivastava: Integral Transforms and Fourier Series. Narosa Publications, 2012.

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Reference Books:

1. I. N. Sneddon: The use of integral transform. McGraw Hill, 1972.
2. Murray R. Spiegel. Laplace transform, Schaum's Series, McGraw Hill Education, 1st Edition 1965.

Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks: 100	
Continuous Comprehensive Evaluation (CCE): **30 Marks**	
External Exam: **70 Marks**	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	**Total Marks: 30**
External Assessment:	**Total Marks: 70**

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B.Sc. III Year	Subject: Mathematics	Session 2023-2024
Course Code	S3- MATH2T	
Course Title	Fundamentals of Boolean Algebra	
Course Type	Minor/Elective	
Credit Value	6	
Total Marks	Max. Marks: 30 + 70	
Course Objective	Know how to apply the knowledge they have gained to solve real problems. And realize that there are multiple solutions to a given problem and these solutions will have a real impact on people's lives and know how to apply tools and ideas from mathematics and theoretical computer science to structure and solve complex problems.	
Course Learning Outcomes (CLO)	The course will enable the students 1 Using the Boolean algebra in logical Problems. 2 Minimize the Boolean Function using Karnaugh Map. 3 Understanding the various logic gates. 4 Applying the circuits in logical problems.	
Credit Value	6	
Total Marks	Max. Marks: 30 + 70	

Part B - Content of Course

Unit	Topics	No. of Lectures
I	1.1 Indian logic 1.1.1 Origins 1.1.2 The School Vaisheshika 1.1.3 Catuskoti 1.1.4 Nyaya 1.1.5 Join Logic 1.1.6 Buddhist Logic 1.1.7 Navya-Nyaya 1.1.8 Influence Logic and Indian Thought 1.1.9 Boolean Logic and Indian Thoughts 1.2 Boolean Algebra: 1.2.1 Truth Table 1.2.2 Properties of Boolean Algebra	24

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	1.2.3 Principle of Duality		
	1.2.4 De Morgan's Theorem		
II	2.1 Boolean Expression		24
	2.2 Boolean Function		
	2.3 Min-term or Minimal Boolean Function		
	2.4 Disjunctive Normal Form or Canonical Form		
	2.5 Complete Disjunctive Normal Form or Complete Canonical Form		
	2.6 Boole's Expansion Theorem		
	2.7 Complete Function of Boolean Function in Disjunctive Normal Form		
	2.8 Max-term or Maximal Boolean Function		
	2.9 Conjunctive Normal Form or Dual Canonical Form		
	2.10 Complete Conjunctive Normal Form		
	2.11 Complement Function of a Boolean Function in Conjunctive Normal Form		
	2.12 SOP & POS Forms		
	2.13 Minimize the Boolean function using Karnaugh-Map upto 3 variables		
III	3.1 AND Gate		18
	3.2 OR Gate		
	3.3 NOT Gate		
	3.4 NAND Gate		
	3.5 NOR Gate		
	3.6 NOR Gate		
	3.7 XNOR Gate		
	3.8 Buffer Gate		
	3.9 Universal Gate		
	3.10 Application of Logic Gates		
IV	Circuits		24
	4.1 Switching Circuits		
	4.2 Parallel Circuits		
	4.3 Series Circuits		
	4.4 Relay Circuits		
	4.5 Various Positions of Switching and Currents in Electric Circuits		
	4.6 Simple Arithmetic and Logic Circuits		
	4.7 Combinational Circuits		
	4.7.1 Adder		
	4.7.2 Subtractor		
	4.8 Simple Combinational Circuit Design Problems		

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Text Books:

1. J. p. Trembley and R. Manohar, Discrete Mathematics Structures with Application To Computer Science, McGraw Hill Education, 1st Edition 2017.
2. C. L. Liu: Elements of Discrete Mathematics, Hill Education, 4th Edition 2017

Reference Books:

1. Seymour Lipschutz and Mark Lipson: Discrete Mathematics (Schaums Outline), McGraw Hill Education, 1st Edition 2017.
2. Edger G. Goodaire and Michael M. Parmenter. Discrete Mathematics with Graph Theory, Pearson Education Pt. Ltd., Indian Reprint 2003

Assessment and Evaluation	
Suggested Continuous Evaluation Methods:	
Maximum Marks: 100	
Continuous Comprehensive Evaluation (CCE): 30 Marks	
External Exam: 70 Marks	
Internal Assessment:	Total Marks: 30
Continuous Comprehensive Evaluation (CCE)	
External Assessment:	Total Marks: 70

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