

SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A++' Grade

Structure and Syllabus in Accordance with
National Education Policy - 2020
with Multiple Entry and Multiple Exit

Bachelor of Science (Mathematics) Part I (Level-4.5)

Semester I and II

under the

Faculty of Science and Technology

(To Be Implemented from Academic Year 2024-25)

PROGRAM STRUCTURE:

**Structure in Accordance with National Education Policy - 2020
With Multiple Entry and Multiple Exit Options
B.Sc. (Mathematics) Part – I (Level-4.5)**

SEM (Level)	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP /CC/RP	Total Credits	Degree/Cum. Cr. MEME
	Course-1 Mathematics	Course-2	Course-3						
SEM - I (4.5)	DSC-I (2): Basic Algebra	DSC-I(2)	DSC-I(2)	OE-1 (2) (T) Quantitative Aptitude for Competitive Examinations		IKS-I(2)		22	UG Certificate 44
	DSC-II (2): Calculus	DSC-II (2)	DSC-II (2)						
SEM - II (4.5)	DSC P-I (2): Mathematics Practical - I	DSC P-I(2)	DSC P-I (2)	OE-2 (2) (P) Practicals on Quantitative Aptitude		VEC-I(2) (Democracy, Election and Constitution)		22	
	DSC-III (2): Differential Equations - I	DSC-III(2)	DSC-III (2)						
Credits	DSC-IV (2): Discrete Mathematics DSC P-II (2): Mathematics Practical - II	DSC-IV (2) DSC P-II (2)	DSC-IV (2) DSC P-II (2)	2+2=4 (T/P)	-	2+2=4	-	44	Exit Option: 4 credits NSQF/Internship/Skill courses
	8(T)+4(P)=12	8(T)+4(P)=12	8(T)+4(P)=12						

Abbreviations:

AEC	Ability Enhancement Course
CC	Co-curricular Courses
CEP	Community Engagement and Service
DSC	Department Specific Core
DSE	Department Specific Elective
FP	Field Project
GE	Generic Elective
IDC	Inter-Disciplinary Course
IKS	Indian Knowledge System
MDC	Multi-Disciplinary Course
MIN	Minor
OE	Open Elective
OEC	Open Elective Course
OJT	On Job Training
P	Practical
RP	Research Project
SEC	Skill Enhancement Course
T	Theory
VEC	Value Education Course
VSC	Vocational Skill Course

B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – I)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type : **DSC – I**
Title of course : **Basic Algebra**
Credit : **02**

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

- CO 1. apply De-Moivre's theorem.
- CO 2. find rank, eigen values, eigen vectors of the matrix.
- CO 3. solve system of linear homogeneous and non-homogeneous equations.
- CO 4. understand Hermitian and Skew Hermitian matrices.

UNIT – 1: ALGEBRA OF COMPLEX NUMBERS

(15 hrs.)

- 1.1. Sums and Products, Moduli, Polar form, Geometrical representation of Complex Numbers, Exponential form, arguments of Products and Quotients.
- 1.2. De-Moivre's Theorem and examples
- 1.3 Applications of De-Moivre's Theorem
 - 1.3.1 n^{th} roots of unity.
 - 1.3.2 Expansion of $\cos n\theta$, $\sin n\theta$
 - 1.3.3 Circular functions and hyperbolic functions.
 - 1.3.4 Relations between circular and hyperbolic functions.
 - 1.3.5 Inverse circular and hyperbolic functions.

UNIT – 2: MATRICES

(15 hrs.)

- 2.1. Introduction
- 2.2 Definitions of Hermitian and Skew Hermitian matrices.
- 2.3. Properties of Hermitian and Skew Hermitian matrices.
- 2.4. Rank of a Matrix, Row-echelon form and reduced row echelon form, normal form.
- 2.5. System of linear homogeneous and non-homogeneous equations.
 - 2.5.1. Condition for consistency.
 - 2.5.2. Nature of the general solution.
 - 2.5.3. Gaussian elimination and Gauss Jordan method
(Using row-echelon form and reduced row echelon form).
 - 2.5.4. Examples based on 2.4.1, 2.4.2 and 2.4.3.
- 2.6. Characteristic equation, eigen values and eigen vectors of a matrix and examples
- 2.7. Cayley Hamilton theorem and examples.

Recommended Books:

1. **Applied Mathematics** by Ch.V. Ramana Murthy, N. C. Shrinivas, S. Chand and Company Ltd., 1st Edition, 2001.
Scope: Unit-I: Chapter No. 1: Art.1.2 to Art.1.13, Art. 1.15, Art. 1.17 to Art. 1.19, Art.1.23
2. **Higher Engineering Mathematics** by H. K. Dass, Er. Rajnish Verma, S. Chand and Company Pvt. Ltd. 3rd Revised Edition 2014.
Scope: Unit-II: Art. 19.1 to Art. 19.3, Art. 21.1 to Art. 21.6, Art. 21.27 to Art. 21.30, Art. 20.1 to Art. 20.4

Reference Books:

1. **Elementary Linear Algebra (Application Version)**, Howard Anton and Chris Rorres, 10th Edition, 2010.
2. **Complex Variables and Applications**, James Ward Brown and Ruel V. Churchill, Mc-Graw Hill, 8th Edition, 2009.
3. **Modern Algebra**, A. R. Vasishtha, Krishna Prakashan, Meerut 1994.
4. **A Text Book of Matrices** - Shanti Narayan (Revised by P. K. Mittal), S. Chand and Co., 11th Edition, reprint 2007.