1.2.1 Percentage of new courses introduced of the total number of courses across all programs offered during the last five years.

Programme Attached to the New Education Policy (NEP) Scheme, Department of Higher Education, Madhya Pradesh

Elective Courses

Programme Name: BCA I Semester

S.No.	Course Code	Course Name	Page No.
01	S1-BCAC 1 G	Computational Mathematics	02 - 03
02	S1-BCAC 2 G	Discrete Mathematics in BCA	04 - 06
03	S1-BCAD 1 G	Numerical Methods	07 - 08
04	S1-BCAD 2 G	Probability & Statistics	09 - 11

Registrar
Rani Durgavati Vishwavidyalaya
Jabalpur

PART A: Introduction			
Program: **Certificate**	Class: **BCA**	Year: **I Year**	Session: **2021-22**

1.	Course Code	S1-BCAC1G	
2.	Course Title	**Computational Mathematics**	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational	**Elective**	
4.	Pre-Requisite (if any)	Students must have basic analytical aptitude.	
5.	Course Learning Outcomes (CLO)	**On successful completion of the course the students shall be able to:** 1. Implement trigonometric solutions for measurements in real world scenarios 2. Implement matrices and simultaneous equations to solve complex problems 3. Use statistical tools efficiently 4. Use Mathematical Logic and predicate calculus for solving problems 5. Apply the concepts of set theory for finding solutions to set related problems	
6.	Credit Value	**Theory - 6 Credits**	
7.	Total Marks	Max. Marks: **25+75**	**Min. Passing Marks: 33**

PART B: Content of the Course

No. of Lectures (in hours per week): **3 lectures Per week**

Total No. of Lectures: **90 Hrs.**

Unit	Topics	No. of Lectures
I	**Trigonometry:** Angles & their Measurement, Values of Trigonometric Ratios, Height and Distances. **Elementary Matrices** and types of matrices.	18
II	**Equations:** Simultaneous linear equations, Methods of Solving Simultaneous equations, Quadratic equations.	18
III	**Statistics:** Frequency Distribution, Measure of Central Tendency: Mean, Mode, Median, Measures of variation: Mean deviation Standard Deviation,	18
IV	**Mathematical Logic:** Statements and notations, Connectives: Negation, Conjunction, And Disjunction. Statement formulas and truth tables. Tautologies, Tautological implications, contradiction contingency	18
V	**Set Theory:** Basic concepts of set theory, notation, inclusion and equality of sets, the power set, types of sets, operations on set, Venn diagrams.	18

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Text Books:

1. Business Mathematics S.M.SHUKLA, Sahitya Bhawan Publications.
2. Business Mathematics D C Agrawal, Sree Sai Prakashan.
3. S. K. Sarkar: A Text Book of Discrete Mathematics, S Chand, 2005.
4. A text book of Discrete Mathematics,9/E ,Sarkar S.K, S.Chand New Delhi,2016
5. मध्य प्रदेश हिन्दी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें।

Reference Books:

1. Fundamental of Statistics ELHANCE & ELHANCE,Kitab Mahal Publication.
2. Mathematical Statistics,8/E RAY and .SHARMA,Ram Prasad and Sons.
3. Business Mathematics, J,K Singh, Himalaya Publishing House 2017
4. Business Mathematics, 9/E, Sancheti and Kapoor , Sultan Chand & Sons ,2014
5. Discrete Mathematics structures with application to computer science", Indian Edition, J. P. Tremblay, R Manohar, McGraw Hill Education 2017
6. "Discrete Mathematical",2/E, J.K Sharma, Macmillan publication, 2005

Suggestive digital platform web links

https://freevideolectures.com/university/iit-roorkee/
https://www.highereducation.mp.gov.in/?page=xhzIQmpZwkylQo2b%2Fy5G7w%3D%3D
https://epathshala.ncert.org.in/

Suggested equivalent online courses

S.No.	Course Title	Duration	Provider
1	Algebra and Trigonometry	15 weeks	Swayam
2	Mathematics	8 weeks	Mitopen Courseware

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.

PART D: Assessment and Evaluation

Internal Assessment : Continuous Comprehensive Evaluation (CCE) : **25 Marks** Shall be based on allotted assignments and Class Tests. The marks shall be as follows:		**External Assessment**: University Exam (UE) :**75 Marks** Time :**02.00 Hours**	
Assessment and presentation of assignment	4 Marks	Section (A) : Three Very Short Questions (50 Words Each) OR Nine MCQ Questions	03 x 03 = 09 Marks **OR** 09 x 01 = **9 Marks**
Class Test I (**Objective Questions**)	5 Marks		
Class Test II (**Descriptive Questions**)	8 Marks	Section (B) : Four Short Questions (200 Words Each)	04 x 09 = 36 Marks
Class Test III (**Objective and Descriptive Questions**)	8 Marks	Section (C): Two Long Questions (500 Words Each)	02 x 15 = 30 Marks
Total	**25 Marks**	Total	**75 Marks**

Any remarks/suggestions:

Part A Introduction				
Program: Certificate Course		**Class:**BCAI Year	**Year:** 2021	**Session:** 2021-2022
1	Course Code	S1-BCAC2G		
2	Course Title	Discrete Mathematics		
3	Course Type	Elective		
4	Pre-requisite (if any)	Open for All		
5	Course Learning Outcomes (CLO)	The course will enable the students: 1.Apply the Boolean algebra, switching circuits and their applications. 2. Minimize the Boolean Function using Karnaugh Map. 3. Understand the lattices and their types. 4. Graphs, their types and its applications in study of shortest path algorithms. 5. Test whether two given graphs are isomorphic. 6. Understand the Eulerian and Hamiltonian graphs. 7. Represent graphs using adjacency and incidence matrices. 8. Understand the discrete numeric functions, generating functions and Recurrence Relations.		
6	Credit Value	**Theory:**6Credit		
7	Total Marks	Max. Marks: 25 + 75	Min. Passing Marks: 33	

Part B - Content of the Course		
Total No. of Lectures (in hours per week): 3 hours per week **Total Lectures:** 90 hours		
Unit	Topics	No. of Lectures
I	**Relations:** Binary, Inverse, Composite and Equivalence relation, Equivalence classes and its properties, Partition of a set, Partial order relation, Partially ordered and Totally ordered sets, Hasse diagram. **Lattices:** Definition and examples, Dual, bounded, distributive and complemented lattices.	18
II	**Boolean Algebra:**Definition and properties, Switching circuits and its applications, Logic gates and circuits. **Boolean functions:** Disjunctive and conjunctive normal forms, Bool's expansion theorem, Minimize the Boolean function using Karnaugh Map.	18
III	**Graphs:**Definition and types of graphs, Subgraphs, Walk, path and circuit, Connected and disconnected graphs, Euler graph, Hamiltonian path and circuit, Dijkstra's Algorithm for shortest paths in weighted graph.	18

IV	**Trees:** Definition and its properties, Rooted, Binary and Spanning tree Rank and nullity of agraph, Kruskal's and Prim's Algorithm, Cut-set and its properties, Fundamental Circuit and Cut-Set, Planar graphs. **Matrix representation of graphs:** Incidence, Adjacency, Circuit, Cut-Set, Path.	18
V	**Discrete numeric and generating functions:** Operations on numeric functions, Asymptotic behavior of numeric functions, Generating functions. **Recurrence relations and recursive algorithms:**Recurrence relations, Linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Solution by the method of generating functions.	18

Keywords/Tags:
Relation, Hasse diagram, Lattices, Boolean Algebra, Boolean function, Graph and Subgraph, Path and circuit, Tree, Spanning tree, Cut-set, Matrix representation of graph, Discrete numeric function, Generating function, Recurrence relation, Recursive algorithm.

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

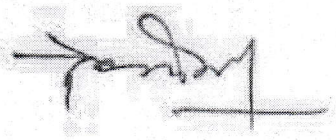
1. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures With Applications To Computer Science, McGraw Hill Education, 1st edition, 2017.
2. C. L. Liu: Elements of Discrete Mathematics, McGraw Hill Education, 4th edition, 2017.
3. Narsingh Deo: Graph Theory with Applications to Engineering and Computer Science, Prentice Hall India Learning Private Limited, 1979.
4. मध्य प्रदेश हिन्दी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें।

Reference Books:

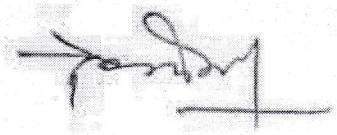
1. Seymour Lipschutz and Mark Lipson: Discrete Mathematics (Schaums Outline), McGraw Hill Education, 3rd edition, 2017.
2. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, Pearson Education Pt.Ltd., Indian Reprint 2003.

Suggested Digital Platforms Web links:
https://www.highereducation.mp.gov.in/?page=xhzIQmpZwkylQo2b%2Fy5G7w%3D%3D

Suggested Equivalent online courses:
https://nptel.ac.in/courses/111106086/
https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/311



Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **25**Marks University Exam (UE): **75**Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	15 10 **Total Marks: 25**
External Assessment: University Exam (UE) Time: 02.00 Hours	Section (A): Three Very Short Questions (50 Words Each) Section (B): Four Short Questions (200 Words Each) Section (C): Two Long Questions (500 Words Each)	03 × 03 = 09 04 × 09 = 36 02 × 15 = 30 **Total Marks: 75**

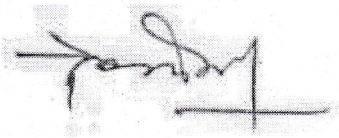


Part A Introduction				
Program: Certificate Course		**Class:** BCA I Year	**Year:** 2021	**Session:** 2021-2022
1	Course Code	S1-BCAD1G		
2	Course Title	Numerical Methods		
3	Course Type	Elective		
4	Pre-requisite (if any)	Open for All		
5	Course Learning Outcomes (CLO)	The course will enable the students to: 1. Understand numerical methods to find the solution of a system of linear equations. 2. Compute interpolation value for real data. 3. Findquadrature 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.		
6	Credit Value	**Theory:** 6Credit		
7	Total Marks	Max. Marks: 25 + 75	Min. Passing Marks: 33	

Part B - Content of the Course		
Total No. of Lectures (in hours per week): 3 hours per week **Total Lectures:** 90 hours		
Unit	Topics	No. of Lectures
I	**Methods for Solving Algebraic and Transcendental Equations**: Bisection Method, RegulaFalsi Method, Secant Method, Newton-Raphson Method, Ramanujan Method.	18
II	**Interpolation:** Lagrange interpolation, Finite difference operators, Interpolation formula using Differences, Gregory-Newton Forward Difference Interpolation, Gregory-Newton Backward Difference Interpolation.	18
III	**Numerical Integration:** Newton- Cote's formulae, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Gauss Integration.	12
IV	**Methods to Solve System of Linear Equations:** Direct method for solving system of linear equations: Gauss elimination, LU decomposition, Cholesky decomposition. Iterative method:Jacobi, Gauss-Seidel.	21
V	**Numerical Solution of Ordinary Differential Equations:** Single step methods: Picard, Taylor's series, Euler, Runge-Kutta. Multistep methods: Predictor-corrector, Modified Euler, Milne-Simpson.	21
Keywords/Tags: Algebraic and transcendental equations, Interpolation, Numerical Integration, Gauss elimination method, LU decomposition, Jacobi method, Gauss-Seidel method, Picard method, Runge-Kutta method, Predictor-corrector method, Milne-Simpson method.		
Remark: Scientific calculator will be allowed during examination.		

Part C - Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: **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. मध्य प्रदेश हिन्दी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें। **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. **Suggested Digital Platforms Web links:** https://epgp.inflibnet.ac.in https://www.highereducation.mp.gov.in/?page=xhzIQmpZwkylQo2b%2Fy5G7w%3D%3D **Suggested Equivalent online courses:** https://nptel.ac.in/courses/111106101/ https://nptel.ac.in/courses/111107105/ https://nptel.ac.in/courses/111107107/ https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_pg/1476

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **25**Marks University Exam (UE): **75**Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	15 10 **Total Marks: 25**
External Assessment: University Exam (UE) Time: 02.00 Hours	Section (A): Three Very Short Questions (50 Words Each) Section (B): Four Short Questions (200 Words Each) Section (C): Two Long Questions (500 Words Each)	03 × 03 = 09 04 × 09 = 36 02 × 15 = 30 **Total Marks: 75**



Part A Introduction				
Program: Certificate Course		**Class:** BCA I Year	**Year:** 2021	**Session:** 2021-2022
1	Course Code	S1-BCAD2G		
2	Course Title	Probability and Statistics		
3	Course Type	Elective		
4	Pre-requisite (if any)	Open for All		
5	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. Calculate probabilities using the addition and multiplication rules. 5. Recognize and understand discrete and continuous probability distribution functions, binomial, uniform and exponential probability distribution. 6. Calculate and interpret the correlation coefficient. 7. Understandthe basic concepts of linear regression and correlation. 8. Interpret the Student's t probability distribution, chi-square goodness-of-fit, F and Z test.		
6	Credit Value	Theory: 6Credit		
7	Total Marks	Max. Marks: 25 + 75	Min. Passing Marks:	

Part B - Content of the Course		
Total No. of Lectures (in hours per week): 3 hours per week **Total Lectures:** 90 hours		
Unit	Topics	No. of Lectures
I	**Theory of Probability - I:** Event and Sample space, Probability of an event, Addition and multiplication theorem of probability, Inverse probability, Baye's theorem. Continuous probability.	18
II	**Theory of Probability - II:** Probability density function and its applications, Standard deviation of various continuous probability distributions, Mathematical expectation, Expectation of sum and product of random variables.	18
III	**Dispersion and Distribution:** Measures of dispersion: Range and interquartile range, Mean deviation and Standard deviation, Moments, Skewness and kurtosis. Moment generating function. Theoretical distribution: Binomial, Poisson, Rectangular, Exponential.	18

IV	**Curve fitting and Correlation:** Methods of least squares, Curve fitting, Correlation and regression, Partial and multiple correlations (up to three variables only)	18
V	**Sampling:** Sampling of large samples, Null and alternative hypothesis, Errors of first and second kinds, Level of significance and critical region, Tests of significance based on chi-square (χ^2), t, F and Z distribution.	18

Keywords/Tags:
Probability, Dispersion, Moment generating function, Theoretical distribution, Curve fitting, Correlation, Regression, Sampling.

Remark:
Scientific calculator will be allowed during examination.

Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

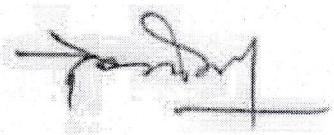
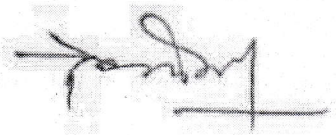
1. H. C. Saxena and J. N. Kapoor: Mathematical Statistics, S. Chand and Company, 2010.
2. E. Rukmangadachari: Probability and Statistics, Pearson Education India; First edition, 2012.
3. मध्य प्रदेश हिन्दी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें ।

Reference Books:

1. Vijay K. Rohatgi, A. K. Md. EhsanesSaleh: An Introduction to Probability and Statistics, Wiley; 3rd edition, 2015.
2. S. C. Gupta and V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2014.

Suggested Digital Platforms Web links:
https://www.highereducation.mp.gov.in/?page=xhzIQmpZwkylQo2b%2Fy5G7w%3D%3D

Suggested Equivalent online courses:
https://nptel.ac.in/courses/111106112/
https://nptel.ac.in/courses/111105090/
https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/313
https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/327



Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: **100** Continuous Comprehensive Evaluation (CCE): **25**Marks University Exam (UE): **75**Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	15 10 **Total Marks: 25**
External Assessment: University Exam (UE) Time: 02.00 Hours	Section (A): Three Very Short Questions (50 Words Each) Section (B): Four Short Questions (200 Words Each) Section (C): Two Long Questions (500 Words Each)	03 × 03 = 09 04 × 09 = 36 02 × 15 = 30 **Total Marks: 75**