MASTER OF SCIENCES
MATHEMATICS

SYLLABUS & REGULATIONS

WITH EFFECT FROM 2024-2025

M.Sc. MATHEMATICS

P.G. Degree Programme (CBCS) Regulations-2016

Amended as per NEP-2020

(with effect from the batch admitted in the academic year 2024-25)

CHOICE BASED CREDIT SYSTEM (CBCS)

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)

SRI VENKATESWARA UNIVERSITY

Accredited by "NAAC" with A+ Grade

Tirupati, Andhra Pradesh - 517502

S.V.UNIVERSITY COLLEGE OF SCIENCES
DEPARTMENT OF MATHEMATICS

M.Sc.,- MATHEMATICS
(W.E.F. 2024-2025)

Mission of the Mathematics Department:

1. To emerge as a global centre of learning academic excellence and innovative research.
2. To pursue collaborative programs with highly reputed National and International institutions.

Vision of the Mathematics Department:

1. Imparting quality mathematical education and inculcating the spirit of research through innovative teaching and Research methodologies.
2. To achieve high standards of excellence in generating and propagating knowledge in mathematics
3. To provide an environment where students can learn, become competent users of mathematics and understand the use of mathematics in other disciplines.

Program Out Comes (PO) of PG in Mathematics & Applied Mathematics:

Students are expected to know or able to do by the time of graduation. At the end of the programme, the students will be to:

1. Apply Knowledge in Mathematics in all the fields of learning including higher research and its extensions.
2. Utilize Number Theory in the field of Cryptography that helps in hiding information and maintaining secrecy in military information, transmission, computer password and e-commerce.
3. Facilitate the study of groups in crystallography in chemistry and Lie symmetry groups in physics.
4. Ability to think, acquire knowledge and skills through logical reasoning and in culture the habit of self-learning throughout life.
5. Inculcate critical thinking to carry out scientific investigation objectively.
6. Equip the student with skills to analyse problems, formulate the hypothesis, evaluate and draw reasonable conclusions.
7. Imbibe effective, scientific / technical communications in both oral and write.
8. Demonstrate the high standards of ethical issues.
9. Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry.
10. Illustrate solutions using numeric or graphical or programming methods.
11. Investigate and solve unfamiliar math problems and allow to think on unsolved mathematical problems.
12. Able to qualify Lectureship and fellowship exams approved by UGC like CSIR-NET, GATE and SET.

Program Specific Outcomes:

1. To develop problem – solving skills and apply them independently to problems in pure and applied mathematics.
2. To assimilate complex mathematical ideas and argument.
3. To develop abstract mathematical thinking.
4. To improve own learning and performance.

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
SRI VENKATESWARA UNIVERSITY::TIRUPATI
S.V.U.COLLEGE OF SCIENCES
DEPARTMENT OF MATHEMATICS

(Revised Scheme of Instruction and Examination, Syllabus etc., (with effect from the Academic Years 2024-2025)

M.Sc. MATHEMATICS

Semester-I

Sl. no	Components of study	Code	Title of the course	Hrs/ week	No. of Credits	Uni. Exams (Hour	IA	Seme-ster end exam	Total Marks
1.	Core	MA 101	Algebra	6	4	3	20	80	100
2.	Core	MA 102	Real Analysis	6	4	3	20	80	100
3.	Compulsory Foundation	MA 103	Differential Equations & Numerical Methods	6 6	4	3	20	80	100
4.	Elective foundation	MA 104	Complex Analysis and Special Functions	6 6	4	3	20	80	100
5.	Theory	MA 105	Operation Research	6	4	3	20	80	100
6.	Practicals	MA 106	Computing Techniques Lab – I (75 Practical + 25 Record)	6	4		--	--	100
			TOTAL	48	24		100	400	600

Semester-II

Sl. no	Components of study	Code	Title of the course	Hrs/ week	No. of Credits	Uni. Exams (Hour	IA	Seme-ster end exam	Total Marks
1.	Core	MA 201	Topology	6	4	3	20	80	100
2.	Core	MA 202	Discrete Mathematics	6	4	3	20	80	100
3.	Compulsory Foundation	MA 203	Computer Algorithm and Problem Solving	6 6	4	3	20	80	100
4.	Elective foundation	MA 204	A Probability and Statistics	6 6	4	3	20	80	100
5.	Theory	MA 205	Linear Algebra and Calculus	6	4	3	20	80	100
6.	Practicals	MA 206	Computing Techniques Lab – II (75 Practical + 25 Record)	6	4	--	--	--	100
			TOTAL	48	24		100	400	600

Semester-III

Sl. no	Components of study	Code	Title of the course	Hrs/ week	No. of Credits	Uni. Exams (Hour	IA	Semester end exam	Total Marks
1.	Core	MA 301	Commutative Algebra	6	4	3	20	80	100
2.	Core	MA 302	Classical Mechanics	6	4	3	20	80	100
3.	Generic Elective	MA 303	A) Differential Geometry B) Approximation Theory	6 6	4	3	20	80	100
4.	Course	MA 304	Numerical Methods Lab-I	6	4	3	--	--	100
5.	Skill Oriented course	MA 305	Mathematical Statistics (50 T+50 P)	3T+ 18P	4	2	10	40T+ 50P	100
6.	Open Elective (Other Departments)	MA 306	A) Business Mathematics-I B) Fundamentals of Mathematical Statistics	6 6	4	3	20	80	100
TOTAL				45T+ 18P	24		90	410	600

Semester-IV

Sl. no	Components of study	Code	Title of the course	Hr/week	No. of Credits	Uni. Exams (Hour	IA	Semester end exam	Total Marks
1.	Core	MA 401	Algebraic coding Theory	6	4	3	20	80	100
2.	Core	MA 402	Number Theory	6	4	3	20	80	100
3.	Generic Elective	MA 403	A) Graph Theory B) Functional Analysis	6 6	4	3	20	80	100
4.	Practical/ Course	MA 404	Numerical Methods Lab -II	6	4	3	--	--	100
5.	Multi Disciplinary Course	MA 405	Operations Research for Industry and Community Development (50 T +50 P)	3T+18P	4	2	10	40T+ 50P	100
6.	Open Elective (Other Departments)	MA 406	A) Business Mathematics-II B) Mathematics for Social Sciences	6 6	4	3	20	80	100
TOTAL				45T+ 18P	24		90	410	600

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S.V.U.COLLEGE OF SCIENCES
M.Sc. MATHEMATICS
SEMESTER - I

MA 101 ALGEBRA

Algebra is one of the broad areas of Mathematics together with Number theory Geometry and analysis. Algebra is applicable to all mathematical domains.

Course objectives:

1. To introduce the basic structures of Algebra such as groups, rings, fields and Domains which are pillars of modern mathematics
2. To develop working knowledge on Sylow's theorems
3. Provide information on Ideals and homomorphism.
4. Discuss U.F.D, E.D and polynomial Rings.

I.GROUP THEORY

Homomorphisms, Automorphisms, Cayleys theorem, Permutation groups, Another counting principle. Sylow's theorem, Direct products, Finite abelian groups.

II. RING THEORY

Rings, Some special classes of rings, Homomorphisms, Ideals and quotients of an integral domain, Euclidean rings. The field of quotients of an integral domain, Euclidean rings, a particular Euclidean ring, polynomial rings, polynomial over the rational field, polynomial rings over the commutative rings.

III.FIELDS

Extension fields, Roots of polynomials, Construction with straight edge and compass, More about roots, the elements of Galois theory, Solvability by radicals, Galois groups over the rationals.

IV. LATTICES

Partially ordered sets, Lattices, Modular Lattices, Schreier's theorem. The Chain conditions decomposition theory for Lattices with ascending chain condition, Independence, complemented modular lattices, Boolean algebras.

References:

(1) Topics in Algebra, by I.N. Herstein

(2) Commutative algebra, by Zariski and Samuel Affiliated East-West Press.

(3) Abstract Algebra – Ronald. Solomon.

(4) A First course in 'ABSTRACT ALGEBRA' seventh edition by John B. Fraleigh, Pearson Education.

(5) Abstract algebra by David S. Summit, Richard .M.Forte, Wiley publication, 3Rd edition.

(6) Introduction to rings and modules by C.Musli, Narosa Publications.

(7) A first course in abstract algebra by John B Fraleigh.

(8) Basic algebra by Jacobson.Nathan , Vol 1, Hindustan Publishing corporation 1991

Course outcomes: After completing this course the student will be able to

1. Identify the concept of action and conjugation.
2. Solve the problems on homomorphism, Permutations and cyclic groups
3. Analyze the maximal, prime, nilpotent and Nil ideals.
4. Explain the applications of Sylow's theorems
5. Understand U.F.D,E.D and Polynomial Rings

MA 102 Analyses

Course Objectives:

1) Acquired knowledge on Riemann-Stieltjes Integration and Differentiation.
2) To apply Integration of Vector Valued Functions, Rectifiable Curves.
3) Discussion of main problem Sequences and Series of Function.
4) Uniform Convergence, Continuity Integration and Differentiation.

I. Finite, countable and uncountable sets - Metric spaces - Compact sets -Perfect sets Connected sets. (2 questions to be set)

II. Sequences in metric spaces Subsequences - Cauchy sequences - Upper and lower limits - Some special sequences. Absolute convergence - Addition and multiplication of series Rearrangements. (1 question to be set).

III. Continuity - Limits of functions Continuous functions Continuity and compactness Continuity and connectedness Discontinuities Monotornic functions Infinite and limits at infinity. (1 question to be set).

IV. Riemann Stieltjes integral Definition and existences of integral - Properties of integral - Intergation and differentiation. (2 questions to be set).

V. Sequences and series of functions Uniform convergence - Uniform convergence and continuity - Uniform convergence and integration - Uniform convergence and differentiation - Equicontinuous family of functions - Weierstrass approximation theorem. (2 questions to be set).

The Lebeggue theory - Set functions A construction of the Lebessque measure - measure spaces -Measurable functions - Simple function - Integration - Comparison with Riemann integral - Integration of complex function - Functions of class L2. (2 questions to be set).

Reference:

(1) Mathematical Analysis- A modern Approach to Advanced Calculus Narosa Book Distributors Pvt LTD- New Delhi

(2) Real Analysis - Golden Math Series By N.P. Bali.

(3) A course of Mathematical Analysis by Shanti Narayan -.K. Mittal , S-Chand & Company LTD-New Delhi

Course Outcomes:

1. Understand the concepts of Riemann Integration and Differentiation.
2. To learn the different types of Sequences and Series of Functions, Equicontinuous Families of Functions.
3. Understand Uniform Convergence and continuity.
4. Apply the Stone-Weierstrass theorem.
5. Analyze the concept of functions of several variables.
6. Study the applications of Integration and Differential forms.

This course introduces fundamental knowledge in mathematics that is applicable in the engineering aspects.

Course objectives :

1. To study linear equations with regular singular points.
2. To provide knowledge on Legendre polynomials and properties of Bessel functions
3. To know the existence and uniqueness of solutions.
4. To Study surfaces and curves in 3-D space.

UNIT- 1

Differential Equation: Differential equation -order of differential equation-degree of differential equation -Solution of differential equation-General Solution-Particular Solution-Differential equation of first order and first degree-Solution of differential equation of first order and first degree ,Variable - separable form, Equation reducible to variable – separable form , Linear differential equation, Bernoul's Equation, Homogeneous Differential Equations, Homogeneous Differerential Equation ca be Reduced in the homogeneous form, Exact differential equation- Formation of a differential equation-Finding equation of a curve whose geometrical properties are given -Orthogonal trajectory.

Unit-2

Linear Differential equations (n^{th} order with constant coefficients) : Linear differential equation with constant coefficients-The Operator D- Complementary Functions (C.F)-Auxiliary equation (A.E)- Rules for finding complementary function, If all the roots of A.E are distinct and real , when the roots of auxiliary equation are equal , when roots of A.E are imaginary, When roots of A. E equation are repeated imaginary, When roots of A. E equation are repeated imaginary, When roots of A.E equations are irrational -The Inverse Operator - Rules for finding the particular integral (P.I) - When Q = ,Case of failure, When Q = sin (ax + b) or cos (ax + b), Case of failure, When Q = , m being a positive integer, When Q = . v, where v is the function of x only, When Q = x.v

Unit-3

Solution of Algebraic and Transcendental Equations : Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method. Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences –Symbolic relations and separation of

symbols-Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss' Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

Unit-4

Fitting a straight line –Nonlinear curve fitting –Curve fitting by a sum of exponentials-Weighted least squares approximation-Linear weighted least squares approximation-Nonlinear weighted least squares. Numerical Differentiation and Integration: The Cubic Spline Method – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule- Boole's and Weddle's Rules.

Unit-5

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods–Predictor-Corrector Methods- Adams-Moulton Method –Milne's Method.

References:

1. Advanced Differential Equations, M.D. Raisinghania , S. Chand Publications
2. Differential Equations" Ross, Shepley L Wieley India Pvt LTD.
3. Engineering Mathematics y Bali NP, SatyanarayanaBhavanari, kelkar, University Science Press, New Delhi 2012.
4. An introduction to O.D.E by Earl.A.Coddington , Prentice Hall of India Private Limited,
   New Delhi 1991.
5. Theory of ODE by Sam Sundaram, Narosa Publications

Course outcomes: From this course students will be able to

1. Recognize and classify O.D.Es.
2. Learn boundary value problems, Eigen values and Eigen functions
3. Apply knowledge on special functions of Mathematical Physics.
4. Understand the method of successive approximation and solve the second order linear questions.
5. Solve the problems related to Picard's theorem
6. Identify research problems where D.Es can be used.
7. Analyse engineering problems like series/ parallel circuit's etc using 1^{st} and 2^{nd} order O.D.Es.

MA 104 : Complex Analysis and Special Functions

Complex analysis, traditionally known as the theory of functions of a complex variable, is the branch of mathematical analysis that investigates functions of complex numbers.

Course Objectives :

1. To define analytic functions and derivative rules of complex functions.
2. To introduce Mobius transformations and explain its applications.
3. To evaluate definite integrals using Cauchy integral formula.
4. To understand power series and expansion of analytic function**.**

UNIT – I

Special functions: Gamma and Beta Functions – Their properties – evaluation of improper integrals. Bessel functions – properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality.

UNIT-II

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.

Elementary functions: Exponential, trigonometric, hyperbolic functions and their properties – General power Z (c is complex), principal value.

UNIT-III

Complex integration: Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity.

UNIT-IV

Residue – Evaluation of Residue by formula and by Laurent series, residue theorem and evaluation of integrals of different types

Argument principle – Rouche's theorem – determination of number of zeros of complex polynomials - Maximum Modulus principle - Fundamental theorem of Algebra, Liouville's Theorem.

UNIT-V

Conformal mapping: Transformation by ez , lnz,z^2, z(n positive integer), Sinz, cosz, z + a/z. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles and cross ratio–determination of bilinear transformation mapping 3 given points .

Text Books

1. A text Book of Mathematical Methods, S M Naidu, StudentsHelpline Books
2. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
3. A text Book of Engineering Mathematics, Thamson Book Collection.
4. A text Book of Engineering Mathematics, Shahnaz Bathul, Prentice Hall of India.

Course outcomes:

1. Identify curves and regions in the complex plane defined by simple expressions.
2. Describe basic properties of complex integration and having the ability to compute such integrals.
3. Decide when and where a given function is analytic and be able to find it series development.
4. Describe conformal mappings between various plane regions.
5. Apply the concepts of Complex Analysis in many branches of mathematics, including algebraic geometry, number theory, analytic combinatorics, applied mathematics; as well as in physics, including the branches of hydrodynamics, thermodynamic sand particularly quantum mechanics.

MA 105 : Operation Research

Course Objectives:

1) Operations research helps in solving problems in different environments that needs decision.
2) This module aims to introduce students to use quantitative methods and techniques for effective decisions-making: model formulation and applications that are used in solving business decision problems.
3) Deterministic inventory models, EOQ model, no step model, setup model.
4) Queuing system, Elements of a queuing model, pure birth, death model.
5) Generalized poisson queuing model specialized poisson queues, single server model, multi-server model.
6) Network models, enumeration of cuts, maximal flow algorithm, linear programming formulation of maximal flow mode, CPM computations.

UNIT- 1

Linear Programming problem Mathematical formulation, assumptions in linear programming, graphical method of solution, simplex method, Big-M method and Two phase method, Dual simplex method.

Unit-2

Integer Programming Introduction, Gomory's cutting plane method, Fractional cut method-Mixed integer and branch and bound techniques.

Transportation Problem-General transportation problem, Finding an initial basic feasible solution, Loops in transportation tables, Degeneracy, Optimality method-MODI method.

Assignment Problem- Hungarian Method, Traveling salesman problem.

Unit-3

Game Theory Introduction, two-person zero-sum games, some basic terms, the maxmini-minimax principle, games without saddle points-Mixed Strategies, graphic solution of 2 * n and m*2 games, dominance property.

Simulation Introduction, Definition of Monte-Carlo Simulation.

Unit-4

Dynamic Programming Introduction, The Recursive equation approach, Algorithm, Solution of a L.P.P by Dynamic Programming.

Sequencing Models-Processing n jobs through 2 machines, n jobs through 3 machines, two jobs through m machines.

Networking Analysis CPM & PERT – Network minimization, shortest route problem, maximal-flow problem, Project scheduling, critical path calculations, PERT calculation.

Unit-5

Queuing Theory Introduction, Queuing system, Elements of Queuing system, Characteristics of Queuing system, Classification of Queuing Models, Poisson Queuing systems-Model I (M/M/1): (:FIFO)-Characteristics of Model I and waiting time characteristics. Characteristics of (M/M/1):(N/FIFO),(M/M/C):(/FIFIO), (M/M/C):(N/FIFO)-all without derivation

Suggested Readings:

- Operation Research by Kanti Swarup, P.KGuptha , Man Mohan 11th edition Sultan Chand & Sons Publication.
- Operation Research , Jaico Publishing House
- Operation Research-An introduction by Hamdy A Taha. Prentice Hall.
- Introduction To Management Science, Anderson, Thomson Learning, 11Edn.
- Operation Research Applications and Algorithms, Winston, Thomson Learning, 4Edn.
- Introduction to Operation Research by Hiller/Lieberman. McGraw Hill.

Course Outcomes:

1) Formulate some real life problems into Linear Programming Problem.
2) Solve linear programming problem by using algebraic graphical method.
3) Use the simplex method to find an optimal vector for the standard linear programming problem and the corresponding dual problem.
4) Prove the optimality condition for feasible vectors for Linear Programming Problem and Dual Linear Programming Problem.
5) Use operations research to solve transportation problems during the allocation of trucks to the formulate operation research models to solve real life problem.
6) Understand Queuing theory basic concepts and solve queuing theory problems.
7) Deterministic inventory models, static economic, classic EOQ models.

MA 106: COMPUTING TECHNIQUES LAB – I

At least 20 programs covered from papers related to the subjects Algebra, Real Analysis, Ordinary Differential Equations, and Complex Analysis. (75 marks for practical examination and 25 marks for record.)

Subject Code	Subject Name	Credits Allotted		Total
MA-106	PRACTICALS	Theory	Practical	4
		----	4	
Course Objective	1. To write different programs related to the subject. 2. To write problems and solving them by using computers. 3. To aware the students how to apply the computers Mathematical techniques in the Real life. 4. To Develop Subject related computer knowledge.			
Course Out comes	1. Develop the Laplace Transform techniques & Fourier Series. 2. Solving the Differential Equations by different methods. 3. Finding the Maximum & Minimum for the functions. 4. Examination the functions are analytics Harmonic Perform sampling methods analysis using R-software.			

MA 201: TOPOLOGY

Topological concepts play important role in the development of modern mathematics and it has large applications in theoretical physics.

Course Objectives:

1. This course aims to teach the fundamentals of point set topology and constitute an awareness of need for the topology in Mathematics.
2. Introduce the basic definitions and standard examples of topological spaces.
3. Define and illustrate a variety of topological properties such as compactness, connectedness and separation axioms.
4. Explain the idea of topological equivalence and define homeomorphisms.

Unit - 1

Topological Space definition of a Topological space, Elementrary Concepts, open bases and open sub-bases, weak topologies. The function algebras (X,R) and (X,C) (1 Question).

Unit - 2

Compactness, product of spaces, Technoff's theorem and locally compact spaces, compactness for the matric spcases, Ascolis theorem. (2 questions).

Unit - 3

Seperation, T-spaces and Hausdorff spaces completely regular and normal spaces, Urysohn's Lemma and Tietz extension theorem. The Urysohn's embedding theorem. Connectedness, connected spaces, components of a space. (2 questions)

Unit - 4

Banach Spaces, definition of Banach spaces, continuouas linear trasformation, The Hahn –Banach theorem, the natural imbedding of N in N**, the open maping theorem, the conjugate of an operator. (2 questions)

Unit - 5

Hilbert spaces, defintion and example, orthogonal complements, orthonrmal set, the conjugate space H*, the adjoint of an operator, self-adjoint operators, normal and unitary operators, projections. (3 questions)

Reference:

1. 'Topology' by K.ChandraSekharaRao, Narosa Publications.
1. "Topology" by J.P. Chauhan, J.N. Sharma, Krishna Publications.
2. "General Topology" by M.G. Murdeshwar, new age International publications.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Understand to construct topological spaces from metric spaces and using general properties of neighbourhoods, open sets, closed sets, basic and sub-basis.
2. Apply the properties of open sets, closed sets, interior points, accumulation points and derived sets in deriving the proofs of various theorems.
3. To understand the concepts of countable spaces and separable spaces.
4. They know what we mean by connectedness, compactness, and hausdorf property and their general characteristics.
5. Understand the Countability axioms, the separation axioms and normal spaces.
6. Understand the classical theorems such as the Uryshon lemma, the Tietze extension theorem.

MA 202: DISCRETE MATHEMATICS

The aim of the discrete mathematics is the study of mathematical structure that are fundamentally discrete rather than continuous.

Course Objectives:

1. To study the mathematical structure that is countable or distinct and separable.
2. To learn sets functions, logic, calculus and analysis.
3. To study the Algebraic systems such as Lattices ,Boolean Algebra and Boolean functions
4. To introduce basic concepts of graph theory

UNIT-I

Mathematical Logic: Statements and notation, connectives, Normal Forms, Disjunctive Normal Forms [DNF], Conjunctive Normal Forms (CNF), Principal DNF, Principal CNF.

Set Theory : Basic Concepts of Set Theory, Relations and Ordering, Functions and Recursion.

UNIT-II

Lattices, Boolean Algebra, Representation and minimization of Boolean functions. Semi-groups, Product and Quotients of Semi-group, Groups, Product and Quotients of Groups, Coding of Binary Information and Error Detection, Decoding and Error Correction.

UNIT-III

Combinatorics: Basics, Permutations and Combinations with repetitions and Constrained Repetitions, Binomial and Multinomial Theorems, Principle of Inclusion and Exclusion.

UNIT-IV

Graph Theory -I : Basic Concepts, Isomorphism, sub - graphs, trees and their Properties., Spanning Tree, Directed Trees, Binary Trees.

UNIT-V

Graph Theory - II : Planar Graphs, Eule Formula, Multi-graphs and Euler Circuit Hamiltonian Circuit; Chromatic Numbers, Four Colour Problem.

References: 1. Discrete Mathematics & Graph Theory by Bhavanari Satyanarana& Kuncham Syam Prasad, PHI Publications, New Delhi, Second Edition, 2014.

2. Mathematical Foundation of Computer Science, by Bhavanari Satyanarayana, T.V. Pradeep Kumar, SK. Mohiddin Shaw, BS Publications, Hyderabad.2016.

Course Outcomes:

1. Use standard notations of propositional logic.
2. Understand the truth tables for expressions involving negation, conjunction, and disjunction
3. Determine if a logical argument is valid or invalid.
4. Find concepts and notations from discrete mathematics are useful in studying Automata theory, Number theory and mathematical cryptography.

MA 203: Computer Algorithm and Problem Solving

Unit - 1

Introduction to Algorithms: Algorithms representations through Flowcharts, Mathematical Flowcharts, finding highestand lowest of given quantities, finding sum of 100 odd numbers, commerce related flowcharts like laying customs duty, finding Gross Sales and discount, Calculations for salary of employees.

Unit 2

Array Algorithms: Concept of Array, Flowcharts and their' Algorithms for manipulation of arrays to transfer contents of one memory array to another, assigning Constant value to the contents of an array, addition, subtraction, multiplication of arrays, sorting and' printing techniques through Algorithm.

Unit 3

Decision Tables: Introduction to Decision making. Structure of Decision Tables Algorithms for selection criteria's - Drafting entries in the decision tables for the same.

Unit 4

Introduction to Problem Solving: Components of Program, Constants, Variables, Input and Output in Progress, Operators, Decision Making, Iteration, the concept of Loop.

Unit 5

Arrays Revisited: Types of Arrays, Subroutine calls, top-down design, subroutines and structured problem solving.

Books Recommended:

1. Solving it by Computers - R.G. Dromey
2. Let us C : Yashwant Kanetkar
3. How to Solve it by Computer – S M Naidu

MA 204: Probability and Statistics

UNIT I

Probability: Sample space and events – Probability – The axioms of probability - Some elementary theorems - Conditional probability – Baye's theorem.

UNIT II

Random variables – Discrete and continuous – Distribution – Distribution function.

Distribution - Binomial, Poisson and normal distribution – related properties.

UNIT III

Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) proportions, sums and differences.

Estimation: Point estimation – interval estimation - Bayesian estimation.

UNIT IV

Test of Hypothesis – Means and proportions – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests. Tests of significance – Student's t-test, F-test, test. Estimation of proportions.

UNIT V

Curve fitting: The method of least squares – Inferences based on the least squares estimations - Curvilinear regression – multiple regressions – correlation for univariate and bivariate distributions.

Books recommended:

1. Probability and statistics for engineers (Erwin Miller And John E.Freund), R A Johnson And C.B.Gupta.. 7th edition, Pearson Education / PHI.
2. S M Naidu, "Probability and statistics for Computer Scientists" StudentsHelpline Publishing House 2007.
3. Introduction to Probability and Statistics, 12th edition, W.Mendenhall, R.J.Beaver and B.M.Beaver, Thomson. (Indian edition).
4. Probability and Statistics in Engineering, 4th Edition, William W.Hines, Douglas C.Montgomery, David M.Goldsman, Connie M.Borror, Wiley Student Edition.
5. Probability, Statistics and Queuing Theory, 2nd Edition, Trivedi, John Wiley and Sons
6. Introduction to Probability and Statistics, J.S.Milton, Jesse C.Arnold, 4th edi,TMH.

MA 205: Linear Algebra and Calculus

Course Objectives

This course will illuminate the students in the concepts of calculus and linear algebra.

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit-I: Matrices

Matrices: Types of Matrices, Symmetric; Skew-symmetric; orthogonal matrices; rank of a matrix by Echelon form, Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method, Gauss seidel iteration method.

Learning outcomes:

Understand the matrix representation of a set of linear equations

Explain the Normal form and Echelon form.

Apply elementary operations to find the rank

Analyse the solution of the system of Linear equations

Evaluate the rank of the matrix.

Unit-II: Eigen Values and Eigen Vectors

Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms up to three variables. Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Learning outcomes:

Understand how to find the eigen values and eigen vectors of a matrix.

Explain the quadratic form to canonical form using orthogonal transformations.

Apply Cayley Hamilton theorem to find inverse and powers of the matrix

Analyse the nature of the quadratic form.

Evaluate the powers of matrix.

Unit III: Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

Learning Outcomes

At the end of this unit, the student will be able to

Translate the given function as series of Taylor's and Maclaurin's with remainders (L3)

analyze the behaviour of functions by using mean value theorems (L3)

Unit IV: Multivariable calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes

At the end of this unit, the student will be able to

Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L3)

Acquire the Knowledge maxima and minima of functions of several variable (L1)

Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit V: Multiple Integrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates.

Learning Outcomes

At the end of this unit, the student will be able to

Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates (L5)

Apply double integration techniques in evaluating areas bounded by region (L4)

Evaluate multiple integrals in Cartesian, cylindrical and spherical geometries (L5)

MA 206: COMPUTING TECHNIQUES LAB – II

At least 20 programs covered from papers related to the subjects Galois Theory, Topology, Partial Differential Equations, and Advanced Complex Analysis. (75 marks for practical examination and 25 marks for record.)

Subject Code	Subject Name	Credits Allotted		Total
MA-106	PRACTICALS	Theory	Practical	
		----	4	4
Course Objective	1. To write different programs related to the subject. 2. To write problems and solving them by using computers. 3. To aware the students how to apply the computers Mathematical techniques in the Real life. 4. To Develop Subject related computer knowledge.			
Course Out comes	1. Develop the Laplace Transform techniques & Fourier Series. 2. Solving the Differential Equations by different methods. 3. Finding the Maximum & Minimum for the functions. 4. Examination the functions are analytics Harmonic Perform sampling methods analysis using R-software.			

BOS, CHAIRMAN
Department of Mathematics
S.V.U.C.S., TIRUPATI.