Swami Ramanand Teerth Marathwada University, Nanded. M.A. /M. Sc. (First Year) (Mathematics) (CBCS) Revised Syllabus Effective from June-2019

Program Educational Objectives (PEOs):

PEO1: To equip students with knowledge, abilities and insight in mathematics and related fields.
PEO2: Have the ability to pursue interdepartmental research in Universities in India and abroad.
PEO3: To develop the ability to utilize the mathematical problem solving methods such as analysis, modeling, programming and mathematical software applications in addressing the practical and heuristic issues.

PEO4: To enable them to work as a mathematical professional or qualify for training as scientific researcher.

PEO5: To enable students to recognize the need for society and the ability to engage in life-long learning.

PROGRAMME OUTCOMES (POs):

After the completion of the program, students will able to:

PO1: Identify, formulate, and analyze the complex problems using the principles of Mathematics.

PO2: Solve critical problems by applying the Mathematical tools.

PO3: Apply the Mathematical concepts, in all the fields of learning including higher research, and recognize the need and prepare for lifelong learning.

PO4: Able to crack competitive examinations, lectureship and fellowship exams approved by UGC like CSIR-NET and SET.

PO5: Apply ethical principles and commit to professional ethics, responsibilities and norms in the society.

PO6: Gain the knowledge of software which will be useful in Industry

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: To understand the basic concepts of advanced mathematics.

PSO2: To develop the problems solving skills and computational skills.

PSO3: To enhance self learning and improve own performance.

PSO4: To formulate mathematical models.

Semester-I

Paper-I Abstract Algebra-I (Group and Ring Theory)

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the concept of Normal subgroups, Quotients groups and Isomorphism.

CO2: Analyze Permutation groups and cyclic decomposition.

CO3: Explain Fundamental theorem of finite Abelian group and its applications.

CO4: Provide information on ideals and Quotient rings, Integral domain, PID, UFD and ED

Paper-II Real Analysis

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the concepts of continuity, differentiability and Integrability of functions.

CO2: Discuss the concept of pointwise and uniform convergence.

CO3: Apply the Stone-Weierstrass theorem and to solve the problems.

CO4: Enumerate the derivative, directional derivative, inverse and implicit function theorem.

Paper-III Ordinary Differential Equations

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the linear differential equations with constant and variable coefficients.

CO2: Discuss the concept of Wronskian, linear dependent and Independent, Legendre equation.

CO3: Comprehend the Euler equations, the Bessel equation and Regular singular points.

CO4: Examine the existence and uniqueness of solutions to first order linear differential equations.

Paper No-IV Complex Analysis- I

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Describe the Rectangular and Polar representation of Complex numbers.

CO2: Comprehend the various mappings and complex functions.

CO3: Analyze C-R Equations, Analytic functions, harmonic functions.

CO4: Evaluate the line integrals and different forms of Cauchy's Theorem.

Paper-V (A) Discrete Mathematics

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Explain design and implementation of digital network and switching circuits.

CO2: Analyze Hamiltonian paths, circuits, Euler graphs, connected and disconnected graphs.

CO3: Discuss the different properties of trees and fundamental circuits.

CO4: Establish the matrix representation of graphs.

Paper-V (B) Dynamics and Continuum Mechanics-I

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define vector moment about a point and scalar moment about an axis.

CO2: Explain Newton's law of motion, various forces and angular momentum.

CO3: Compare the theorem of parallel and Perpendicular axes.

CO4: Describe the law of motion, the law of conservation of energy and impulsive motion

Paper-V (C) Theory of Probability

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Discuss the multiplication theorem of probability for independent events and its Examples.

CO2: Explain Moment Generating function Technique and its applications.

CO3: Compare recurrence relation for moments of binomial and Poisson distribution.

CO4: Analyze the normal distribution as a limiting form of binomial distribution.

Paper-V (D) Differential Geometry of Manifolds-I

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define tangent spaces, Jocobian map.

CO2: Discuss the Lie-derivative, exterior algebra and derivative.

CO3: Analyze the topological groups, Lie groups and algebra.

CO4: Identify the homomorphism and isomorphism of Lie transformation groups.

Paper-VI Tutorial –I

Semester-II

Paper-VII Linear Algebra

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the concepts of Liner Independence, bases and Dual spaces.

CO2: Discuss Algebra of Linear Transformations and Characteristics roots.

CO3: Explain canonical forms and Cayley-Hamilton Theorem.

CO4: Analyze rational canonical forms and Determinants.

Paper-VIII Measure and Integration Theory

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Comprehend the measurable sets, Lebesgue measure, Fatou's Lemma, Lebesgue's Dominated Convergence and Integration of series.

CO2: Discuss the four derivatives, Functions of bounded variations.

CO3: Define the Hereditary class and Measure spaces.

CO4: Explain signed measure and their derivatives.

Paper-IX Partial Differential Equations

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Analyze the origin of first order partial differential equations and solving them using Charpit's method.

CO2: Justify non-linear first order partial differential equation.

CO3: Classify second order partial differential equations.

CO4: Discuss boundary value problems and classification in the case of n-variables.

Paper No-X Complex Analysis- II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define Liouville's Theorem, Picard Theorem, Maximum Modulus Theorem.

CO2: Analyze the concepts of Laurent Series, Singularities, Principle & analytic part of Laurent Series. CO3: Compare Residue theorem and the argument principle.

CO4: Discuss Conformal Mapping, Meromorphic Functions.

Paper-XI (A) Combinatorics

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Comprehend the rules of Sum and Product of Permutations and Combinations.

CO2: Identify Solutions by the technique of Generating Functions.

CO3: Discuss the Recurrence relations, Divide and conquer relations.

CO4: Analyze the Inclusion-exclusion principle and Rook polynomials.

Paper-XI (B) Dynamics and Continuum Mechanics-II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define the basic concept of indices, tensor, scalar and vector fields.

CO2: Discuss the description of motion of a Continuum, rate of deformation.

CO3: Analyze strain component, stress tensor, components of symmetry of stress Tensor.

CO4: Explain the Newtonian fluids, mathematical principles.

Paper-XI(C) Operation Research

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Explain Graphical Method, Simplex Method, Big-M method, Two Phase method.

CO2: Apply Duality to solve problems in Linear Programming.

CO3: Analyze the test of optimality for Degeneracy by using Transportation Algorithms.

CO4: Discuss the Assignment Problem and its Applications, game theory.

Paper-XI (D) Differential Geometry of Manifolds-II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define principle fibre bundle, tangents bundle.

CO2: Discuss the curvature tensors, sectional curvature and Geodesics in a Reimannian Manifolds.

CO3: Explain Gauss formula, Weingarten equation and lines of curvature.

CO4: Analyze generalized Gauss and Mainardi Codazzi equation and contravarient and Covariant almost analytic vector field.

Paper-XII Tutorial –II

Semester-III

Paper-XIII Functional Analysis

Course Outcomes (CO)

CO1: Understand Banach Spaces, The HahnBanach Theorem.

CO2: Study the open Mapping Theorem, Hilbert Spaces.

CO3: Analyse different operators and their properties

CO4: Understand Finite Dimensional Spectral Theory

Paper-XIV Topology

Course Outcomes (CO)

CO1: Understand basics of Topological Spaces

CO2: Study Connected Spaces, Limit Point Compactness, Local Compactness.

CO3: Achieve the zenith in treating Countable Axioms, Separable, Regular and Normal spaces.

CO4: Understand theorems like The Urysohn's Lemma, Urysohn's Metrization Theorem.

Paper-XV Elementary Number Theory

Course Outcomes (CO)

CO1: Tackle Division Algorithm, The Euclidean Algorithm, Fundamental Theorem of Arithmetic.

CO2: Handle Theory of Congruences: Chinese Remainder Theorem, Fermat Theorem, Wilson'sTheorem. CO3: Study Mobius Inversion Formula, different number theoretic functions

CO4: Understand Primitive Roots, Indices and the Quadratic Reciprocity Law, Theory of Indices

Paper-XVI Integral Transforms

Course Outcomes (CO)

CO1: Know the relation between differential and integral Transforms, and how to change from one to another.

CO2: Understand different kinds of kernels and use techniques for solving problems on each kind.

CO3: Explain Neumann series and solve Laplace and Fourier integral Transforms using appropriate methods.

CO4: Use Laplace transform, Fourier transform for solving a wide range of differential and integral equations.

Paper-XVII Fluid Mechanics – I

Course Outcomes (CO)

CO1: Understand basics of Topological Spaces

CO2: Study Connected Spaces, Limit Point Compactness, Local Compactness.

CO3: Achieve the zenith in treating Countable Axioms, Separable, Regular and Normal spaces.

CO4: Understand theorems like The Urysohn's Lemma, Urysohn's Metrization Theorem.

Paper-XVIII Difference Equations – I

Course Outcomes (CO)

CO1: Acquire the knowledge of Difference Calculus

CO2: Attain mastery to solve Linear Difference equations

CO3: Study Z-transform and stability Theory

CO4: Study in detail Phase plane analysis, and floquet theory

Paper-XIX Fractional Calculus and its Applications – I

Course Outcomes (CO)

CO1: Know the relation between differential and integral equations, and how to change from one to another.

CO2: Understand different kinds of kernels and use techniques for solving problems on each kind.

CO3: Explain Neumann series and solve linear Volterra and singular integral equations using appropriate methods.

CO4: Use Laplace transform, Fourier transform for solving a wide range of differential and integral equations

Paper-XX Tutorial –II

Semester-IV

Paper-XXI Numerical Analysis

Course Outcomes (CO)

CO1: Obtain the solutions of Transcendental and Polynomial Equations.

CO2: Find solutions of system of equations using direct methods and Iteration methods

CO3: Attain mastery to solve problems using interpolation.

CO4: Acquire knowledge of Numerical methods to find solution of Ordinary Differential Equations

Paper-XXII Abstract Algebra – II (Field Theory))

Course Outcomes (CO)

CO1: Understand the main algebraic properties of fields.

CO2: Analyze properties of algebraic, normal and separable extension

CO3: Compute Galois groups in simple cases and to apply the group-theoretic information to comprehend results about fields.

CO4: Develop knowledge of some classical Greek problems.

Paper-XXIII Classical Mechanics

Course Outcomes (CO)

CO1: Learn D-Alemberts principle and formulate Laganges equation of motion

CO2:Understand Calculus of variation and solve different problems

CO3:Formulate Hamiltonian equation and understand its physical significance

CO4:Gain knowledge of Eulerian angles and Cayley Klein parameters

Paper XIV Integral Equations

Course Outcomes (CO)

CO1: Know the relation between differential and integral equations, and how to change from one to another.

CO2: Understand different kinds of kernels and use techniques for solving problems on each kind.

CO3: Explain Neumann series and solve linear Volterra and singular integral equations using appropriate methods.

CO4: Use Laplace transform, Fourier transform for solving a wide range of differential and integral equations.

Paper-XXV Fluid Mechanics – II

Course Outcomes (CO)

CO1: Understand basics of Topological Spaces

CO2: Study Connected Spaces, Limit Point Compactness, Local Compactness.

CO3: Achieve the zenith in treating Countable Axioms, Separable, Regular and Normal spaces.

CO4: Understand theorems like The Urysohn's Lemma, Urysohn's Metrization Theorem.

Paper-XXVI Difference Equations – II

Course Outcomes (CO)

CO1: Acquire the knowledge of Difference Calculus

CO2: Attain mastery to solve Linear Difference equations

CO3: Study Z-transform and stability Theory

CO4: Study in detail Phase plane analysis, and floquet theory

Paper-XXVII Algebraic Gemetry

Course Outcomes (CO)

CO1: Understand the proof of Hilbert Nullstellensatz and the concept of rational maps

CO2: Deduce the algebraic characterizations of the dimension of a variety.

CO3: Classify the smooth cubics and understand the group structure of elliptic curve.

CO4: Configuration of lines on cubics and rationalize the cubics.

Paper-XXVIII Commutative Algebra

Course Outcomes (CO)

On completion of the course the student should have the following learning outcomes defined in terms of knowledge, skills and general competence:

CO1: Understand the proof of snake lemma and construction of tensor product

CO2: Explain localization of rings and master the concepts like extended and contracted ideals in ring of fractions

CO3: Construct the proof of the primary decomposition of ideals, going up and going down theorems. CO4: Identify the relation between Artin and Noetherian rings; relate with Dedekind domains.

Paper-XXIX Fractional Calculus and its Applications – II

Course Outcomes (CO)

CO1: Know the relation between differential and integral equations, and how to change from one to another.

CO2: Understand different kinds of kernels and use techniques for solving problems on each kind.

CO3: Explain Neumann series and solve linear Volterra and singular integral equations using appropriate methods.

CO4: Use Laplace transform, Fourier transform for solving a wide range of differential and integral equations