

KUVEMPU



UNIVERSITY

SYLLABUS

**I and II Semester
B.A./B.Sc., Mathematics
(According to State Education Policy 2024)**

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2024-25

Bachelor of Science (B.Sc.) Semester Scheme

Curriculum Structure for Undergraduate Programme

2024 - 25

Syllabus for Mathematics

Sl. No .	Course/ Paper Code	Title of the Paper	Subject Category	Teaching Hours / Week	Semester End Exam.	Internal Assessm	Total Marks	Credits	Duratio n of examina
1	2	3	4	5	6	7	8	9	10
Semester - I									
1	ALGEBRA-I AND CALCULUS - I		24MCM - T1	04	80	20	100	03	3 Hrs
	Mathematics Lab - I		24MCM - P1	04	40	10	50	02	3 Hrs
Total				08	120	30	150	05	-----
Semester - II									
2	ALGEBRA-II AND CALCULUS - II		24MCM - T2	04	80	20	100	03	3 Hrs
	Mathematics Lab - II		24MCM - P2	04	40	10	50	02	3 Hrs
Total				08	120	30	150	05	-----

THEORY PAPER
SEMESTER – I
24MCM-T1: ALGEBRA-I AND CALCULUS-I

Course Learning Objectives:

- To grasp a comprehensive understanding of matrices and their applications in solving system of equations.
- To understand the concept of successive differentiation.
- To explore the various methods available for partial derivatives, total derivatives, Jacobians and related problems.
- To understand the concept of polar Coordinates.
- To understand the concept of integral calculus and its applications.

Course Outcomes: This course will enable the students to

- Learn to Solve the system of linear equations.
- Solve the system of homogeneous and non-homogeneous linear equations by using the concept of Rank of matrix, finding Eigen values and Eigen vectors.
- Using Leibnitz's rule to evaluate derivatives and its applications.
- Understand Euler's theorem of homogeneous functions.
- Learn to evaluate standard definite integrals using Reduction formulae.

UNIT I: MATRICES

(14 Hours)

Recapitulation of matrices, Elementary Transformations; Row and column reduction, Echelon form, Rank of a matrix; Inverse of a matrix by elementary row operations; Solution of system of linear equations; Criteria for existence of non-trivial solutions of homogeneous system of linear equations. Solution of non-homogeneous system of linear equations. Eigen values and Eigen vectors of square matrices, Diagonalization of square matrix, Cayley-Hamilton theorem (without proof), inverse of a matrix by Cayley-Hamilton theorem.

UNIT II: SUCCESSIVE DIFFERENTIATION AND PARTIAL DERIVATIVES

(14 Hours)

Derivatives of higher order – nth derivatives of the standard functions : e^{ax} , $(ax + b)^n$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax}\sin(bx + c)$, $e^{ax}\cos(bx + c)$ with problems; Leibnitz's theorem on nth derivative of product of two functions and its applications; Partial derivatives definition and examples; homogeneous functions; Euler's theorem and its extension; total derivatives and total differential; Jacobians-Problems.

UNIT III: POLAR CO-ORDINATES

(14 Hours)

Polar coordinates; angle between the radius vector and tangent; Angle of Intersection of two curves; pedal equations; Derivative of an arc in Cartesian, parametric and polar forms; curvature of plane curve, radius of curvature formula in Cartesian, parametric, polar and pedal forms; centre of curvature, Evolute and problems there on.

UNIT IV: INTEGRAL CALCULUS

(14 Hours)

Integration of Algebraic Rational and irrational functions and integration of rational functions involving trigonometric functions and definite integrals. Reduction Formulae for $\int \sin^n x dx$, $\int \cos^n x dx$, $\int \tan^n x dx$, $\int \cot^n x dx$, $\int \sec^n x dx$, $\int \operatorname{cosec}^n x dx$, $\int \sin^m x \cos^n x dx$ with definite limit. Differentiation under the integral sign by Leibnitz's rule.

Reference Books:

1. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
2. Integral Calculus - Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.,
3. A Text of Matrices - Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd.
4. Differential and Integral Calculus – Schaum's outline series.
5. Differential Calculus – N P Bali, New Age International Publishers.
6. Differential Calculus – S Balachandra Rao, C K Shantha New Age International Publishers.
7. A Text of Mathematics – G K Ranganath, S Chand and Company.
8. Integral calculus- N.P Bali, Golden maths series.

PRACTICAL PAPER
SEMESTER – I
24MCM-P1: ALGEBRA-I AND CALCULUS-I

Practical Hours: 4 Hours/Week
Total Practical Hours: 56 Hours

Credits: 2
Max. Marks: 50

Course Learning Objectives:

- Foundation for introducing the programming.
- Enable the student to explore mathematical concepts and verify mathematical facts through the use of software's.
- Enhance the skills in programming.
- Acquire knowledge of practical applications of algebra and calculus through FOSS tools.

Course Learning Outcomes: This course will enable the students to

- Learn *Free and Open-Source Software (FOSS)* tools for computer programming.
- Solve problem on algebra and calculus theory studied in **24MCMT1** by using FOSS tools.
- Acquire knowledge of applications of algebra and calculus through FOSS.

Practical/Lab Work to be performed in Computer Lab (FOSS)

Suggested Software's: Maxima/Scilab /Python.

Introduction to the software and commands related to the topic.

1. Computation of addition and subtraction of matrices.
2. Computation of Multiplication of matrices.
3. Computation of Trace and Transpose of Matrix.
4. Computation of Row reduced Echelon form, Rank and inverse of a matrix.
5. Solving the system of homogeneous and non-homogeneous linear algebraic equations.
6. Finding the n^{th} Derivative of e^{ax} , trigonometric and hyperbolic functions.
7. Finding the n^{th} Derivative of algebraic and logarithmic functions.
8. Finding the n^{th} Derivative of $e^{ax} \sin (bx + c)$, $e^{ax} \cos (bx + c)$.
9. Finding the Partial derivatives of a function.
10. Verification of Euler's theorem and its extension with examples.
11. To find Jacobians and verifying its properties.
12. Finding the angle between the radius vector and tangent to the given curves.
13. Finding the angle of intersection of two curves.
14. Finding the curvature of the given curves.
15. Program to find reduction formula with or without limits.

THEORY PAPER
SEMESTER – II
24MCM-T2: ALGEBRA-II, CALCULUS-II AND
DIFFERENTIAL EQUATIONS-I

Course Learning Objectives:

- To understand the basic concept of groups, subgroups with examples.
- To understand the concept of mean value theorems and its consequences.
- To understand the concept of tracing of curves.
- To understand the concept of ordinary Differential Equations of first order & first degree.

Course Outcomes: This course will enable the students to:

- Understand cyclic groups and its generators; Applications of Lagrange's theorem.
- Understand the importance and geometrical meaning of Rolle's theorem, Lagrange's theorem and Cauchy's mean value theorem.
- Learn to Plot standard Cartesian, Polar and Parametric curves.
- Develop the skills of solving first order and first-degree differential Equations.
- Acquire more knowledge on algebra and calculus.

UNIT I: GROUPS

(14 Hours)

Definition of a group with examples and properties, Problems there on, Subgroups, centre of a group, order of an element of a group, order of a group, cyclic groups, Coset decomposition, Lagrange's theorem and its consequences. Fermat's theorem and Euler's theorem.

UNIT II: DIFFERENTIABILITY AND MEAN VALUE THEOREMS

(14 Hours)

Recapitulation of Continuity and Differentiability. Rolle's theorem - statement and problems; Lagrange's mean value theorem; Cauchy's mean value theorem with proof and examples. Taylor's theorem, Maclaurin's series. Indeterminate forms and evaluation of limits using L'Hospital Rule.

UNIT III: ORDINARY DIFFERENTIAL EQUATION

(14 Hours)

Definition of an ordinary differential equation, its order and degree. Classification of solutions. Solution of first degree and first order equations. 1. Variable separable, 2. Homogeneous and reducible to homogeneous form, 3. Linear and Bernoulli's form, 4. Exact equations and reducible to exact form with standard Integrating factor, necessary and sufficient condition for the equation to be exact.

UNIT IV: THEORY OF PLANE CURVES

(14 Hours)

Asymptotes and Envelopes; Nature of singular and multiple points; cusp, node and conjugate points. General rules for Tracing of curves – Tracing of Standard cartesian and polar curves.

Reference Books:

1. Topics in Algebra - I N Herstein, Wiley Eastern Ltd., New Delhi.
2. Modern Algebra - Sharma and Vasishta, Krishna Prakashan Mandir, Meerut, U.P.
3. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi.
4. A Course in abstract algebra, Vijay K Khana and S K Bhambri, Vikas Publications.
5. A text book of B.Sc Mathematics – G K Ranganath, S Chand and Company
6. Golden Algebra – N P Bali, Golden Maths Series.
7. Differential Calculus – S Balachandra Rao, New Age International Publisher.
8. Ordinary & Partial Differential Equations – M D Raisinghania, S Chand Publications.

24MCM-P2: ALGEBRA-II, CALCULUS-II AND DIFFERENTIAL EQUATIONS-I

Practical Hours: 4 Hours/Week
Total Practical Hours: 56 Hours

Credits: 2
Max. Marks: 50

Course Learning Objectives:

- Enable the student to explore mathematical concepts and verify mathematical facts through the use of software.
- Enhances the skills in programming.
- Acquire knowledge of practical applications of algebra and calculus through FOSS tools.

Course Learning Outcomes: This course will enable the students to

- Learn *Free and Open-Source Software (FOSS)* tools for computer programming.
- Solve problem on algebra and calculus theory studied in 24MCMT2 by using FOSS tools.
- Enhances the skills in programming.
- Learn to plot curves.
- Learn to solve differential equations.
- Acquire knowledge of applications of algebra and calculus through FOSS tools.

Practical/Lab Work to be performed in Computer Lab (FOSS)

Suggested Software's: Maxima/ Scilab / Python.

Introduction to the software and commands related to the topic.

1. Program for verification of binary operations.
2. Program to construct Cayley's table and test Abelian for given finite set.
3. Program to find all possible cosets of the given finite group.
4. Program to find generators and corresponding possible subgroups of a cyclic group.
5. Programs to verify Lagrange's theorem with suitable examples.
5. Verification of Lagrange's mean value theorem.
6. Verification of Cauchy's mean value theorem.
7. Problems on Taylor's and Maclaurin's series.
8. Evaluation of limits by L'Hospital rules.
9. Program to solve Linear and Bernoulli's differential equations.
10. Program to verify exactness and finding its solution then plot the solution.
11. Plotting standard Cartesian curves.
12. Plotting standard polar curves.

**THEORY EXAMINATION QUESTION PAPER PATTERN
SEMESTERS I AND II**

**B.Sc., Semester – I Degree Examination: 2024-25
(Semester Scheme; New Syllabus: 2024-25)
SUBJECT: MATHEMATICS**

PAPER: _____ : _____
PAPER CODE: _____

Time: 3 Hours

Max. Marks: 80

Instructions to Candidates:

- 1) All sections are Compulsory.
- 2) Draw neat labelled diagrams wherever necessary.

SECTION – A

1. Answer all the following questions:

10x2=20

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)
- i)
- j)

SECTION – B

Answer any SIX of the following:

6x5=30

- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.

SECTION – C

Answer any THREE of the following:

3x10=30

- 10.
- 11.
- 12.
- 13.

From Unit-I
From Unit-II
From Unit-III
From Unit-IV

Question Paper Pattern for Practical Paper Examination

(Semesters I–VI)

Duration: 3Hrs

- Experimentation (Major & Minor/ Spotters) 30 Marks
- Viva Voce 10 Marks
- Total 40 Marks**

Internal Assessment for Theory Paper

I-VI semesters

Sl. No.	Internal Assessment	Maximum Marks
01.	Two Session Tests with proper record for assessment (5+5 = 10)	10
02.	Assessment of Skill Development activities/Seminars/Group Discussion/Assignment etc., with proper record	05
03.	Attendance with proper record	05
TOTAL MARKS		20

• Attendance Marks-breakup

<75%	-	00 Marks
75-80%	-	01 Mark
80-85%	-	02 Marks
85-90%	-	03 Marks
90-95%	-	04 Marks
>95%	-	05 Marks

Internal Assessment for Practical Paper I-VI semesters

- Attendance - 05 Marks
- Record/Journal - 05 Marks

Total 10 Marks