FIRST-YEAR OF BACHELOR OF SCIENCE MAJOR MATHEMATICS REVISED SYLLABUS ACCORDING TO CBCS NEP2020

COURSE TITLE: ALGEBRA II SEMESTER-II, W.E.F. 2023-2024

RECOMMENDED BY THE BOARD OF STUDIES IN MATHEMATICS
AND
APPROVED BY THE ACADEMIC COUNCIL

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal.Sangmeshwar, Dist. Ratnagiri-415804, Maharashtra, India

Academic Council Item No: _____

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Bachelor of Science
Name of the Department	:	Mathematics
Name of the Class	:	First Year
Semester	:	First
No. of Credits	:	02
Title of the Course	:	Algebra-II
Course Code	:	S104MTT
Name of the Vertical in adherence to NEP 2020	:	Major and Minor
Eligibility for Admission	:	Any 12^{th} Pass seeking Admission to Degree Programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	UG
Pattern of Marks Distribution for TE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2023-2024
Ordinances /Regulations (if any)		

Syllabus for First Year of Bachelor of Science in Mathematics

(With effect from the academic year 2023-2024)

SEMESTER-I **Paper No.– Mathematics Paper- II**

Course Title: Calculus-I **No. of Credits - 02**

Type of Vertical: Major and Minor **COURSE CODE: S104MTT**

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to…

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	Remember the fundamental concepts of sequence, series and maxima and minima of a function.
CLO-02	Understand	Understand convergence and divergence of a sequence and series, and mean value theorems
CLO-03	Apply	Apply tests for maxima and minima to find extreme values and L'Hospital rule.
CLO-04	Analyze	Analyze convex and concave functions and graphing of a functions

Syllabus for First Year of Bachelor of Science in Mathematics

(With effect from the academic year 2023-2024)

SEMESTER-II **Paper No.– Mathematics Paper -II**

Course Title: Algebra- II **No. of Credits - 02**

Type of Vertical: Major and Minor **COURSE CODE: S104MTT**

Module No.	Content	No. of Lectures
1 System of Equations and Matrices	1. Parametric Equation of Lines and Planes , System of homogeneous and non homogeneous linear Equations, The solution of m homogeneous linear equations in n unknowns by elimination and their geometrical interpretation for (m, n) = (1,2), (1,3), (2,2), (2,2), (3,3); Definition of n-tuple of real numbers, sum of n-tuples and scalar multiple of n-tuple. Deduce that the system of m homogeneous linear equations has a non trivial solution if m < n. 2. Matrices with real entries; addition, scalar multiplication of matrices and multiplication of matrices, transpose of a matrix, types of matrices: zero matrix, identity matrix, scalar matrix, diagonal matrix, upper and lower triangular matrices, symmetric matrix, skew symmetric matrix, invertible matrix; Identities such as $(AB)^t = B^t A^t$, $(AB)^{-1} = B^{-1}A^{-1}$ 3. System of linear equations in matrix form , Elemetary row operations , row echelon matrix, Gausian elimination method.	10
2 Vector Spaces	1. Definition of real vector space , Examples such as$\mathbb{IR}^n$, $IR[x], M_{m\times n}(IR)$space of real valued functions on a non empty set. 2. Subspace: definition, examples: lines , planes passing through origin as subspaces of respectively; upper triangular matrices, diagonal matrices, symmetric matrices, skew–symmetric matrix as subspaces of $M_n\ (IR)$ (n = 2,3) ; $p_n(x)= a_0 + a_1x + a_2x^2 + \cdots \ldots \ldots \ldots + a_nx^n$, $a_i \in R$, $\forall 1 \leq i \leq n$ as subpace of , $IR[x]$, the space of allsolutions of the system of m homogeneous linear equations in n unknowns as a subspace ofIR^n . 3. Properties of a subspace such as necessary and sufficient	10

	conditions for a non empty subset to be a subspace of a vector space, arbitrary intersection of subspaces of aVector space is a subspace, union of two subspaces is a subspace if and only if one is the subset of other. 4. Finite linear combination of vectors in a vector space; linear span L(S) of a non empty subet S of a vector space, S is generating set for L(S), L(S) is a vector subspace of V; Linearly independent/ Linearly Dependent subsets of a vector space, a subset $\{v_1, v_2, \ldots\ldots v_k\}$is linearly dependent if and only $\exists \in \{1,2, \ldots k\}$ such that v_i is a linear combination of other vectors 's $v_j\,'s$.	
3 **Basis of a Vector Space and Linear Transformation**	1. Basis of a vector space, dimension of a vector space, maximal linearly independent subset of a vector space is a basis of a vector space, any two basis of a vector space have same number of elements, any set of n linearly independent vectors in an n dimensional vector space is a basis, any collection of n+1 vectors in an n-dimensional vector space is linearly dependent. 2. Extending any basis of a subspace W of a vector space V to a basis of the vector space V. If $W_1\ and\ W_2$, are two subspaces of a vector space V then $W_1 + W_2$is a subspace, $\dim(W_1 + W_2) = \dim(W_1) + \dim(W_2) - \dim(W_1 \cap W_2)$. 3. Linear Transformations; Kernel, Image of a Linear Transformation T ,Rank T, Nullity T, properties such as: kernel T is a subspace of domain space of T and Img T is a subspace of codomain subspace of T. If V= $\{v_1, v_2, \ldots\ldots\ldots v_n\}$is a basis of V and W = $\{w_1, w_2, \ldots\ldots w_n\}$any vectors in W then there exists a unique linear transformation T: V→ W such that $T(v_j) = w_j = \forall\ 1 \le i \le n$, Rank nullity theorem (statement only) and examples.	10
	Total	30

Required Previous Knowledge

Basic Mathematics Knowledge is necessary before starting to learn the course.

Access to the Course

The course is available for all the students admitted for Bachelor of Science as a Major or a minor. The students seeking admission in other disciplines may select the course as a minor considering the terms and conditions laid down by the University of Mumbai, the Government of Maharashtra, and the college, from time to time.

Forms of Assessment

The assessment of the course will be of Diagnostic, Formative and Summative type. At the beginning of the course diagnostic assessment will be carried out. The formative assessment will be used for the Continuous Internal Evaluation whereas the summative assessment will be conducted at the end of the term. The weightage for formative and summative assessment will be 60:40. The detailed pattern is as given below.

Question Paper Pattern
Time: 1 hour

Question No.	Question Pattern	Marks
Q.1	Short Answer Questions (based on Unit I)	10
Q.2	Long Answer Questions (based on Unit II)	10
Q.3	Long Answer Questions (based on Unit III)	10
Total		30

Internal evaluation (20 Marks)

Sr. No.	Description	Marks
1	Mid Term Examination	10
2	Active Participation in teaching learning Process	05
3	Subject related activities as assigned by the teacher	05
	Total	**20**

Grading Scale

The grading scale used is O to F. Grade O is the highest passing grade on the grading scale, and grade F is a fail. The Board of Examinations of the college reserves the right to change the grading scale.

References:

1. S. Kumaresan , Linear Algebra , Prentice Hall of India Pvt limited .
2.
3. K.Hoffmann and R. Kunze Linear Algebra, Tata MacGraw Hill, New Delhi, 1971
4. Gilbert Strang , Linear Algebra and it's Applications, International Student Edition.
5. L. Smith , Linear Algebra, Springer Verlang
6. A. RamchandranRao, P. Bhimashankaran; Linear Algebra Tata Mac Graw Hill.
7. Serge Lang, Introduction to Linear Algebra, Second edition Springer.