

ALLIED MATHEMATICS

Course Structure and Syllabus

(For the candidates admitted from the academic year 2023 - 2024 onwards)

CHOICE BASED CREDIT SYSTEM (CBCS)



THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Nationally Re-Accredited by NAAC with B⁺⁺)

(Affiliated to Bharathidasan University, Tiruchirappalli)

ELAMBALUR, PERAMBALUR – 621 220



Question Paper Pattern

| Mathematics Programme | | |
|-------------------------------|--|--------------------------|
| Maximum Marks : 75 | | Duration: 3 Hours |
| Part – A | 20 Multiple Choice Questions | 20 x 1 = 20 Marks |
| Part – B Paragraph | 5 Questions (Internal Choice) One set of questions from each unit | 5 x 5 = 25 Marks |
| Part – C Essay Type | 3 Questions (Answer any 3 out of 5 Questions) One question from each unit | 3 x10 = 30 Marks |
| Total | | 75 Marks |

MODEL QUESTION PAPER:

BSC/ BCA SEMESTER EXAMINATIONS

Time: 3 Hours Maximum Marks - 75

SECTION – A

Answer **ALL** of the Following

(20 x 1 = 20 Marks)

SECTION – B

Answer **ALL** of the Following

(5 x 5 = 25 Marks)

SECTION – C

Answer any **THREE** of the Following

(3 x 10 = 30 Marks)

BCA

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - I - NUMERICAL METHODS

Course Code: **23UMA1AC1**

Instruction Hours: 4

Credits: 3

Exam Hours: 3

Internal Marks: 25

External Marks: 75

OBJECTIVES:

- To apply the numerical problem in efficiency with various methods.
- To acquire the knowledge of problem solving ability.
- To gain the knowledge about the numerical problems.
- To obtain approximate solutions to mathematical problems.
- To Derive numerical methods for various mathematical operations and tasks

Course Outcomes:

On completion of the course, the student will be able to

CLO 1: Compute the Solution of Algebraic and Transcendental equation using Bisection, Method of false position and Newton- Raphson Method.

CLO 2: Find the solution of linear system of equation by Gaussian Elimination, Gauss Jacobi, and Gauss Seidel Methods

CLO 3: Solve Interpolation of Finite differences – Newton’s Forward, Central and Backward differences

CLO 4: Obtain the Numerical differentiation and integration.

CLO 5: Derive and compute the solution of Taylor series, Picard’s and Euler method and Runge–Kutta Methods

UNIT – I

Algebraic & Transcendental Equations: Finding a root of the given equation (Derivation of the formula not needed) using Bisection Method, Iteration Method, Method of False Position, Newton Raphson Method.

UNIT – II

Solutions to Linear Systems: Introduction- Gaussian Elimination Method- Gauss-Jordan Elimination Method- Iterative Methods-Gauss-Jacobi Method- Gauss Siedal Method of Iteration.

UNIT – III

Finite Differences: First Difference- Forward and Backward differences – Newton’s Forward & Backward difference interpolation formula – Divided differences and their properties – Lagrange’s Interpolation Formula. (Proof not needed).

UNIT – IV

Numerical Differentiation and Integration: Introduction – Newton’s Forward and Backward Differences to compute derivatives -Numerical Integration using Trapezoidal rule & Simpson’s one-third and three-eight rule.

UNIT – V

Numerical Solution of ODE: Solution by Taylor Series Method – Euler Method – Runge - Kutta 2nd and 4th order Methods.

TEXT BOOK:

1. Dr.P.Kandasamy, Dr.K.Thilagavty, Dr.K.Gunavathi, Numerical Methods, S.Chand& co., 2010

UNIT – I Chapter – 3 Sections 3.1 to 3.4

UNIT – II Chapter – 4 Sections 4.1, 4.2, 4.2.1, 4.7 to 4.9.

UNIT – III Chapter – 5 Sections 5.1, 5.2.

| | | |
|----------|-----------------|---|
| | Chapter – 6 & 8 | Sections 6.2, 6.3 & 8.2, 8.3, 8.7 |
| UNIT –IV | Chapter – 9 | Sections 9.1 to 9.3, 9.9, 9.13, 9.14. |
| UNIT – V | Chapter – 11 | Sections 11.5, 11.8 to 11.13, 11.16 to 11.18. |

REFERENCE(S):

1. S. Narayanan & Others, Numerical Analysis, S. Viswanathan Publishers, 1994.
2. A.Singaravelu, Numerical Methods, Meenachi Agency, June 2000.
3. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt.Limited, 4th Edition, 2009.

WEB LINK:

1. <https://www.youtube.com/watch?v=4cqDPHxWs9g>
2. <https://www.youtube.com/watch?v=82IDoaiYU0c>
3. <https://www.youtube.com/watch?v=nmlwSQJmX2M>

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|--------------------------|---------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| I | 23UMA1AC1 | NUMERICAL METHODS | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO3 | | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | |
| CO4 | | ✓ | | ✓ | | | ✓ | ✓ | | | |
| CO5 | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Number of Matches (✓) = 36 | | | | | | Relationship: HIGH | | | | | |

| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
|--------------|-----------|--------|----------|--------|-----------|
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

BCA

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE – I - STATISTICAL METHODS – I

Course Code: 23UMA1AC2

Exam Hours: 3

Instruction Hours:

Internal Marks: 25

Credits:

External Marks: 75

OBJECTIVES:

- To plan the collected data in terms of experimental designs and statistical surveys
- To develop the basic concepts of statistics.
- To apply the knowledge and ideas of statistical datas.
- To analyzing the data and drawing conclusions from it.
- To assessing the strengths of the conclusions and evaluating their uncertainty.

COURSE OUTCOMES:

CLO 1: Calculate Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean.

CLO 2: Illustrate the dispersion.

CLO 3: Discuss axiomatic approach towards probability and Prove addition and multiplication theorems.

CLO 4: Define and illustrate the random variable and distribution function and Discuss and illustrate the properties of Probability mass function, Probability density function.

CLO 5: Discuss and illustrate the Mathematical Expectation for addition and Multiplication theorem.

UNIT – I

Statistical data: Introduction–Formation of frequency distribution - Graphic representation of a frequency distribution -Various measures of Central Tendency – Mean – Median – Mode - Geometric mean - Harmonic mean (simple problems only).

UNIT – II

Measures of dispersion: Range - Quartile deviation- Mean deviation -Standard deviation – Coefficient of dispersion (simple problems only).

UNIT – III

Probability: Definitions of various terms –Mathematical Probability –Axiomatic Probability - Random Event – Addition and Multiplication Laws of Probability – Conditional Probability - Independent events.

UNIT – IV

Random Variables: Distribution functions – Discrete random variable – Continuous random variable – Joint Probability mass function– Joint Probability distribution function – Marginal distribution function – Joint density function – Conditional distribution function.

UNIT – V

Mathematical Expectation: Addition and Multiplication theorem - Covariance Expectation -variance of linear combination of random variables – Moment generating function – Characteristic function – Probability generating function– Simple Problems.

TEXT BOOK:

1. Gupta S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics – Sultan Chand & Sons, 2011.

| | | |
|------------|-----------------|---------------------------------------|
| UNIT – I | Chapter – 2 | Sections 2.1 to 2.9 |
| UNIT – II | Chapter – 2 | Sections 2.13, 2.14, 2.16 |
| UNIT – III | Chapter – 3 | Sections 3.3, 3.4, 3.8.5 to 3.12 |
| UNIT – IV | Chapter – 5 | Sections 5.1 to 5.5.5 |
| UNIT – V | Chapter – 6 & 7 | Sections 6.2 to 6.6.1 & 7.1, 7.3, 7.9 |

REFERENCE(S):

1. Kandasamy, P.,K.Thilagavathi and K. Gunavathi, Probability, Statistics and Queueing theory – (2007) S.Chand and Co., New Delhi.
2. Vittal.P.R. Mathematical Statistics – 2004 – Maragatham Publishers.

Web Link:

1. <https://www.pdfdrive.com/mathematicsprobability-and-statisticsapplied-mathematics-e16657497.html>
2. <https://www.pdfdrive.com/mathematical-statistics-e18751543.html>

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|-------------------------|-------------------------|-----|-----|-----|-----------------------------------|-------|---------|------|------|--|
| I | 23UMA1AC2 | STATISTICAL METHODS - I | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes(POs) | | | | | Programme Specific Outcomes(PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| CO3 | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| CO4 | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Number of Matches (✓) = 37 | | | | | | Relationship: HIGH | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

BCA

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - I - DISCRETE MATHEMATICS

Course Code: 23UMA1AC3

Instruction Hours: 4

Credits: 3

Exam Hours: 3

Internal Marks: 25

External Marks: 75

OBJECTIVES:

- To Use mathematically correct terminology and notation
- To enrich the knowledge in the field of functions.
- To study the concepts of Boolean algebra and the normal forms.
- To Apply logical reasoning to solve a variety of problems
- To Construct correct direct and indirect proofs.

COURSE OUTCOMES:

On completion of the course, the student will be able to

CLO 1: Understand the concepts of mathematical logics such as connections, concept of tautology, etc.,

CLO 2: Gains knowledge in disjunctive and conjunctive normal forms.

CLO 3: Study the concepts of predicate calculus, Relations and ordering.

CLO 4: Learn about partially ordered the set, lattices and their types.

CLO 5: Understand Boolean algebra and Boolean functions.

UNIT – I

Statement and notation: Connectives – Negative – Conjunctive – Disjunctive – Statement Formulae and Truth tables – Conditional and Bi conditional statements.

UNIT – II

Statement and notation(Continued): Well defined formulae – Tautologies.

Normal forms: Disjunctive Normal forms – Conjunctive Normal forms.

UNIT – III

Relations and Ordering: Relations – Properties of Binary relations in a set – Relation matrix and the graph of a relation – Equivalence relation – Composition of a binary relation.

UNIT – IV

Lattice as partially ordered set: Some properties of lattices – Lattices as algebraic systems – Sub lattice - Direct product and homomorphism – Some special lattices.

UNIT – V

Boolean Algebra: Definition and Example – Sub algebra - Direct Product and Homomorphism - **Boolean functions:** Boolean forms and free Boolean algebras – Values of Boolean expressions and Boolean functions.

TEXT BOOK:

1. J.P. Tremblay and R. Manohar, Discrete mathematical Structures with Applications to Computer Science, Tata McGraw Hill, Thirty-ninth reprint, 2011.

| | | |
|------------|-------------|--|
| UNIT – I | Chapter – 1 | Sections 1.1, 1.2 to 1.2.4, 1.2.6 |
| UNIT – II | Chapter – 1 | Sections 1.2.7 & 1.2.8, 1.3.1 & 1.3.2. |
| UNIT – III | Chapter – 2 | Sections 2.3.1 to 2.3.3, 2.3.5 & 2.3.7 |
| UNIT – IV | Chapter – 4 | Section 4.1 |
| UNIT –V | Chapter – 4 | Sections 4.2 & 4.3 |

REFERENCE(S):

1. Rakesh Dube, Adesh Pandey and Ritu Gupta, Discrete Structures and Automata Theory, Narosa Publishing House, 2000.
2. John E. Hopcroft, Jeffery D. Ullman, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, New Delhi, 1995.

Web Link:

1. <https://www.pdfdrive.com/mathematical-structures-for-computer-science-discrete-mathematics-and-its-applications-e158202395.html>
2. <https://www.pdfdrive.com/introduction-to-automata-theory-languages-and-computations-e184570093.html>

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|---------------------------|-------------------------|----------------------|-----|-----|-------------------------------|-----------------------------------|-------|---------|------|------|--|
| I | 23UMA1AC3 | DISCRETE MATHEMATICS | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes(POs) | | | | | Programme Specific Outcomes(PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO2 | | ✓ | | ✓ | | | | | ✓ | ✓ | |
| CO3 | | | | | ✓ | | ✓ | ✓ | | | |
| CO4 | ✓ | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Number of Matches(✓) = 32 | | | | | Relationship: MODERATE | | | | | | |

| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
|--------------|-----------|--------|----------|--------|-----------|
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

BCA

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - II - OPERATIONS RESEARCH

Course Code: 23UMA2AC2

Exam Hours: 3

Instruction Hours: 4

Internal Marks: 25

Credits: 3

External Marks: 75

OBJECTIVES:

- To study the methods used to solve assignment problems and transportation problems.
- To train the students in network problems.
- To achieve the best performance under the given circumstances.
- To apply the scientific method to the conditions under which the research is conducted.
- To provide a more detailed and insightful analysis to decision-makers

COURSE OUTCOMES:

CLO 1: Recognize and relate LPP and solving LPP using graphical method.

CLO 2: Compute Simplex Algorithm, Two Phase Method and Big-M Method of LPP.

CLO 3: Explain Transportation problem and Evaluate its initial basic feasible solution.

CLO 4: Discuss and solve assignment problem using Hungarian algorithm.

CLO 5: Describe and Construct Network and compute PERT and CPM.

UNIT – I

Linear Programming Problem: Introduction - Graphical Solution Method – General Linear Programming Problem - Canonical and Standard forms of LPP.

UNIT – II

Linear Programming Problem (Continued): Introduction - Simplex Method for $<$, $=$, $>$ constraints – Big-M Method.

UNIT – III

Transportation Problem: Introduction – LP formulation of the Transportation Problem – Finding an Initial Basic Feasible Solution - Transportation Algorithm (Modi Method) – Unbalanced Transportation Problem.

UNIT – IV

Assignment Algorithm: Introduction- Mathematical Formulation of the Problem – Solution Methods of Assignment Problem – Special Cases in Assignment Problems – Travelling salesman Problem.

UNIT – V

Networks: Introduction – Network (Basic Components) – Logical Sequencing – Rules of Networking Construction – Concurrent Activities - CPM computation- PERT computation.

TEXT BOOK:

1. KantiSwarup, P.K.Gupta and Man Mohan, Operations Research, Sultan Chand & Co.Ltd.2012

| | | |
|------------|--------------|--|
| UNIT – I | Chapter – 3 | Sections 3.1 to 3.5 |
| UNIT – II | Chapter – 4 | Sections 4.1, 4.3 & 4.4 |
| UNIT – III | Chapter – 10 | Sections 10.1, 10.2, 10.9 to 10.13 & 10.15 |
| UNIT – IV | Chapter – 11 | Sections 11.1 to 11.4 & 11.7 |
| UNIT – V | Chapter – 25 | Sections 25.1 to 25.7. |

REFERENCE(S):

1. PremKumar, Gupta and D.S. Hira, "Operations Research", An Introduction, S. Chand and Co., Ltd. New Delhi,
2. Hamdy.A.Taha, "Operations Research", Seventh Edition, McMillan Publishing Company, New Delhi, 1982.

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|--------------------------|---------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| II | 22UMA2AC2 | OPERATIONS RESEARCH | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | |
| CO2 | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| CO3 | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| CO4 | | ✓ | | | ✓ | | ✓ | ✓ | | ✓ | |
| CO5 | ✓ | ✓ | | ✓ | ✓ | | ✓ | | | ✓ | |
| Number of Matches (✓) = 32 | | | | | | Relationship: MODERATE | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

BCA

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE II – STATISTICAL METHODS - II

Course Code: 23UMA2AC3

Instruction Hours: 4

Credits: 2

Exam Hours: 3

Internal Marks: 25

External Marks: 75

OBJECTIVES:

- To assist the students to gain the proficiency in Mathematical statistics.
- To deduce statistical inference of a data through sampling techniques.
- To apply the knowledge and ideas of statistical datas.
- To analyzing the data and drawing conclusions from it.
- To assessing the strengths of the conclusions and evaluating their uncertainty

COURSE OUTCOMES:

On completion of the course, the student will be able to

CLO 1: Understand the concept of Correlation.

CLO 2: To Gain the Knowledge of Regression.

CLO 3: To be able to deduce statistical inference of a data through sampling techniques
Understand Student's t-test of Difference of means.

CLO 4: Student learns how to Test of significance for large samples.

CLO 5: Understand Chi-Square variate and independence of attributes.

UNIT – I

Correlation: Introduction – Meaning – Scatter Diagram – Karl Pearson's coefficient of correlation – Rank correlation.

UNIT – II

Regression: Introduction – Linear regression – curvilinear regression – regression curves.

UNIT –III

Test of significance for Small samples: Parameter and statistics – Statistical hypothesis - Students t - test and its properties– independent and paired t - tests – simple problems – Snedcer's F- test and its properties – Simple problems.

UNIT – IV

Test of significance for large samples: One tailed and two tailed tests – Significance difference between one and two proportion based tests - Significance difference between one and two mean based tests – Simple problems.

UNIT –V

Chi-Square distribution: Properties – Uses – Goodness of fit – Conditions for the validity – Independence of attributes.

TEXT BOOK(S):

1. S. C. Gupta, V. K. Kapoor, Fundamentals of Mathematical Statistics, Edition:2011, Sultan Chand & Sons publications, New Delhi.
2. T. Veerarajan, Probability, Statistics and Random processes, 3rd Edition: 2012, Tata McGraw Hill Education Private Limited, New Delhi.

| | | |
|------------|--------------|------------------------------------|
| UNIT – I | Chapter – 10 | Sections 10.1 to 10.4, 10.7 of [1] |
| UNIT – II | Chapter – 11 | Sections 11.1 to 11.4 of [1] |
| UNIT – III | Chapter – 8 | Page no. 419 to 421, 447 to 463[2] |
| UNIT – IV | Chapter – 8 | Page no. 422 to 441[2] |
| UNIT – V | Chapter – 8 | Page no. 466 to 481 [2] |

REFERENCES:

1. S.P. Gupta, Statistical Methods, Revised Edition, 2001.
2. R.S.N. Pillai and Bagavathi, Practical statistics, Second Edition, 2013.

Web Link:

1. https://books.google.co.in/books?id=FmuH3IcYIRYC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=true
2. <https://www.pdfdrive.com/statistics-601-advanced-statistical-methods-e387419.html>

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|-------------------------|--------------------------|-----|-----|-----|-----------------------------------|-------|---------|------|------|--|
| II | 22UMA2AC3 | STATISTICAL METHODS – II | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes(POs) | | | | | Programme Specific Outcomes(PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | |
| CO3 | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| CO4 | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Number of Matches (✓) = 36 | | | | | | Relationship: HIGH | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

BCA

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - II - GRAPH THEORY AND APPLICATIONS

Course Code: 23UMA2AC4

Exam Hours: 3

Instruction Hours: 4

Internal Marks: 25

Credits: 3

External Marks: 75

OBJECTIVES:

- To introduce the basic concepts of Graph theory.
- To apply the Graph Theory in other disciplines.
- To improve the proof writing skills.
- To create algorithms for finding the shortest path between two points.
- For instance, much of computer science operates through the usage of graph algorithms and data structures.

COURSE LEARNING OUTCOME:

Students will be able to

CLO 1: Describe the origin of graph theory.

CLO 2: Understand Eulerian and Hamiltonian graphs.

CLO 3: Study about Bipartite graphs.

CLO 4: Demonstrate Matrix Representation of graphs.

CLO 5: Derive some properties on Planar and dual graphs.

UNIT – I

Basics: Graphs – Pictorial representation – Subgroups – Isomorphism and degrees – Walks and connected graphs – Cycles in graphs – Cut-vertices and cut-edges.

UNIT – II

Eulerian and Hamiltonian Graphs: Eulerian graphs – Fleury's algorithm – Hamiltonian graphs – weighted graphs.

UNIT – III

Bipartite Graphs and Matrices: Bipartite graphs – Marriage problem – Trees – Connector problem

UNIT – IV

Matrices and Vector Spaces Associated with Graphs: Matrix representations – Vector spaces associated with graphs – Cycle space – cut-set space.

UNIT – V

Planar Graphs: Planar Graphs – Euler formula – Platonic solids – Dual of a plane graph – Characterization of planar graphs.

TEXT BOOK:

1. Choudum.S.A. – A First Course in Graph Theory, Macmillan India Limited, 2000.

| | | |
|------------|-------------|---------------------|
| UNIT – I | Chapter – 1 | Sections 1.1 to 1.7 |
| UNIT – II | Chapter – 2 | Sections 2.1 to 2.4 |
| UNIT – III | Chapter – 3 | Sections 3.1 to 3.4 |
| UNIT – IV | Chapter – 4 | Sections 4.1 to 4.4 |
| UNIT – V | Chapter – 5 | Sections 5.1 to 5.5 |

REFERENCE(S):

1. Murugan.M – Introduction to Graph Theory, Muthali Publishing House, Chennai, 2005.
2. Arumugam.S and S. Ramachandran, - Invitation to Graph Theory, Scitech publications India Pvt. Limited, Chennai – [2001, Edition].

Web link:

1. <https://www.maths.ed.ac.uk/~v1ranick/papers/wilsongraph.pdf>
2. [https://www.gacwrmd.in/learning/Maths/GRAPH%20THEORY%20\(7BMAE1A\).pdf](https://www.gacwrmd.in/learning/Maths/GRAPH%20THEORY%20(7BMAE1A).pdf)

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|-------------------------|-------------------------------|-----|-----|-----|-----------------------------------|-------|---------|------|------|--|
| II | 22UMA2AC4 | GRAPH THEORY AND APPLICATIONS | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes(POs) | | | | | Programme Specific Outcomes(PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | |
| CO3 | ✓ | | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| CO5 | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Number of Matches (✓) = 36 | | | | | | Relationship: HIGH | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

Computer Science & Information Technology
(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - I - NUMERICAL METHODS

Course Code: **23UMA1AC1**

Instruction Hours: 4

Credits: 3

Exam Hours: 3

Internal Marks: 25

External Marks: 75

OBJECTIVES:

- To apply the numerical problem in efficiency with various methods.
- To Derive numerical methods for various mathematical operations and tasks

COURSE OUTCOMES:

On completion of the course, the student will be able to

CLO 1: Compute the Solution of Algebraic and Transcendental equation using Bisection, Method of false position and Newton- Raphson Method.

CLO 2: Find the solution of linear system of equation by Gaussian Elimination, Gauss Jacobi, and Gauss Seidel Methods

CLO 3: Solve Interpolation of Finite differences – Newton’s Forward, Central and Backward differences

CLO 4: Obtain the Numerical differentiation and integration.

CLO 5: Derive and compute the solution of Taylor series, Picard’s and Euler method and Runge–Kutta Methods

UNIT – I

Algebraic & Transcendental Equations: Finding a root of the given equation (Derivation of the formula not needed) using Bisection Method, Iteration Method, Method of False Position, Newton Raphson Method.

UNIT – II

Solutions to Linear Systems: Introduction- Gaussian Elimination Method- Gauss-Jordan Elimination Method- Iterative Methods-Gauss-Jacobi Method- Gauss Siedal Method of Iteration.

UNIT – III

Finite Differences: First Difference- Forward and Backward differences – Newton’s Forward & Backward difference interpolation formula – Divided differences and their properties – Lagrange’s Interpolation Formula. (Proof not needed).

UNIT – IV

Numerical Differentiation and Integration: Introduction – Newton’s Forward and Backward Differences to compute derivatives -Numerical Integration using Trapezoidal rule & Simpson’s one-third and three-eighth rule.

UNIT – V

Numerical Solution of ODE: Solution by Taylor Series Method – Euler Method – Runge - Kutta 2nd and 4th order Methods.

TEXT BOOK:

1. Dr.P.Kandasamy, Dr.K.Thilagavty, Dr.K.Gunavathi, Numerical Methods, S.Chand& co., 2010

| | | |
|------------|-----------------|---|
| UNIT – I | Chapter – 3 | Sections 3.1 to 3.4 |
| UNIT – II | Chapter – 4 | Sections 4.1, 4.2, 4.2.1, 4.7 to 4.9. |
| UNIT – III | Chapter – 5 | Sections 5.1, 5.2. |
| | Chapter – 6 & 8 | Sections 6.2, 6.3 & 8.2, 8.3, 8.7 |
| UNIT –IV | Chapter – 9 | Sections 9.1 to 9.3, 9.9, 9.13, 9.14. |
| UNIT – V | Chapter – 11 | Sections 11.5, 11.8 to 11.13, 11.16 to 11.18. |

REFERENCE(S):

1. S. Narayanan & Others, Numerical Analysis, S. Viswanathan Publishers, 1994.
2. A.Singaravelu, Numerical Methods, Meenachi Agency, June 2000.
3. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt.Limited, 4th Edition, 2009.

WEB LINK:

1. <https://www.youtube.com/watch?v=4cqdpHxWs9g>
2. <https://www.youtube.com/watch?v=82lDoaiYU0c>
3. <https://www.youtube.com/watch?v=nmlwSQJmX2M>

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|--------------------------|---------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| I | 23UMA1AC1 | NUMERICAL METHODS | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO3 | | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | |
| CO4 | | ✓ | | ✓ | | | ✓ | ✓ | | | |
| CO5 | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Number of Matches (✓) = 36 | | | | | | Relationship: HIGH | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

Computer Science & Information Technology
(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - II - OPERATIONS RESEARCH

Course Code: 23UMA2AC2

Exam Hours: 3

Instruction Hours: 4

Internal Marks: 25

Credits: 3

External Marks: 75

OBJECTIVES:

- To study the methods used to solve assignment problems and transportation problems.
- To train the students in network problems

COURSE OUTCOMES

CLO 1: Recognize and relate LPP and solving LPP using graphical method.

CLO 2: Compute Simplex Algorithm, Two Phase Method and Big-M Method of LPP.

CLO 3: Explain Transportation problem and Evaluate its initial basic feasible solution.

CLO 4: Discuss and solve assignment problem using Hungarian algorithm.

CLO 5: Describe and Construct Network and compute PERT and CPM.

UNIT – I

Linear Programming Problem: Introduction - Graphical Solution Method – General Linear Programming Problem - Canonical and Standard forms of LPP.

UNIT – II

Linear Programming Problem (Continued): Introduction - Simplex Method for $<$, $=$, $>$ constraints – Big-M Method.

UNIT – III

Transportation Problem: Introduction – LP formulation of the Transportation Problem – Finding an Initial Basic Feasible Solution - Transportation Algorithm (Modi Method) – Unbalanced Transportation Problem.

UNIT – IV

Assignment Algorithm: Introduction- Mathematical Formulation of the Problem – Solution Methods of Assignment Problem – Special Cases in Assignment Problems – Travelling salesman Problem.

UNIT – V

Networks: Introduction – Network (Basic Components) – Logical Sequencing – Rules of Networking Construction – Concurrent Activities - CPM computation- PERT computation.

TEXT BOOK:

1. KantiSwarup, P.K.Gupta and Man Mohan, Operations Research, Sultan Chand & Co.Ltd.2012

UNIT – I Chapter – 3 Sections 3.1 to 3.5

UNIT – II Chapter – 4 Sections 4.1, 4.3 & 4.4

UNIT – III Chapter – 10 Sections 10.1, 10.2, 10.9 to 10.13 &10.15

UNIT – IV Chapter – 11 Sections 11.1 to 11.4 & 11.7

UNIT – V Chapter – 25 Sections 25.1 to 25.7.

REFERENCE(S):

1. PremKumar, Gupta and D.S. Hira, “Operations Research”, An Introduction, S. Chand and Co., Ltd. New Delhi,
2. Hamdy.A.Taha, “Operations Research”, Seventh Edition, McMillan Publishing Company, New Delhi, 1982.

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|--------------------------|---------------------|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| II | 23UMA2AC2 | OPERATIONS RESEARCH | | | | | 5 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | |
| CO2 | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| CO3 | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| CO4 | | ✓ | | | ✓ | | ✓ | ✓ | | ✓ | |
| CO5 | ✓ | ✓ | | ✓ | ✓ | | ✓ | | | ✓ | |
| Number of Matches (✓) = 32 | | | | | | Relationship: MODERATE | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

B.Sc., PHYSICS

(For the candidates admitted from the academic year 2023 - 2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - I – ALGEBRA AND CALCULUS

Course Code: 23UMA1AC11

Instruction Hours: 5

Credits: 3

Exam Hours: 3

Internal Marks: 25

External Marks: 75

OBJECTIVES:

- To train the students to solve the problems in Theory of Equations.
- To learn the basic concepts in the integration.

COURSE OUTCOMES

CLO 1: Apply domain knowledge for Relation between the coefficients and the roots of an algebraic equation with illustrate the examples.

CLO 2: Determine the concepts of Eigen values and Eigen vectors.

CLO 3: To find maxima and minima, critical points and inflection points of functions.

CLO 4: To gain the Knowledge of various types of Integration.

CLO 3: Discuss and demonstrate the Linear Equations with constant coefficients, Complementary function and Particular integrals.

UNIT – I

Theory of Equations: Relation between roots & coefficients – Transformations of Equations – Diminishing, Increasing & Multiplying the roots by a constant- Rolle's Theorem, Descarte's rule of Signs (statement only) – Simple problems.

UNIT – II

Matrices: Singular matrices – Inverse of a non-singular matrix using adjoint method - Rank of a Matrix – Consistency – Characteristic equation, Eigen values, Eigen vectors – Cayley Hamilton's Theorem (proof not needed) – Simple applications only

UNIT – III

Differentiation: Maxima & Minima – Concavity, Convexity – Points of inflexion - Partial differentiation – Euler's Theorem - Total differential coefficients (proof not needed) – Simple problems only.

UNIT –IV

Integration: Evaluation of integrals of types 1. $\int \frac{px+q}{ax^2+bx+c} dx$ 2. $\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx$ 3. $\int \frac{dx}{a+bsinx}$
4. $\int \frac{dx}{a+b\cos x}$ – Evaluation using Integration by parts.

UNIT – V

Differential Equations: Variables Separables – Linear equations – Second order of types $(aD^2 + bD + c)y = F(x)$ where a,b,c are constants and F(x) is one of the following types (i) e^{Kx} (ii) $\sin(kx)$ or $\cos(kx)$ (iii) x^n , n being an integer.

TEXT BOOK(S):

1. T.K. Manickavasagam Pillai & Others, Algebra, Vol I, S.V Publications, 2004
2. T.K. Manickavasagam Pillai & Others, Algebra, Vol II, S.V Publications, Pvt. Ltd 2011.
3. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. I, S.ViswanathanPvt Limited, 2010.
4. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. II, S. ViswanathanPvt Limited, 2011.
5. S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. III, S. ViswanathanPvt Limited, 2008

| | | |
|------------|------------------|--|
| UNIT – I | Chapter – 6 | Sections 11, 15, 17, 18, 24, 25 of [1] |
| UNIT – II | Chapter – 2 | Sections 1 to 16 of [2] |
| UNIT – III | Chapters – 5 & 8 | Sections 1, 2 & 1.1 to 1.6 of [3] |
| UNIT – IV | Chapter – 1 | Sections 7,8,9,11 of [4] |
| UNIT – V | Chapter – 1 & 2 | Sections 2.1, 2.4 & 1 to 3 of [5] |

REFERENCE:

1. M.L. Khanna, Differential Calculus, Jaiprakashnath and Co., Meerut-2004.
2. S. RethinaKumar, “Algebra and Calculus”, Sai Publication – 2015.

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|----------------------------|-------------------------|----------------------|-----|-----|---------------------------|-----------------------------------|-------|---------|------|------|--|
| I | 23UMA1AC11 | ALGEBRA AND CALCULUS | | | | | 5 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes(POs) | | | | | Programme Specific Outcomes(PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | |
| CO2 | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO3 | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | | |
| CO4 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO5 | | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Number of Matches (✓) = 36 | | | | | Relationship: HIGH | | | | | | |

| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
|--------------|-----------|--------|----------|--------|-----------|
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |

B.Sc., PHYSICS

(For the candidates admitted from the academic year 2023-2024 onwards)

ALLIED MATHEMATICS

ALLIED COURSE - II - ANALYTICAL GEOMETRY (3D), TRIGONOMETRY AND FOURIER SERIES

Course Code: 23UMA2AC21

Instruction Hours: 4

Credits: 3

Exam Hours: 3

Internal Marks: 25

External Marks: 75

OBJECTIVES:

- To learn the basic needs Trigonometry.
- To learn the basic ideas of Fourier Series.

COURSE OUTCOMES

CLO 1: Describe the equation of a straight line passing through two given points and shortest distance between two skew lines.

CLO 2: Finding centre, radius and length of the tangent plane to a sphere.

CLO 3: Expansion of $\sin nx$, $\cos nx$, $\tan nx$ and powers of sines and cosines in terms of functions of multiples of θ

CLO 4: Define and illustrate the concept of hyperbolic functions.

CLO 5: Find Odd and Even function, Half range Fourier series.

UNIT – I

Equation of a straight line passing through two given points - Condition for a line to be parallel to a plane - Coplanar lines - Shortest distance between two given lines – Simple problems.

UNIT – II

Equation of a sphere - Finding centre and radius - Length of the tangent to a sphere - Plane section of a sphere.

UNIT – III

Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ (n being a positive integer) - Expansion of $\sin^n\theta$, $\cos^n\theta$, $\sin^n\theta\cos^m\theta$ in a series of sines & cosines of multiples of θ (θ - given in radians) .

UNIT – IV

Euler's formula for $e^{i\theta}$ - Definition of Hyperbolic functions –Formulae involving Hyperbolic functions - Relation between Hyperbolic & circular functions – Expansion of $\sin hx$, $\cosh x$, $\tan hx$ in powers of x

UNIT – V

Definition of Fourier series – Finding Fourier Coefficients for a given periodic function with period 2π .

TEXT BOOK(S):

1. T.K.Manickavasagam Pillai, T.Natarajan, "Analytical Geometry (3D)" Part-II, S. Viswanathan (Printers & Publishers, Pvt Limited, 2011).
2. S. Narayanan, T.K. Manichavasagam Pillai, " Trigonometry", S. Viswanathan (Printers & Publishers, Pvt Limited, 2011).
3. S.Narayanan, T.K. Manichavasagam Pillai, "Calculus" Volume – III, S. Viswanathan(Printers & Publishers, Pvt Limited, 2011).

| | | |
|------------|-------------|---------------------------------|
| UNIT – I | Chapter – 3 | Sections 4, 5, 7 & 8 of [1] |
| UNIT – II | Chapter – 4 | Sections 2 to 5 of [1] |
| UNIT – III | Chapter – 3 | Sections 1,2,3,4 of [2] |
| UNIT – IV | Chapter – 4 | Sections 1, 2 (2.1, 2.2) of [2] |
| UNIT – V | Chapter – 6 | Sections 1 to 2 of [3] |

Relationship Matrix for COs, POs and PSOs

| Semester | Code | Title of the Course | | | | | Hours | Credits | | | |
|-----------------------------|--------------------------|---|-----|-----|-----|------------------------------------|-------|---------|------|------|--|
| II | 23UMA2AC21 | ANALYTICAL GEOMETRY (3D), TRIGONOMETRY AND FOURIER SERIES | | | | | 4 | 3 | | | |
| Course Outcomes (COs) | Programme Outcomes (POs) | | | | | Programme Specific Outcomes (PSOs) | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| CO2 | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | |
| CO4 | | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | |
| CO5 | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | |
| Number of Matches (✓) = 35 | | | | | | Relationship: HIGH | | | | | |

| | | | | | |
|---------------------|-----------|--------|----------|--------|-----------|
| Mapping | 1-29% | 30-59% | 60-69% | 70-89% | 90-100% |
| Matches | 1-14 | 15-29 | 30-34 | 35-44 | 45-50 |
| Relationship | Very Poor | Poor | Moderate | High | Very High |