SHIVAJI UNIVERSITY, KOLHAPUR.

Accredited By NAAC with 'A++' Grade

Structure and Syllabus in Accordance with

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)

Bachelor of Science – Part III (Mathematics)

Semester V and VI

under the

Faculty of Science and Technology

(To Be Implemented from Academic Year 2024-25)

B.Sc. (Mathematics) (Part III) (Semester – V)
Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

1. Title : Mathematics
2. Year of implementation : Academic Year 2024–25
3. Duration : The duration of the course shall be one year and two semesters
4. Pattern : Semester
5. Structure of Course :

Paper-No.	Course Code	Title of the Paper	Total Marks	Theory/ Practical perweek
		Semester-V		
IX	DSC-E9	Real Analysis	50	03
X	DSC-E10	Modern Algebra	50	03
XI	DSC-E11	Partial Differential Equations	50	03
XII	DSC-E12	Integral Transform	50	03
		Semester-VI		
XIII	DSC-F9	Metric Spaces	50	03
XIV	DSC-F10	Linear Algebra	50	03
XV	DSC-F11	Complex Analysis	50	03
XVI	DSC-F12	Operations Research	50	03
		(Semester III & IV)		
CCPM-IV		Problems on Operations Research	50	05
CCPM-V		Problems on Laplace and Fourier Transform	50	05
CCPM-VI		Mathematical Computation Using Python	50	05
CCPM-VII		Project and Study Tour	50	05

B.Sc. (Mathematics) (Part III) (Semester – V)
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Syllabus to be implemented from Academic Year 2024-25

Course code	:	DSE – E9
Title of course	:	Real Analysis
Theory	:	32 Hrs. (40 lecturers of 48 min.)
Marks	:	50 (Credit: 02)

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. understand the basic facts about functions and countability of sets

CO 2. recognize bounded, convergent, divergent, Cauchy and monotonic sequences.

CO 3. calculate limit superior, limit inferior, and the limit (when exists) of a sequence..

CO 4. use different tests for convergence and absolute convergence of an infinite series of real numbers.

Unit 1: Functions and Sequence of real numbers

(20 Lect.)

1.1. Functions

1.1.1. Definitions: Cartesian product, Function, domain and range of a function, inverse image and image of a set under a function, extension and restriction of functions, one - to - one (or 1 - 1) function, onto function.

1.1.2. Real-valued functions.

1.1.3. Equivalence and Countability.

1.1.4. Real numbers.

1.1.5. Least upper bounds.

1.2. Sequence of real numbers

1.2.1. Definition of sequence and subsequence.

1.2.2. Limit of a sequence.

1.2.3. Convergent sequence.

1.2.4. Divergent sequences.

1.2.5. Bounded sequences.

1.2.6. Monotone sequences.

1.2.7. Operations on convergent sequences.

1.2.8. Limit superior and limit inferior.

1.2.9. Cauchy sequences.

1.2.10. Summability of sequences.

Unit 2: Series of real numbers

2.1. Convergence and divergence.

2.2. Series with nonnegative terms.

2.3. Alternating series.

2.4. Conditional convergence and absolute convergence.

2.5. Tests for absolute convergence.

2.6. Series whose terms form nonincreasing sequence.

2.7. (C,1) summability of series.

2.8. The class ℓ^2

Recommended Books:

1. R. R. Goldberg, **Methods of Real Analysis**, Indian Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Scope of Syllabus:

Unit 1: Chapter 1: Sec.: 1.3, 1.4, 1.5, 1.6, 1.7; Chapter 2: Sec.: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11

Unit 2: Chapter 3: Sec.: 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.9, 3.10

Reference Books:

1. Steven G. Krantz, **Real Analysis and Foundations**, Second Edition, Chapman and Hall/CRC.

2. Shanti Narayan and M. D. Raisinghania, **Elements of Real Analysis**, Fifteenth Revised Edition, S. .Chand & Company Ltd. NewDelhi, 2014.

3. Kenneth.A.Ross, **Elementary Analysis: The Theory of Calculus**, Second Edition, Undergraduate Texts in Mathematics, Springer , 2013.

4. R.G.Bartle and D.R.Sherbert, **Introduction to Real Analysis**, Fourth Edition, Wiley India Pvt. Ltd., 2016.