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

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur

(Empowered Autonomous)

Department Of Mathematics

Course Outcomes (COs)

M.Sc. Part I Mathematics (Introduced in the year 2023)	
Semester I	
Modern Algebra (DSC13MAT11)	
CO No.	**On completion of the course, student will be able to:**
CO1	Check solvability of groups via Sylows theorems.
CO2	Check irreducibility of polynomial over any field.
CO3	Becomes familiar with theory of modules and submodules.
CO4	Understand concepts of rings over Rings of polynomial.
Ordinary Differential Equations (DSC13MAT12)	
CO No.	**On completion of the course, student will be able to:**
CO1	Find the linearly independent and hence general solutions of given differential equations
CO2	Find series solution of Bessel's and Legendre's differential equations.
CO3	Apply Picard's successive approximation method to find approximate solution of initial value problem.
CO4	Apply the Lipschitz condition of successive approximation.
Measure and Integration (DSC13MAT13)	
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 characterize Riemann and Lebesgue integrability.

Numerical Analysis - I (DSC13MAT14)	
CO No.	**On completion of the course, student will be able to:**
CO1	Apply the methods to solve linear and non linear equations
CO2	Solve differential equations using various numerical methods
CO3	Determine eigen values and eigen vector of a square matrix
CO4	Construct LU decomposition of a square matrix
Operation Research (DSE13MAT11)	
CO No.	**On completion of the course, student will be able to:**
CO1	Identify Convex set and convex functions.
CO2	Construct linear integer programming models and discuss the solution techniques,
CO3	Formulate the nonlinear programming models, and propose the best strategy using decision making methods
CO4	Solve multi –level decision problems using dynamic programming method.
Introduction to data science (DSE13MAT12)	
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 technique, skills and modern engineering tools necessary for engineering practice
Dynamical System - I (DSE13MAT13)	
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.

Research Methodology (MIN13MAT11)	
CO1	Design and formulate research problem and Analyse research related information and follow research ethics.
CO2	Recognize that today's world is controlled by Computer, Information Technology but tomorrow world will be ruled by ideas, concept, and creativity.
CO3	Describe when IPR would take such important place in growth of individuals & nation and to emphasise the need of information about Intellectual Property Right to be promoted among students.
CO4	Analyse that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products

Semester II

Linear Algebra (DSC13MAT21)	
CO No.	**On completion of the course, student will be able to:**
CO1	Understand basic notions in linear algebra and use the results in developing advanced mathematics.
CO2	Study the properties of vector spaces, linear transformations, algebra of linear transformations and inner product spaces in detail.
CO3	Construct canonical forms and bilinear forms.
CO4	Apply knowledge of vector space, linear transformations, canonical forms and bilinear transformations

General Topology (DSC13MAT22)	
CO No.	**On completion of the course, student will be able to:**
CO1	build foundation for future study in analysis, in geometry and in algebraic topology.
CO2	introduce the fundamental concepts in topological spaces.
CO3	identify compact and connected sets in topological spaces.
CO4	use separation and countability axioms, Urysohn lemma, Urysohn metrization theorem and Tychonoff theorem.

Advanced Calculus (DSC13MAT23)	
CO No.	**On completion of the course, student will be able to:**
CO1	Analyze convergence of sequence and series, double sequences and double series

CO2	Analyze convergence of sequences and series of functions
CO3	Check differentiability of functions of several variables
CO4	Apply inverse and implicit functions theorem for functions of several variables

Numerical Analysis - II (DSC13MAT24)

CO No.	On completion of the course, student will be able to:
CO1	Apply the methods to solve linear and non linear equations
CO2	Find numerical integration and analyze error in computation
CO3	Solve differential equations using various numerical methods
CO4	To check convergence and stability of numerical ethods

Number Theory (DSE13MAT21)

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 (DSE13MAT22)

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

Dynamical system II (DSE13MAT23)

CO No.	On completion of the course, student will be able to:
CO1	relate the stability of the system with its linearization.
CO2	distinguish between stable and unstable sets corresponding to the given system.
CO3	construct the local stable manifolds for the nonlinear system.
CO4	identify the chaotic behaviour in the system by using Lyapunov exponents.

VIVEKANAND COLLEGE KOLHAPUR (Empowered Autonomous) ESTD JUNE 1964

Thorat

(Prof. S. P. Thorat)
HEAD
Department of Mathematics
Vivekanand College, Kolhapur