

Scheme of
B.Sc. Physical Science-(Mathematics)
AND
B.A. Multidisciplinary-(Mathematics)
(Scheme UG A1: Undergraduate Programs)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A1	Calculus	240/MATP/CC101	3	--	2	3	-	1	4	25	50	5	20	100

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A2	Algebra	240/MATP/CC201	3	--	2	3	-	1	4	25	50	5	20	100

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A3	Ordinary and Partial Differential Equations	240/MATP/CC301	3	--	2	3	-	1	4	25	50	5	20	100

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A4	Sequence and Series	240/MATP/CC401	3	--	2	3	-	1	4	25	50	5	20	100

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Semester 5

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A5	Integral Transforms	240/MATP/CC501	3	--	2	3	-	1	4	25	50	5	20	100

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A6	Mathematical Analysis	240/MATP/CC601	3	--	2	3	-	1	4	25	50	5	20	100

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Semester-I

Session: 2025-26

Part A – Introduction

Subject	Mathematics		
Semester	I		
Name of the Course	Calculus		
Course Code	CC-A1		
Course ID	240/MATP/CC101		
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC		
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand and apply concepts of limit, continuity, and differentiability. 2. Understand asymptotes and curvature, their geometrical meanings, and solve related problems. 3. Identify and classify singular points of curves, understand curve rectification, and derive reduction formulae. 4. Evaluate areas bounded by curves, and determine the volume and surface area of solids formed by the revolution of curves.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	25	5	30
End Term Assessment Marks	50	20	70
Examination Time	3 Hours	3 Hours	100

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Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Limit and continuity of a real valued function, Basic properties of limits, Types of discontinuities, Differentiability of functions, Indeterminate forms, Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's series expansion with different forms of remainder.	12
II	Asymptotes: Horizontal, vertical and oblique asymptotes for algebraic curves, Asymptotes for polar curves, Intersection of a curve and its asymptotes, Curvature and radius of curvature of curves (Cartesian, Parametric, Polar & Intrinsic forms).	12
III	Multiple points, Node, Cusp, Conjugate point, Tests for concavity and convexity, Points of inflexion, Tracing of curves, Reduction formulae.	11
IV	Rectification, intrinsic equation of a curve, Quadrature, Area bounded by closed curves, Volumes and surfaces of solids of revolution.	10

Practical

The practical component of the course has two parts

(A) Problem Solving- Questions related to the following problems will be solved and their record will be maintained in the Practical Notebook:

1. Problems of curve tracing when equation is given in Cartesian coordinates.
2. Problems of curve tracing when equation is given in Parametric form.
3. Problems of curve tracing when equation is given in Polar coordinates.
4. Problem of determination of length of a curve expressed in Cartesian coordinates.
5. Problem of determination of length of a curve expressed in Polar coordinates.
6. Problem of determination of radius of curvature expressed in Cartesian coordinates.
7. Problem of determination of radius of curvature expressed in Polar coordinates.
8. Problem of determination of radius of curvature expressed in Parametric form.
9. Problem of determination of volumes and surfaces of solids of revolution for Cartesian curve.
10. Problem of determination of volumes and surfaces of solids of revolution for Parametric curve.
11. Problem of determination of volumes and surfaces of solids of revolution for Polar

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(b) The following practicals will be done using MAXIMA software and their record will be maintained in the practical note book:

1. Learn to use basic operators and functions in Maxima software.
2. Simplify algebraic expressions and expressions containing radicals, logarithms, exponentials and trigonometric functions.
3. Expand algebraic, rational, trigonometric and logarithmic expressions.
4. Find derivatives of algebraic, trigonometric, exponential and logarithmic functions.
5. Find derivatives of functions involving above mentioned functions.
6. Problems of successive differentiation.
7. Find indefinite integrals of different functions.
8. Find definite integrals of different functions.
9. To plot curves involving cartesian, parametric and polar forms.
10. To demonstrate singular points.

Suggested Evaluation Methods

Internal Assessment:

> Theory 25

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 10
- Mid-Term Exam: 10

> Practicum 5

- Seminar/Demonstration/Viva-voce/Lab records etc.: 5

End Term Examination:

> Theory 50

- Written Examination

> Practicum 20

- Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. H. Anton, I. Bivens & S. Davis (2021), *Calculus (12th edition)*, J. Wiley & Sons.
2. G. Klambauer (1986), *Aspects of Calculus* (4th edition). Springer.
3. W. Krawcewicz & B. Rai (2003), *Calculus with Maple Labs*. Alpha Science Int'l Ltd.
4. G. Prasad (2016), *Differential Calculus* (19th edition). Pothishala Pvt. Ltd.
5. G. B. Thomas Jr., J. Hass, C. Heil & M. D. Weir (2018), *Thomas' Calculus* (14th edition). Pearson Education.
6. S. Narayan (2003), *A Textbook of Vector Calculus*. S. Chand Publishing, 2003.
7. M. R. Spiegel & R. Wrede (2002), *Theory and Problems of Advanced Calculus*. Schaum Publishing Co., New York.

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Semester-II			
Session: 2025-26			
Part A – Introduction			
Subject	Mathematics		
Semester	II		
Name of the Course	Algebra		
Course Code	CC-A2		
Course ID	240/MATP/CC201		
Course Type: (CC/ MIC/ MDC/VOC/ AEC/ VAC/SEC)	CC		
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes(CLOs)	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Understand types of matrices, operations, rank, inverse, eigen values, eigenvectors, and Cayley-Hamilton theorem. 2. Solve linear equations with matrices, understand consistency, and also understand bilinear and quadratic forms. 3. Analyze polynomial equations, solve with root conditions, and apply Descartes' rule of signs. 4. Solve cubic equations, understand divisibility, gcd, lcm, prime numbers, and the fundamental theorem of arithmetic. 		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	25	5	30
End Term Assessment Marks	50	20	70

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Examination Time	3 Hours	3 Hours	100
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Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering the entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices, Elementary operations on matrices, Rank of a matrix, Inverse of a matrix, Linear dependence and independence of rows and columns of matrix, Row rank and column rank of a matrix, Eigenvalues, Eigen vectors and characteristic equation of a matrix, Minimal polynomial of a matrix, Cayley-Hamilton theorem.	12
II	Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.	12
III	Relations between the roots and coefficients of a general polynomial equation in one variable, Solutions of polynomial equations having conditions on roots, Common roots and multiple roots, Transformation of equations, Nature of the roots of an equation, Descarte's rule of signs.	11
IV	Solutions of cubic equations (Cardon's method), Divisibility, greatest common divisor (gcd), least common multiple (lcm), Prime numbers, Fundamental theorem of Arithmetic.	10

Practical

<p>The practical component of the course has two parts:</p> <p>A) Problem Solving: Questions related to the following problems will be worked out and record of those will be maintained in the Practical Notebook:</p> <ol style="list-style-type: none"> 1. Problems to find the row rank and column rank of a matrix. 2. Problems to find the eigen values and eigen vectors of a matrix. 3. Problems to find the minimal polynomial of a matrix. 4. Problems of finding inverse of a matrix using CayleyHamilton theorem. 5. Problems of solving cubic equations by Cardon's method. 6. Problems of solving biquadratic equations by Descarte's method. 7. Problems of solving biquadratic equations by Ferrari's method. 8. Problems to find gcd and lcm of two integers. 9. Problems to find solution of linear congruence using Euler's theorem. 10. Problems to find common solution of congruences using Chinese remainder theorem 	30
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B) The following practicals will be done using MAXIMA Software and their record will be maintained in the practical note Book:

1. To find roots of algebraic equations.
2. To find multiple roots of algebraic equations.
3. To find the value of a determinant.
4. To compute inverse of a square matrix.
5. To find eigen values of a square matrix.
6. To find eigen vectors of a square matrix.
7. To solve system of linear equations.
8. Problems to find gcd and lcm of two or more integers.
9. Problems of solving biquadratic equations by Ferrari's method.

Suggested Evaluation Methods

Internal Assessment:

➤ Theory 25

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 10
- Mid-Term Exam: 10

➤ Practicum 5

- Seminar/Demonstration/Viva-voce/Lab records etc.: 5

End Term Examination:

➤ Theory 50

Written Examination

➤ Practicum 20

Lab record, viva- voce, written examination.

Recommended Books:

1. H.S. Hall & S.R. Knight (1994), *Higher Algebra*. H.M. Publications.
2. S. Narayan & P. K. Mittal (2010), *A Text Books of Matrices*. S. Chand Publications.
3. K. B. Dutta (2004). *Matrix and Linear Algebra*. Prentice Hall of India Pvt. Ltd.
4. C. Prasad (1991), *Text Book on Algebra and Theory of Equations*. Pothishala Private Ltd., Allahabad.

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