MASTER OF SCIENCES
MATHEMATICS

SYLLABUS & REGULATIONS

WITH EFFECT FROM 2025-26

M.Sc. - MATHEMATICS

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

Amended as per NEP-2020&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. 2025-2026)

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	MSc 101	Algebra	6	4	3	30	70	100
2.	Core	MSc 102	Real Analysis	6	4	3	30	70	100
3.	Compulsory Foundation	MSc 103	Ordinary Differential Equations	6 6	4	3	30	70	100
4.	Elective foundation	MSc 104	Complex Analysis	6 6	4	3	30	70	100
5.	Theory	MSc 105	Discrete Mathematics	6	4	3	30	70	100
6.	Practicals	MSc 106	Computing Techniques Lab – I (75 Practical + 25 Record)	6	4		--	--	100
			TOTAL	48	24		*150*	350	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	MSc 201	Topology	6	4	3	30	70	100
2.	Core	MSc 202	Computer Algorithm and Problem Solving	6	4	3	30	70	100
3.	Compulsory Foundation	MSc 203	Partial Differential Equations	6 6	4	3	30	70	100
4.	Elective foundation	MSc 204	Advanced ComplexAnalysis	6 6	4	3	30	70	100
5.	Theory	MSc 205	Operation Research	6	4	3	30	70	100
6.	Practicals	MSc 206	Computing Techniques Lab – II (75 Practical + 25 Record)	6	4	--	--	--	100
			TOTAL	48	24		*150*	350	600

Semester-III

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	MSc 301	Commutative Algebra	6	4	3	30	70	100
2.	Core	MSc 302	Classical Mechanics	6	4	3	30	70	100
3.	Generic Elective	MSc 303	A) Differential Geometry B) Approximation Theory	6 6	4	3	30	70	100
4.	Course	MA 304	Numerical Methods Lab-I	6	4	3	--	--	100
5.	Skill Oriented course	MSc 305	Mathematical Statistics (50 T+50 P)	3T+ 18P	4	2	10	40T+ 50P	100
6.	Open Elective (Other Departments)	MSc 306	A) Business Mathematics-I B) Fundamentals of Mathematical Statistics	6 6	4	3	30	70	100
		TOTAL		45T+ 18P	24		130	370	600

Semester-IV

Sl. no	Components of study	Code	Title of the course	Hr/week	No. of Credits	Uni. Exams (Hour	IA	Seme-ster end exam	Total Marks
1.	Core	MSc 401	Algebraic coding Theory	6	4	3	30	70	100
2.	Core	MSc 402	Number Theory	6	4	3	30	70	100
3.	Generic Elective	MSc 403	A) Graph Theory B) Functional Analysis	6 6	4	3	30	70	100
4.	Practical/ Course	MSc 404	Numerical Methods Lab -II	6	4	3	--	--	100
5.	Multi Disciplinary Course	MSc 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)	MSc 406	A) Business Mathematics-II B) Mathematics for Social Sciences	6 6	4	3	30	70	100
		TOTAL		45T+ 18P	24		130	370	600

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
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M.Sc. MATHEMATICS
SEMESTER - I

MSc 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.

UNIT –I:

Cyclic groups - Conjugacy and G-Sets, Permutation groups-Cyclic decomposition-Alternating Group A_n -Simplicity of A_n .

(Section 4 of Chapter 4, Sections 4 of Chapter 5, Sections 1, 2 and 3 of chapters 7).

UNIT –II:

Structure Theory of Groups: Direct Products –Finitely generated abelian groups -Invariants of a finite abelian group –Sylow theorems –group of orders p2, pq.

(Section 1,2,3,4 and 5 of Chapter 8).

UNIT – III:

Ideals and Homomorphism's: Ideals – Homomorphism's –Sum and direct sum of ideals – Maximal and prime ideals – Nilpotent and nil ideals –Zorn's Lemma

(Chapter 10)

UNIT – IV:

Unique Factorization domains and Euclidean Domains: Unique factorization domains-Principal ideal domains-Euclidean domains, Polynomial rings over UFD.

(Chapter 11)

Scope and standard in the book **"Basic Abstract Algebra" by P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Cambridge University Press, Reprint 1997.**

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

MSc 102 Real Analyses

This course covers Riemann-Stieltjes Integral, Sequences and Series of Functions, Functions of Several Variables, Improper Integrals, Fourier series, Maxima and Minima.

<u>Course Objectives:</u>

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.

UNIT –I:

The Riemann –StieltijesIntegral : Definition and Existence of the integral properties of the integral, integration and Differentiation, Integration of vector valued function, Rectifiable curves.

UNIT – II:

Sequence and series of functions : Discussions of main problem, uniform convergence, uniform convergence and continuity, Uniform convergence and Integration, Uniform convergence and Differentiation, Equicontinuous families of functions, The stone –Weistrass theorem .

Scope and standard as in Chapters 6, sections 7.1 to 7.26 of chapter 7 of Walter Rudin" Principles of Mathematical Analysis" 3rd edition 1976, Nc. Graw hill International student edition.

UNIT – III:

Improper Integrals: Introduction, Integration of unbounded functions with finite limit of Integration, comparison tests for convergence at a $\propto$, infinite Range of Integration.

Fourier series: Trigonometrically series, some preliminary theorems, the Main theorem intervals other than -$[-\Pi, \Pi]$

UNIT-IV:

Functions of Several Variables : Explicit and Implicit functions, Continuity, Partial derivations, differentiability, partial derivatives of higher order, differentials of higher order, function of functions, change of variables, Taylor's theorem, Extreme values, Maxima and Minima, functions of several variables.

Scope and standard as in chapters 11, 12 and 15 of **Mathematical Anlaysis by " S.C. Malik 1994" Wiley Eastern limited**

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

<u>Course Outcomes:</u>

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.

MSc103 :ORDINARY DIFFERENTIAL EQUATIONS

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 –I:

Oscillation Theory and boundary value problems: Qualitative properties of solutions –The Sturm comparison theorem-Eigen values, Eigen functions and the vibrating string.

UNIT – II:

Power series solutions: Series solutions of first order equations –Second order linear equations-Ordinary points-Regular singular points- Gauss's hyper geometric equation.

UNIT – III:

Some special functions of Mathematical Physics :Legender polynomials – properties of Legendre polynomials –Bessel functions –The gamma function- Properties of Bessel functions.

UNIT-IV:

The existence and uniqueness of solutions : The method of successive approximations-Picard's theorem-systems. The second order linear equations.

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.

MSc104 :Complex Analysis

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:

Differentiation: Analytic Functions: Derivative Rules for Differentiating Complex Functions-The Cauchy-Riemann Equations –Analytic Functions-Geometrical Interpretation of Arg $f^1(z)$ and $\left|f^1(z)\right|$ - Conformal Mapping –The Mapping w = $\frac{az+b}{cz+d}$ -Conformal Mapping of the Extended Plane.

UNIT – II:

Mobius Transformations: The Group Property of Mobius Transformations – The Circle – Preserving Property of Mobius Transformations-Fixed points of a Mobius Transformation-Invariance of Cross Ratio-Mapping of a circle onto a Circle –Symmetry Transformations.

UNIT – III:

Complex Integrals: Cauchy Integral Theorem: Rectifiable Curves-Complex Integrals-The Case of Smooth Curves-Cauchy's Integral Theorem-The Key Lemma proof of Cauchy's Integral Theorem-Application to the Evaluation of Definite Integrals Cauchy's Integral Theorem for a system of Contours. Cauchy's Integral Formula –Morera's Theorem – Cauchy's Inequalities.

UNIT-IV:

Power Series: The Cauchy-Hadamard Theorem – Taylor Series. The Uniqueness Theorem for Power series-Expansion of an Analytic Function in a power series –Liouvill'es Theorem. The Uniqueness Theorem for Analytic functions-A Points and Zeros-Weirstrass' Double Series Theorem-Substitution of One Power Series into Another- Division of Power series.

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, ShahnazBathul, 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.

MSc 105: DISCRETE MATHEMATICS

UNIT-I
MATHEMATICAL LOGIC

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT-II
SET THEORY

Set Theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT-III
ALGEBRAIC STRUCTURES

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT-III
ELEMENTARY COMBINATORICS

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

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REFERENCE BOOKS

1. Discrete Mathematics, Dr. P. Santosh Kumar Patra, Dr. D. Ranadheer Reddy, Mr. K. Upender Reddy, Spectrum University Press, Hyderabad
2. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
3. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.
4. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
5. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

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.

MSc 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	<u>PRACTICALS</u>	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.			

MSc 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 –I:

Metric spaces:-open sets-closed sets- convergence-completeness and Baire's theorem-Continuous mappings – Cauchy's Inequality and MinKowskisInequality- Euclidean and Unitary Spaces

UNIT – II:

Topological Spaces, definition & examples-open bases and open sub bases- compact spaces

UNIT – III:

Product of spaces-Trychonoff's theorem and loally compact spaces-compactness for Metric spaces.

UNIT-IV:

Separation –T^1 space and Hausdorff spaces –completely regular spaces and Normal spaces – Urysohn's lemma- Tietze extension theorem-Urysohn's imbedding theorem –Connected spaces.

Articles 9 to 13,16,17,18,21 to 29 and 31 of Chapters II, III, IV, V and VI of **Introduction to Topology and Modern Analysis" by G.F. Simmons of MC Graw Hill Publishing company, ltd**.

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.

MSc 202: PARTIAL DIFFERENTIAL EQUATIONS

This course is designed to strengthen the fundamental knowledge of P.D.Es which lead to understand the real world problems.

Course Objectives:

1. To provide the students various methods to find solutions of O.D.Es and P.D.Es
2. To introduce orthogonal trajectories in 3D space
3. To explain methods to solve Linear P.D.Es with constant and Variable coefficients.
4. To discuss the boundary value problems and Laplace Equation.

UNIT –I:

Differential Equations in more than two variables: Methods of solutions of dx/P =dy/Q = dz/R-Orthogonal trajectories of a system of curves on surface-Pfaffian differential forms and equations in Three variables.

UNIT – II:

Partial Differential Equations of the First order: Partial Differential equations-Origins of first order partial differential equations-Cauchy’s problems for first order equations-Linear equations of first order-Integral surfaces passing through a given curve –Surfaces orthogonal to a given system of surfaces-Charpit’s method.

UNIT – III:

Partial Differential Equations of the Second order: The Origin of second order equations – Linear partial differential with constant coefficients-Equations with variable coefficients.

UNIT-IV:

Laplace’s Equations : Elementary solution of Laplace’s equation-Families of equipotential surfaces-Boundary value problems – Separation of variables

Scope and Standard as in **“Elements of Partial Differential Equations” by IAN Sneddon**Chapter 1: Section 1 to 6, Chapter 2: Sections 1,2,4,5,6,10 Chapter 3: Sections 1,4,5, chapter 4: Sections 2,3,4,5, Chapter 5: Sec2, Chapter 6: Section 3 and 4.

Reference:

1. Ordinary and Partial Differential Equations by M.D. Raisinghania.
2. Advanced Differential Equations by M.D.Raisinghania, S. Chand Company Limited, New Delhi, 2021.
3. An elementary course to P.D.E by T.Amarnath, Second Edition, Narosa publishing house.

Course outcomes:

Students will be able to

1. Analyze the origin of first order PDEs and Integral surfaces passing through a given curve
2. Identify linear and nonlinear PDE and solve nonlinear PDE by Charpit'smethod.
3. Apply Variables separable methods to solve Laplace Equation in cylindrical or spherical coordinates.
4. Obtain equipotential surfaces using Laplace's equation.
5. Understand the importance of partial differential equations in geometry, physics and other subjects.

MSc 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.

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 :YashwantKanetkar
3. How to Solve it by Computer – S M Naidu

MSc 204: A ADVANCED COMPLEX ANALYSIS

Course Objectives:

1. To introduce some topics of contemporary advanced complex analysis.
2. To explain Laurent Series, poles and singular points.
3. To understand Residue theorem and its applications.
4. To discuss Laplace's equation, Harmonic functions and Dirichlet problem.
5. To analyse various methods to solve problems in day to day life.

UNIT –I:

Laurent Series-Singular Points: Laurent Series-Laurent's Theorem-Poles and Essential Singular points-Behavior at an Essential Singular point. Picard's Theorem-Behavior at infinity.

UNIT – II:

The Residue Theorem and its Applications: The Residue Theorem-Residues at infinity-Jordan's Lemma-Evaluation of Definite Integrals – The Argument principal-The Theorems of Rouche and Hurwitz-Local Behavior of Analytic Mappings-The Maximum Modulus principle and Schwarz's Lemma.

UNIT – III:

Harmonic Functions: Laplace's Equations-Conjugate Harmonic Functions-Poisson's integral. Schwartz's Formula-The Dirichlet problem.

Conformal Mapping: General Principles of Conformal Mapping –Mapping of the Upper Half-Plane onto a Rectangle –The Schwarz-Christoffel Transformation.

UNIT-IV:

Infinite product and Partial Fraction Expansions: Preliminary Results- Infinite Products-Weierstrass' Theorem –Mittage – Leffer's Theorem – The gamma Functions –Cauchy's Theorem on Partial Fraction Expansions.

Scope and Standard as in **"Introductory Complex Anlaysis" by Richard A. Silverman, Dover Publications, Inc. New York (1972)** Chapter 11 to 15.

Reference:

1. Fundamentals of Complex Analysis- Edward B. Saff, Arthur David Snider, Pearson Education
2. Foundations of Complex Analysis by S. Ponnusamy- Narosa Publications.

<u>Course Outcomes</u>:

1. Explain the basic properties of complex integration and compute such integrals.
2. Learn topics of contemporary Advanced complex analysis in particular spaces of holomorphic functions, entire functions, harmonic functions and conformal mapping functions.
3. Apply advanced techniques to evaluate definite integrals and differential equations in applied areas.
4. Explain general principles of conformal mapping.
5. Compute the residue of a function and use the Residue Theory to evaluate a contour integral or an integral over the real line.

MSc205 : 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.

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

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

Suggested Readings:

- Operation Research by KantiSwarup, 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.

<u>Course Outcomes:</u>

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.

MSc 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.)

<table>
<tr><td>Subject Code</td><td>Subject Name</td><td colspan="2">Credits Allotted</td><td>Total</td></tr>
<tr><td rowspan="2">MA-106</td><td rowspan="2">PRACTICALS</td><td>Theory</td><td>Practical</td><td rowspan="2">4</td></tr>
<tr><td>----</td><td>4</td></tr>
<tr><td>Course Objective</td><td colspan="4">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.</td></tr>
<tr><td>Course Out comes</td><td colspan="4">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.</td></tr>
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