Program : Certificate	Class : BCA I Year	Year : 2021	Session : 2021-2022

1	**Course Code**	**NBCAE(Y-101)**	
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: • Implement trigonometric solutions for measurements in real world scenarios. • Implement matrices and simultaneous equations to solve complex problems. • Use statistical tools efficiently. • Use mathematical logic and predicate calculus for solving problems. • 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. 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
1	**Trigonometry:**Angles& their measurement, values of trigonometric Ratio height and distances, Elementary matrices and types of matrices.	18
2	**Equations:** Simultaneous linear equations, methods of solving simultaneous equations, quadratic equations.	18
3	**Statistics:**Frequency distribution, measure of central tendency: Mean, Mode, Median. **Measure of Variation:** Mean deviation Standard Deviation.	18
4	**Mathematical Logic:**Statements and notations, connectives: Negation, conjunction, and disjunction, statement formulas and truth tables. Tautologies, Tautological implications, contradiction contingency.	18
5	**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

Text Books, Reference Books, Other resources

Text Books:

- Business Mathematics S.M. Shukla, SahityaBhawan Publications.
- Business Mathematics D C Agrawal, Sreesaiprakshan.

- S.K. Sarkar: A Text book of discrete mathematics, S Chand, 2005.
- A Text Book of Discrete Mathematics, 9/E, Sarkar S.K. Chand New Delhi, 2016
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:

- Fundamental of Statistics ELHANCE & ELHANCE, KitabMahal Publication.
- Mathematical Statistics, 8/E Ray and Sharma, Ram Prasad & Songs.
- Business Mathematics, J.K. Singh, Himalaya Publishing House, 2017.
- Business Mathematics, 9/E, Sancheti&Kapoor, Sultan Chand & Songs, 2014.
- Discrete Mathematics structures with application to computer sciences", Indian Ediion, J.P. Tremblay, R Manohar, McGraw Hill Education 2017.
- "Discrete Mathematical", 2/E, J.K. Sharma, Macmillan Publication, 2005.

Suggested digital platform web links:

https://freevideolectures.com/university/iit-roorkee/
https://highereducation.mp.gov.in/?page=xhzlQmpZwky1Qb%2Fy5G7w%3D%3D
https://epathshala.nceart.org.in/

Suggested equivalent online courses:

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

Part D- Assessment and Evaluation

Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25 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) Nine MCQ Questions	03 x 03 = 09 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
Class Test III **(Based on OS commands)**	**8 Marks**	**Section (C):** Two Long Questions (500 Words Each)	02 x 15 = 30
Total	**25 Marks**	**Total**	75 Marks
Any remarks / suggestions:			

Part A Introduction

Program : Certificate	Class : BCA I Year	Year : 2021	Session : 2021-2022

1	**Course Code**	**NBCAE(Y-102)**	
2	**Course Title**	Discrete Mathematics	
3	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Elective	
4	**Pre-Requisite (if any)**	Open for all	
5	**Course Learning outcomes (CLO)**	The Course will enable the students: • Apply the Boolean algebra, switching circuits and their applications. • Minimize the Boolean function using Karnaugh Map. • Understand the lattices and their types. • Graphs, their types and its applications in study shortest path algorithms. • Test whether two Eulerian and Hamiltonian Graphs. • Understand Eulerian and Hamiltonian graphs. • Represent graphs using discrete numeric functions, generating functions and recurrence relations.	
6	**Credit Value**	**Theory – 6 Credits**	
7	**Total Marks**	Max. Marks : 25+75	Min. 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
1	**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**
2	**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**
3	**Graphs:**definition and types of graphs, sub graphs, Walk, path and circuit, connected and disconnected graphs, Euler graph,	**18**

	Hamiltonian path and circuit, Dijkstra's Algorithm for shortest paths in weighted graph.	
4	**Trees:**Definition and its properties, Rooted. Binary and spanning tree Rank and Nullity of graph, 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**
5	**Discrete numeric and generating functions:**Operations on numeric functions, asymptotic behavior of numeric functions, generating function. **Recurrence relations and recursive algorithms:** Recurrence relations, Linear recurrence relations with constant coefficients, Homogeneous solution, 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

Text Books:

- J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer science, McGraw Hill Education, 1st edition, 2017.
- C. L. Liu: Elements of Discrete mathematics, McGraw Hill Education, 4th edition 2017.
- NarsinghDeo: Graph Theory with Applications to Engineering and computer science, Prentice Hall India Learning Private Limited, 1979.
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:

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

Suggested digital platform web links:
https://highereducation.mp.gov.in/?page=xhzlQmpZwky1Qb%2Fy5G7w%3D%3D

Suggested equivalent online courses:
http://nptel.ac.in/course/111106086/
https://ugemoocs.inflibnet.ac.in/idndex.php/course/view_ug/311

Part D- Assessment and Evaluation

Suggest continuous evaluation methods:

Maximum Marks:	100
Continuous Comprehensive Evaluation (CCE)	25 Marks
University Exam (UE)	75 Marks

Internal Assessment:	Class Test	**15**
Continuous	Assignment	**10**
ComprehensiveEvaluation	/Presentation	**Total marks: 25**

(CCE)			
External Assessment: University Exam (UE) Time: 02.00 Hours	**4 Marks**	**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 x 03 = 09 04 x 09 = 36 02 x 15 = 30 Total Marks:75

Part A Introduction			
Program : Certificate	Class : BCA I Year	Year : 2021	Session : 2021-2022

1	**Course Code**	NBCAE(Y-103)	
2	**Course Title**	Numerical Methods	
3	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Elective	
4	**Pre-Requisite (if any)**	Open for all	
5	**Course Learning outcomes (CLO)**	The Course will enable the students: • Understand numerical methods to find the solution of a system of linear equations • Compute interpolation value for real data. • Find quadrature by using various numerical methods. • Solve system of linear equations by using various numerical techniques. • Obtain solutions of ordinary differential equations by using numerical methods.	
6	**Credit Value**	**Theory – 6 Credits**	
7	**Total Marks**	Max. Marks : 25+75	Min. 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
1	**Methods for solving Algebraic and transcendental Equations:**Bisection method, RegulaFalsi method, secant method, Newton-Raphson method, Ramanujan Method.	18
2	**Interpolation:** Lagrange interpolation, finite difference operators, Interpolation formula using difference, Gregory-Newton forward difference Interpolation, Gregory-Newton Backward difference interpolations.	18
3	**Numerical Integration:** Newton- Cote's formulae, Trapezoidal rule, Simpson's 1/3 rules, Simpson's 3/8 rule, Gauss integration.	12
4	**Methods of solve system of Linear equations:** Direct method for solving system of linear equations: Gauss elimination, LU decomposition, Cholesky decomposition. Iterative	21

	method: Jacobi, Gauss-Seidel.	
5	**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 methods.

Remark: Scientific calculator will be allowed during examination.

Part C- Learning Resources

Text Books, Reference Books, Other resources

Text Books:

- S.S. Sastry: Introductory Methods of Numerical Analysis, Prentice Hall India Learning Private Limited, Fifth Edition, 2012.
- E. Balagurusamy:: Numerical Methods, Tata McGraw hill Publication, 2017.
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:

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

Suggested digital platform web links:
https://epgp.inflibnet.ac.in
https://highereducation.mp.gov.in/?page=xhzlQmpZwky1Qb%2Fy5G7w%3D%3D

Suggested equivalent online courses:
http://nptel.ac.in/course/111106101/
http://nptel.ac.in/course/111106105/
http://nptel.ac.in/course/111106107/
https://ugemoocs.inflibnet.ac.in/idndex.php/course/view_pg/1476

Part D- Assessment and Evaluation

Suggest continuous evaluation methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE) 25 Marks
University Exam (UE) 75 Marks

Internal Assessment: Continuous ComprehensiveEvaluation (CCE)	Class Test Assignment /Presentation	**15** **10** **Total marks: 25**

External Assessment: University Exam (UE) Time: 02.00 Hours	**4 Marks**	**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 x 03 = 09 04 x 09 = 36 02 x 15 = 30 **Total Marks:75**

Part A Introduction			
Program : Certificate	Class : BCA I Year	Year : 2021	Session : 2021-2022

1	**Course Code**	NBCAE(Y-104)	
2	**Course Title**	Probability and Statistics	
3	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Elective	
4	**Pre-Requisite (if any)**	Open for all	
5	**Course Learning outcomes (CLO)**	The Course will enable the students: • Describe and calculate the mean deviation, standard deviation, range, quartiles and percentiles. • Understand and use the terminology of probability. • Determine whether two events are mutually exclusive and independent. • Calculate probabilities using the addition and multiplication rules. • Recognize and understand discrete and continuous probability distribution function, binomial, uniform and exponential probability distribution. • Calculate and interpret the correlation coefficient. • Understand basic concepts of linear regression and correlation. • Interpret the student's T probability distribution, chi-square goodness-of-fit, F and Z test.	
6	**Credit Value**	**Theory – 6 Credits**	
7	**Total Marks**	Max. Marks : 25+75	Min. 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
1	**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
2	**Theory of Probability - II:** Probability density function and its applications, standard deviation	18

	of various continuous probability distributions, mathematical expectation, Expectation of sum and product of random variables.	
3	**Dispersion and Distribution:** Measure 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**
4	**Curve fitting and correlation:** Methods of least squares, Curve fitting, Correlation and regression, Partial and multiple correlations (Up to three variables only)	**18**
5	**Sampling:** Sampling of large samples, Null and alternative hypothesis, Errors of first and second kinds, Level of significance and ciritical region, Tests of significance based on chi-squareχ^2. T, F and Z distribution.	**21**

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

Text Books:

- H.C. Saxena and J.N. Kapoor: Mathematical Statistics, S. Chand and Company, 2010.
- E, Rukmangadachari: Probability and statistics, Pearson Education India: First edition, 2012.
- मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें

Reference Books:

- Vijay K. Rohatgi, A.K. Md. EhsanesSaleh: An Introduction to probability and statistics, Wiley: 3rd edition, 2015.
- S. C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statstics, Sultan Chand & sons, 2014.

Suggested digital platform web links:
https://highereducation.mp.gov.in/?page=xhzlQmpZwky1Qb%2Fy5G7w%3D%3D

Suggested equivalent online courses:
http://nptel.ac.in/course/111106112/
http://nptel.ac.in/course/111105090/
https://ugemoocs.inflibnet.ac.in/idndex.php/course/view_ug/313
https://ugemoocs.inflibnet.ac.in/idndex.php/course/view_ug/327

Part D- Assessment and Evaluation

Suggest continuous evaluation methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE) 25 Marks

University Exam (UE)	75 Marks		
Internal Assessment: Continuous ComprehensiveEvaluation (CCE)	Class Test Assignment /Presentation	**15** **10** **Total marks: 25**	
External Assessment: University Exam (UE) Time: 02.00 Hours	**4 Marks**	**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 x 03 = 09 04 x 09 = 36 02 x 15 = 30 **Total Marks:75**