Davangere University

Bachelor of Science (B.Sc.) Semester Scheme
Curriculum Structure for Undergraduate Programme for 2025-26
Syllabus for Mathematics

Sl. No.	Course/Paper Code	Title of the Paper	Subject Category	Teaching Hours/ week	Semester End Exam.	Internal Assessment	Total Marks	Credits	Examination Duration
1	2	3	4	5	6	7	8	9	10
Semester-III									
1	ALGEBRA-III, DIFFERENTIAL EQUATIONS-1, SEQUENCE AND SERIES		24MT-3	04	80	20	100	03	3 Hrs.
	Mathematics Lab – III		24MP-3	04	40	10	50	02	3 Hrs.
	Total			08	120	30	150	05	---
Semester-IV									
2	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS-II, LAPLACE TRANSFORMS		24MT-4	04	80	20	100	03	3 Hrs.
	Mathematics Lab – IV		24MP-4	04	40	10	50	02	3 Hrs.
	Total			08	120	30	150	05	---

THEORY PAPER
SEMESTER-III

24MT-3: ALGEBRA-III, DIFFERENTIAL EQUATIONS-1, SEQUENCE AND SERIES

TOTAL HOURS – 56

Course Learning Objectives:

a) To gain a clear understanding of the definitions and properties of normal subgroups, quotient groups, and isomorphisms.

b) To equip with the ability to identify and solve various types of first-order differential equations (of first degree and higher degree), understand the meaning of solutions, and apply these concepts to real-world problems.

c) To develop a fundamental understanding of sequences, series, and related concepts like limits, convergence, and divergence.

d) To determine if an infinite sequence is bounded, monotonic, or oscillating, and if it's convergent or divergent. Determine if an infinite series is convergent or divergent using various tests.

Course Outcome: On successful completion of the course, the student will able to:

a) Explain the significance of the notions of cosets, normal subgroups, and quotient group.

b) Differentiate, classify, and find solutions for separable, exact, linear, homogeneous, and Bernoulli equations. Additionally, they should be able to recognize and apply integrating factors,

c) Recognize different types of sequences and series, determine their convergenc or divergence, and compute sums of convergent series.

d) Evaluate the convergence or divergence of infinite series based on various tests.

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SYLLABUS (24MT-3)

UNIT I: NORMAL SUBGROUPS (14 Hrs)

Definition and examples; Standard theorems on normal subgroups; Quotient groups; Homomorphism and Isomorphism of groups; Fundamental theorem of homomorphism, Permutation groups.

UNIT II: DIFFERENTIAL EQUATIONS (14 Hrs)

Definition; Order and degree of a differential equation, Equations of first order and first degree: variable separable, reducible to variable separable, homogeneous and reducible to homogeneous, Linear and Bernoulli's form, Exact equations (excluding reducible to exact form).

Equations of first order and higher degree: Solvable for p, Solvable for x, solvable for y and Clairaut's equation.

UNIT III: SEQUENCE OF REAL NUMBERS (14 Hrs)

Definition of a sequence, Limit of a sequence, Algebra of limit of a sequence. Convergent, Divergent and oscillatory sequences: Related problems. Bounded sequence; Every convergent Sequence is bounded – converse is not true. Monotonic sequences with their properties and related problems.

UNIT IV: INFINITE SERIES (14 Hrs)

Definition of convergent, divergent and oscillatory series, Standard properties and results. Tests of convergence: comparison tests; D'Alemberts Ratio test; Raabe's test; Cauchy's root test, Absolute Convergence and Leibnitz's test for alternating series.

Suggested References/Text books:

1) G.K.Ranganath, A Textbook of B.Sc. Mathematics, S. Chand Publishing.
2) M D Raisinghania, Advanced Differential Equations, S. Chand Publishing.
3) F Ayres, Schaum's Outline of Theory and Problems of Differential Equations, Schaum Publishing Co, 611 Broadway, New York 12
4) S Narayanan and T K Manicavachogam Pillay, Differential Equations and its Applications, Viswanathan, S., Printers & Publishers Pvt Ltd (30 May 2009).
5) Shanthi Narayana and P.K. Mittal, A Course of Mathematical Analysis, S. Chand and Company Pvt. Ltd., New Delhi.
6) G F Simmons, Differential equation with Applications and historical notes, McGraw Hill Education, 2nd edition (1 July 2017).
7) A.R. Vasistha and R.K. Gupta, Laplace Transforms, Krishna Prakashan Media Pvt. Ltd. Meerut.
8) G. B. Gururajachar, Text Book of Mathematics, Academic Excellent Series Pub.
9) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

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24MP-3: MATHEMATICS LAB-III

(4 hours/ week per batch of not more than 15 students)

Course Learning Objectives:

a) Foundation for introducing to programming.

b) Enables the student to explore mathematical concepts and verify mathematical facts through the use of software

c) Enhances the skills in programming.

d) Acquire knowledge of practical applications of algebra, differential quations, sequence and series through FOSS.

Course Outcome: On successful completion of the course, the student will abl to:

a) Learn Free and Open Source Software (FOSS) tools for computer programming.

b) show proficiency in using the software C-Programming.

c) understand the use of various techniques of the software for effectively doing mathematics.

d) obtain necessary skills in programming.

e) understand the applications of mathematics

f) explore and grasp concepts for the future across a wealth of disciplines.

Syllabus: Problems from 24MT-3 (Theory) may be solved with the help of programming.

Suggested Softwares: Maxima/Scilab/Phython.

List of Programs (Suggested):

1. Verification of normality of a given subgroup.

2. Illustrating homomorphism and isomorphism of groups.

3. Solution for linear differential equations

4. Particular Solution of linear differential equations and plotting their solutions.

5. Verification of Exactness and solution

6. Solution for Non-linear differential equation.

7. General and singular solution of Clairaut's equation.

8. Nature of a sequence.

9. Boundedness of a sequence.

10. Monotonicity of a sequence.

11. Nature of the series.

12. Convergence of the series by D'Alemberts Ratio test and Raabe's test

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24MT-4: VECTOR CALCULUS, DIFFERENTIAL EQUATIONS-II, LAPLACE TRANSFORMS
TOTAL HOURS – 56

Course Learning Objectives:

a) To provide students with a strong foundation in vector calculus and its applications in various scientific and engineering fields.

b) to solve second and higher-order linear differential equations with constant coefficients.

c) To gaining a grasp of the definition, properties, and conditions for existence of Laplace transforms.

d) Understanding the concept of inverse transforms and techniques like the Convolution theorem.

Course Outcome: On successful completion of the course, the student will able to:

a) apply concepts like gradients, divergences, and curls to solve problems,

b) learn various techniques, including finding the complementary function, determining particular solutions, and applying these solutions to real-world problems.

c) Students will be able to calculate Laplace transforms of standard functions and determine conditions for their existence.

d) To find the inverse Laplace transforms of functions, applying techniques.

SYLLABUS

UNIT I: VECTOR DIFFERENTIAL CALCULUS (14 Hrs)

Definition of Scalar and Vector Fields, Gradient of a scalar field; Geometrical meaning. Directional derivative: Maximum directional derivative, Angle between two surfaces, Divergence and Curl of a vector field, Solenoidal and Irrotational fields, Laplacian of a scalar field, Harmonic functions, Vector identities, Related Problems.

UNIT II: SECOND AND HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS WITH CONSTANT CO-EFFICIENTS (14 Hrs)

Complementary functions, Particular integral of Standard types, Cauchy-Euler differential equations, Legendre differential equations, Simultaneous linear differential equations with constant co-efficients (for two variables).

UNIT III: LAPLACE TRANSFORMS (14 Hrs)

Definition and basic properties, Laplace transforms of e^{at}, $\cos at$, $\sin at$, t^n, $\cosh at$, $\sinh at$, $e^{at} F(t)$, $t^n F(t)$, $F(t)/t$ – problems, Laplace transform of derivatives of functions, Laplace transforms of integrals of functions, Laplace transforms of periodic functions and unit step function.

UNIT IV: INVERSE LAPLACE TRANSFORMS (14 Hrs)

Basic properties and related problems. Convolution theorem, Initial value problems, Solution of first and second order differential equations with constant coefficients by Laplace transform method.

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Suggested References/Text books:

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3) F Ayres, Schaum's Outline of Theory and Problems of Differential Equations, Schaum Publishing Co, 611 Broadway, New York 12

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7) A.R. Vasistha and R.K. Gupta, Laplace Transforms, Krishna Prakashan Media Pvt. Ltd. Meerut.

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24MP-4: MATHEMATICS LAB-IV

(4 hours/ week per batch of not more than 15 students)

Course Learning Objectives:

a) Foundation for introducing to programming.

b) Enables the student to explore mathematical concepts and verify mathematical facts through the use of software.

c) Enhances the skills in programming.

d) Acquire knowledge of practical applications of algebra and calculus through FOSS.

Course Outcome: On successful completion of the course, the student will able to:

a) Learn Free and Open Source Software (FOSS) tools for computer programming.

b) Show proficiency in using the software C-Programming.

c) Understand the use of various techniques of the software for effectively doing mathematics.

d) Obtain necessary skills in programming.

e) Understand the applications of mathematics

f) Explore and grasp concepts for the future across a wealth of disciplines.

Syllabus: Problems from 24MT-4 (Theory) may be solved with the help of programming.

Suggested Softwares: Maxima/Scilab/Phython.

List of Programs (Suggested):

1. Gradient and Laplacian of a scalar function.

2. Divergence and Curl of a vector function.

3. Solenoidal and irrotational vector fields.

4. Verification of orthogonal planes.

5. Complementary function of second order linear differential equation with constant coefficients.

6. Particular Integral of second order linear differential equation with constant coefficients.

7. Solutions of second order linear differential equation with constant coefficients and plot the solution.

8. Solution of Cauchy-Euler differential equation.

9. Laplace transforms of the given functions.

10. Inverse Laplace transform of given functions.

11. Convolution Theorem.

12. Solutions of differential equation using Laplace transform method.

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THEORY EXAMINATION QUESTION PAPER PATTERN
(Semesters I –VI)

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 and labeled diagrams wherever necessary.

SECTION-A

1. Answer **all** the following questions: **(2×10=20)**

a)

b)

c)

d)

e)

f)

g)

h)

i)

j)

SECTION-B

Answer any **SIX** of the following: **(5×6=30)**

2.

3.

4.

5.

6.

7.

8.

9.

SECTION -C

Answer **Any Three** of the following: **(10×3=30)**

10.   From Unit-I

11.   From Unit-II

12.   From Unit-III

13.   From Unit-IV

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Question Paper Pattern for Practical Paper Examination

(Semesters I –VI)
Duration: 3Hrs

- Experimentation (Major & Minor/Spotters)   -   30 Marks
- Viva Voice   -   10 Marks

                                    Total   **40 Marks**

Internal Assessment for Theory Paper

I-VI semesters

Sl. No.	Internal Assessment	Maximum Marks
(1)	(2)	(3)
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**

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Bachelor of Science (B.Sc.) Semester Scheme
Curriculum Structure for Undergraduate Programme for 2025-26
Syllabus for Mathematics (Open Elective)

Sl. No.	Course/Paper Code	Title of the Paper	Subject Category	Teaching Hours/ week	Semester End Exam.	Internal Assessment	Total Marks	Credits	Examination Duration
1	2	3	4	5	6	7	8	9	10
Semester-III									
1	BASIC MATHEMATICS - I		24EMT-1	02	40	10	50	02	2 Hrs.
Semester-IV									
2	BASIC MATHEMATICS - II		24EMT-2	02	40	10	50	02	2 Hrs.

SEMESTER-III

24OMT- 1: BASIC MATHEMATICS – I (Elective/Optional)

TOTAL HOURS – 32

UNIT –I: MATHEMATICAL LOGIC   (16 hours)

Statements, Types of Statements, Connectives, Truth table, Conditional Statement, Compound Statements, Bi-conditional Statements, Equivalence Formulae, logical equivalence and switching circuits, quantifiers.

UNIT – II: SETS RELEATION AND FUNCTIONS   (16 hours)

Basic Set theory: Empty set, Finite and infinite set, Equal sets, Sub sets, Power sets, Universal set, Union and Intersection sets, Difference of sets, Complement of a set and properties.

Ordered pairs, Cartesian product of sets, definition of relation, domain and co-domain, range of a relation. Definition of a function, domain and co-domain, range of a function, real valued functions. Types of functions: constant, identity, polynomial, rational, modulus, signum, exponential, greatest integer function and their graphs. Sum difference, product and quotient of functions.

RESERENCR

1. A TEXT BOOK OF MATHEMATICS BY. G K RANGANATH
2. TEXT BOOK OF MATHEMATICS BY O P ARORA
3. TEXT BOOK OF MATHEMATICS BY SS BOSSCO
4. A TEXT BOOK OF MATHEMATICS BY V SEETHA RAMAIAH
5. TEXT BOOK OF MATHEMATICS BY G B GURURAJACHAR

24EMT- 2: BASIC MATHEMATICS – II (Elective/Optional)

TCTAL HOURS – 32

UNIT-I: STATISTICS   (16 hours)

Measures of Dispersion: Range, Mean deviation, Variance, and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

UNIT-II: MATRICES AND DETERMINANTS   (16 hours)

Types of Matrices and problems, addition, subtraction and multiplication of matrices and examples. Definition of Determinant of square matrix and its properties with examples. Eigen equation and Eigen values. Cayley-Hamilton theorem (statements only), verification of cayley Hamilton theorem for square matrices of order two only. Finding inverse of a matrix by Cayley Hamilton theorem.

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B.Sc. Degree Examination; 2024-25
(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: Basic Mathematics-I (Open Elective)

Paper –_____: _____

Paper Code: _____

Time: 2 Hours   **Max. Marks: 40**

Instructions to candidates:

1) All sections are compulsory

2) Draw neat and labeled diagrams wherever necessary

SECTION-A

I.   Answer the following questions   (5×2=10)

   a)

   b)

   c)

   d)

   e)

SECTION -B

II.   Answer any six of the following   (6×5=30)

   1)

   2)

   3)

   4)

   5)

   6)

   7)

   8)

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