"Education for Knowledge, Science, and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur (Autonomous)

KOLHAPUR (AUTONOMOUS)

Department Of Mathematics

Course Outcomes (COs)

M.Sc. Part II Mathematics (Introduced in the year 2022)	
Semester III	
Functional Analysis(CC-1180C)	
CO No.	**On completion of the course, student will be able to:**
CO1	To familiarize the students with the fundamental topics, principles and methods of functional analysis
CO2	Understand and apply fundamental theorems from the theory of normed and Banach spaces, including the Hahn-Banach theorem, the open mapping theorem, the closed graph theorem.
CO3	Able to understand Hilbert space and its application and acquire knowledge of orthogonal sets and operators
CO4	Understand Adjoint of an operator on a Hilbert space and concept of projection, self – adjoint, normal and unitary operator.
Advanced Discrete Mathematics(CC-1181C)	
CO No.	**On completion of the course, student will be able to:**
CO1	Solve discrete probability problems and use set to solve problems in combinatorics and probability theory.
CO2	Determine if a given graph is simple or a multigraph, directed or undirected graph, cyclic or acyclic, and determine the connectivity of a graph.
CO3	To determine if graph has a Euler or a Hamiltonian path or circuit, Define Pigeonhole principle and solve problems related to this.
CO4	Identify the types of Lattices and find supremum and infimum.
Number Theory (CBC-1183C)	
CO No.	**On completion of the course, student will be able to:**
CO1	learn more advanced properties of primes and pseudo primes.
CO2	Able to apply Mobius Inversion formula to number theoretic functions
CO3	Able to explore basic idea of cryptography.
CO4	Understand concept of primitive roots and index of an integer relative to a given primitive root.

Fuzzy Mathematics I (CBC-1185C)	
CO No.	**On completion of the course, student will be able to:**
CO1	Acquire the knowledge of notion of crisp sets and fuzzy sets
CO2	Understand the basic concepts of crisp set and fuzzy sets
CO3	Develop the skill of operation on fuzzy sets and fuzzy arithmetic's
CO4	Demonstrate the technologies of fuzzy sets and fuzzy numbers
Operational Research –I (CBC-1184C)	
CO No.	**On completion of the course, student will be able to:**
CO1	Able to identify convex set and convex functions and construct linear integer programming models discuss the solution techniques
CO2	Able to solve multi –level decision problems using dynamic programming method.
CO3	Able to identify the appropriate methods to solve the different kinds of Optimization Problems.
CO4	Formulate the nonlinear programming models and able to find solution methods for solving the nonlinear and linear optimization problems.
Lattice Theory - I (CBC-1182C)	
CO No.	**On completion of the course, student will be able to:**
CO1	Understand the relation between posets and lattices
CO2	Study the basic properties and characterization of lattice
CO3	Understand and apply the distributive complemented lattice
CO4	Design analyse and implement the concepts of stone's theorem and its consequence, pseudo complemented lattices and it's dual
Dynamical System I (CBC-1186C)	
CO No.	**On completion of the course, student will be able to:**
CO1	Classify equilibrium points of the dynamical system
CO2	Construct bifurcation diagrams and analyze the system for different values of parameter.
CO3	Relate the qualitative properties of the system with the eigen values of coefficient matrix.
CO4	Construct the exponential of a matrix and apply it to solve the dynamical system.
Commutative Algebra (CBC-1187C)	
CO No.	**On completion of the course, student will be able to:**
CO1	Classify the ideals to solve the related problems.
CO2	Understand various radicals and know Hilbert basis theorem and apply it to other development.

CO3	Use Nakayama Lemma for further development in Noetherian Rings.
CO4	Derive the Krull intersection theorem

Semester IV

Field Theory (CC-1190D)

CO No.	On completion of the course, student will be able to:
CO1	Apply the knowledge of algebra to attain a good mathematical maturity and enables to build mathematical thinking and reasoning
CO2	Identify and analyse different types of algebraic structures such as algebraically closed fields, splitting fields, finite field extension to understand and use the fundamental results in Algebra
CO3	Design analyse and implement the concepts of Gauss lemma, separable extension etc.
CO4	Identify the challenging problems in advanced algebra to pursue further research.

Measure and Integration (CC-1199D)

CO No.	On completion of the course, student will be able to:
CO1	Understand algebra of sets, open and closed sets of real number and outer measure and measurable sets
CO2	Understand the abstract measure theory and definition and main properties of the integral
CO3	Able to construct Lebesgue's measure on the real line and in n-dimensional Euclidean space.
CO4	Able to use the concept of measure theory to solve the problems related to probability theory, stochastic calculus and functional analysis

Algebraic Number Theory (CBC-1192D)

CO No.	On completion of the course, student will be able to:
CO1	Understand The concept (definition and significance) of algebraic numbers and algebraic integers.
CO2	Understand and clearly define number fields and their ring of integers, in particular quadratic number fields and cyclotomic number fields.
CO3	Able to factorise an algebraic integer into irreducible and find the ideals of an algebraic number ring.
CO4	Able to compute the class groups and the group of units of a number field.

Fuzzy Mathematics II (CBC-1193D)

CO No.	On completion of the course, student will be able to:
CO1	Acquire the concept of fuzzy relations
CO2	Understand the basic concepts of fuzzy logic and fuzzy algebra
CO3	Construct approximate solutions of fuzzy relation equations
CO4	Solve problems in Engineering and medicine

Operational Research –II (CBC-1194D)	
CO No.	**On completion of the course, student will be able to:**
CO1	Decide an optimal replacement period/policy for a given item/equipment/machine
CO2	Understand the various selective inventory control techniques and its applications. Capability to develop deterministic inventory models
CO3	Understand the mathematical modeling of queuieng systems To apply and extend queueing models to analyze real world systems.
CO4	Understand application of PERT and CPM techniques and able to construct network diagrams.
Introduction to Data Science (CBC-1195D)	
CO No.	**On completion of the course, student will be able to:**
CO1	Having an ability to apply mathematics and science in AI and machine learning applications
CO2	Having computational thinking (Ability to translate vast data into abstract concepts and to understand database reasoning)
CO3	Having problem-solving ability- solving social issues and engineering problems
CO4	Having an ability to use techniques, skills and modern engineering tools necessary for engineering practice
Dynamical System II (CBC-1196D)	
CO No.	**On completion of the course, student will be able to:**
CO1	Test for the existence and uniqueness of solution of nonlinear system.
CO2	Relate the stability of the system with its linearization.
CO3	Distinguish between stable and unstable sets corresponding to the given system.
CO4	Identify the chaotic behaviour in the system by using Lyapunov exponents
Combinatorics (CBC-1197D)	
CO No.	**On completion of the course, student will be able to:**
CO1	Students will familiar with fundamental combinatorial structures than naturally appears in various other field of mathematics.
CO2	Learn how to use those structure to represent mathematical applied questions
CO3	Able to use generating function to solve a variety of combinatorial problems
CO4	Identify the challenging problems in arrangement and selections
Fractional Calculus (CBC-1198D)	
CO No.	**On completion of the course, student will be able to:**
CO1	Understand G-L and RL-fractional integral and evaluate fractional integrals of some common functions

CO2	RL and Caputo-fractional derivatives and evaluate fractional derivatives of some common functions
CO3	To Solve Linear Fractional Differential Equation using the Laplace and Mellin transform
CO4	study of fractional differential Equations

(S. P. Thorat)
HEAD
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