KUVEMPU UNIVERSITY

DEPARTMENT OF P.G. STUDIES & RESEARCH IN MATHEMATICS

PROCEEDINGS OF U.G. B.O.S. MEETING IN MATHEMATICS & STATISTICS

The Meeting of the Board of Studies in UG Mathematics and Statistics (combined) was held on 19-06-2025 and 20-06-2025 at the Department of P.G. Studies and Research in Mathematics, Jnana Sahyadri, Shankaraghatta.

MEMBERS PRESENT

1. Dr. VENKATESHA , — CHAIRMAN
   Professor, Dept. of Mathematics, Kuvempu University
2. Dr. VIDYA K B — MEMBER
   Associate Professor, Dept. of Mathematics,
   Government Science College, Chitradurga
3. Mrs. SHWETHA T M, — MEMBER
   Associate Professor, Dept. of Mathematics,
   Government First Grade College, Tarikere
4. Dr. SOMASHEKHARA P, — MEMBER
   Associate Professor, Dept. of Mathematics,
   IDSG Government College, Chikmagalore
5. Sri. SOMASHEKHARA C, — MEMBER
   Associate Professor, Dept. of Mathematics,
   Sir M V Govt. Science College, Bommanakatte, Bhadravathi.

MEMBERS ABSENT

1. Dr. B C PRASANNA KUMAR, — MEMBER
   Professor, Dept. of Mathematics
   Davangere University, Davanagere

Special Invitees:

1. Dr. P.Venkatesh, Associate Professor, Department of Mathematics, Sahyadri Science College, Shivamogga.
2. Smt.Suvarna Malaghan, Associate Professor, Department of Mathematics , Smt. Indira Gandhi Govt. First Grade College for Women, Sagara.
3. Dr.Nagaraja N, Associate Professor , Department of Mathematics, Tunga Mahavidyalaya, Thirthahalli.
4. Dr.Arasaiah, Associate Professor, Department of Mathematics, Sir.M.V.Govt. Science College, Bhadravathi.

The Chairman Welcome all the members of the committee and taken up the following:

Agenda:

1. Preparation and approval of IIIrd and IVth semester U G B.Sc/B.A Syllabus of Mathematics in accordance with State Education Policy 2024.
2. Approval of Gradation list of U.G Teachers for Examination Purpose.

The Board resolved the following:

The members of the board of studies (U.G) in Mathematics, thoroughly discussed and prepared the 3rd and 4th semester under graduate (B.A/B.Sc) mathematics syllabus as per **State Education Policy 2024** and approved the same. The Board also prepared and approved the Gradation list of UG teachers for Examination Purpose for the academic year 2025-26.

Finally, the chairman proposed thanks to all the members present in the U.G. BOS meeting.

Date: 20-06-2025

Place: Shankaraghatta

(Prof. Venkatesh)
U.G BOS Chairman

CHAIRMAN- BOARD OF STUDIES
Department of P.G. Studies in Mathematics
Kuvempu University, Jnana Sahyadri
Shankaraghatta-577 451
Shivamogga, Karnataka, INDIA

KUVEMPU UNIVERSITY

SYLLABUS

III and IV Semester
B.Sc., Mathematics
(According to State Education Policy - 2024)

DEPARTMENT OF MATHEMATICS,
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JNANA SAHYADRI, SHANKARAGHATTA - 577451
SHIVAMOGGA, KARNATAKA, INDIA.
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2025-26

KUVEMPU UNIVERSITY

Bachelor of Science (B.Sc.) Semester Scheme

Curriculum Structure for Undergraduate Programme 2025 - 26

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	Duration of examination
1	2	3	4	5	6	7	8	9	10
Semester - III									
1	Algebra-II, Differential Equations-II and Real Analysis-I		24MCM -T3	04	80	20	100	03	3 Hrs
	Mathematics Lab - III		24MCM -P3	04	40	10	50	02	3 Hrs
		Total		08	120	30	150	05	-----
Semester - IV									
2	Algebra-III, Differential Equations-III and Laplace Transforms		24MCM -T4	04	80	20	100	03	3 Hrs
	Mathematics Lab - IV		24MCM -P4	04	40	10	50	02	3 Hrs
		Total		08	120	30	150	05	-----

Syllabus for Mathematics (Elective)

Sl No	Course /Paper Code	Title of the Paper	Subject Category	Teaching Hours per week	Semester End Exam	Internal Assessment	Total Marks	Credits	Examination Duration
1	2	3	4	5	6	7	8	9	10
SEMESTER-III									
1	Mathematics Elective -I		24EL/OP: MT-1	02	40	10	50	02	2 Hours
SEMESTER-IV									
1	Mathematics Elective -II		24EL/OP: MT-2	02	40	10	50	02	2 Hours

THEORY PAPER

SEMESTER – III

24MCM-T3: Algebra-II, Differential Equations-II and Real Analysis-I

Course Learning Objectives: This course will enable the students to learn to

- Identify and analyse different algebraic structures such as normal subgroups.
- Solve first order higher degree differential equations.
- Solve linear differential equations of higher order with constant coefficients.
- Identify nature of sequence.
- Test the convergence of series.

Course Outcomes: This course will enable the students to

- Prove various statements related to algebraic structures.
- Understand the basic concepts and solutions of first order and higher degree differential equations
- Solve higher order linear differential equations with constant coefficients.
- Recognize homogeneous and non-homogeneous differential equations.
- Understand and be able to apply basic definitions and concepts of convergence.
- Analyse nature of infinite series including tests for convergence such as comparison, ratio and root tests.

Unit I: Normal Subgroups:

Normal Subgroups – properties, examples and problems, Quotient group, Homomorphism and Isomorphism of groups – properties examples and problems. Kernel and Range of a homomorphism, Normality of the Kernel, Fundamental theorem of homomorphism, Properties related to isomorphism.

14 hours

Unit II: Ordinary Differential Equations:

Equations of first order and higher degree - Solvable for P, Solvable for x (Singular solutions), Solvable for y (Singular solutions) and Clairaut's equation. Orthogonal trajectories. Second and higher order linear differential equation with constant coefficients, complimentary functions, particular integral, standard types, Cauchy- Euler differential equations. Simultaneous differential equations with constant coefficients (two variables).

14 hours

Unit III: Sequence of Real Numbers:

Definition of a sequence, Bounded and unbounded sequences, Infimum and supremum of a sequence, Limit of a sequence - Algebra of limit of a sequence. Convergent, Divergent and oscillatory sequences. Standard theorems on limits, related problems, Monotonic sequences with their properties and related problems.

14 hours

Unit IV: Infinite Series:

Definition of Infinite series, Convergence, Divergence and Oscillatory of series, Properties of convergence, Series of positive terms - Geometric series, p – series, Tests of convergence: Comparison tests, D'Alembert's ratio test, Raabe's test and Cauchy's root test, alternating series – Leibnitz's test.

14 hours

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. A Course in abstract algebra, Vijay K Khana and S K Bhambri, Vikas Publications.
4. A text book of B.Sc. Mathematics – G K Ranganath, S Chand and Company.
5. Golden Algebra – N P Bali, Golden Maths Series.
6. Ordinary & Partial Differential Equations – M D Rai Singhania, S Chand Publications.
7. Differential equations - N P Bali, Golden Maths Series.
8. Principles of Real analysis – S C Mallik, New Age International (India) Pvt.Ltd.,4th edition,2018.
9. Sequence and Series - N P Bali, Golden Maths Series.

PRACTICAL PAPER

SEMESTER – III

24MCM-P3: Algebra-II, Differential Equations-II and Real Analysis-I

Practical Hours: 4 Hours/Week **Credits: 2**
Total Practical Hours: 56 Hours **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.
- Enhance the skills in programming.
- Acquire knowledge of practical applications of algebra, differential equations and Laplace Transforms 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, differential equations and Laplace Transforms studied in 24MCM-T3 by using FOSS tools.
- Acquire knowledge of applications of algebra, differential equations and Laplace Transforms through FOSS.

Practical / Lab Work to be performed in Computer Lab (FOSS)
Suggested Software: Maxima / Scilab /Python.

1. Program to test normality of a given subgroup of a group.
2. Program to test homomorphism of a give function from $G \rightarrow G'$.
3. Program to test isomorphism of a given function from $G \rightarrow G'$
4. Program to verify fundamental theorem of homomorphism of a give function from $G \rightarrow G'$.
5. Program to find the solution of given differential equation (1st order but not of 1st degree).
6. Program to find complementary function and particular integral of given differential equation with constant coefficients.
7. Program to find solution of given Cauchy- Euler equations with constant coefficients.
8. Program to find solution of given simultaneous differential equations with constant coefficients.
9. Program to illustrate convergence of the given sequence.
10. Program to determine divergence of the given sequence.
11. Program to illustrate oscillatory of the given sequence.
12. Program to determine convergence of the given series by Comparison Test.
13. Program to determine convergence of the given series by Ratio Test.
14. Program to determine convergence of the given series by Raabe's Test.
15. Program to test the convergence of the series using Cauchy's Root Test.
16. Program to test the convergence of the series using Leibnitz's theorem.

24EL/OP:MT-1: Mathematics Elective -I

TOTAL HOURS: 32

Course Learning Objectives: This course will enable the students to Learn to

- To understand the Structure of Logical Statements.
- To learn how to evaluate truth values, logical equivalences and validity.
- To translate statements into logical expressions and analyse them
- To use logic in areas such as Algorithms, Formal verification and Knowledge verification.
- To provide students a strong foundation in vector calculus and its applications in various scientific and engineering fields.
- To understand gradient, divergence, and curl.

Course Outcomes: This course will enable the students to:

By the end of the course the students will be able to

- identify logical connectives, Truth tables, Logical Equivalences and Quantifiers.
- write structured Proofs, including those used in Mathematical Reasoning and Computer algorithm
- translate Real world problems into logical models and validate correctness through logical methods.
- Know whether the given logical connective is a Tautology OR Contradiction.
- Compute gradient, divergence and curl.
- Visualise and interpret physical and geometric meanings of vector calculus.

UNIT I: MATHEMATICAL LOGIC:

Statements, Types of Statements, Connectives, Truth table, Compound statements, Conditional Statements, Bi-Conditional statements, Equivalence formulae, logical equivalence, Quantifiers. **16 Hours**

UNIT-II: VECTOR DIFFERENTIAL CALCULUS:

Scalar field-Gradient of a scalar field, Geometrical meaning, Directional derivative, Maximal directional derivative, Unit normal to the surfaces- tangent plane and normal to the surface, Vector field –Divergence and Curl of a vector field, geometrical meaning, solenoidal and irrotational field.

16 Hours

REFERENCES:

(1) Fundamentals of Mathematical Statistics – S.C Gupta and V.K Kapoor
(2) Understanding Basic Statistics – Charles Henry Brase and Corrinne Pellillo Brase,
(3) Fundamentals of Mathematical Statistics –Dr. Sanjeev Dhawanthe
(4) The Elements of Vector Calculus – Kanti Kumar Verma and Dr, Deepak Kumar
(5) A Text Book of Vector Calculus – Shanti Narayan and P.K/ Mittal
(6) A Text Book of Vector Calculus –Anil Kumar Sharma

THEORY PAPER

SEMESTER – IV

24MCM-T4: Algebra-III, Differential Equations-III and Laplace Transforms

Course Learning Objectives: This course will enable the students to

- Understand the concept of two operations and their interactions.
- Identify and analyse different algebraic structures such as rings, integral domains, division ring and fields.
- Learn to solve second order linear differential equation with variable coefficients.
- Understand the basic fundamentals of Laplace Transforms.
- Apply Laplace Transforms to solve differential equations.

Course Outcomes: This course will enable the students to:

- Understand fundamental concepts of different types of rings.
- Apply appropriate methods to solve second order linear differential equation with variable coefficients.
- Compute Laplace and Inverse Laplace Transforms.
- Solve linear differential equations by applying Laplace Transform techniques.

Unit-I: Rings, Fields and Integral Domains:

Definition, examples and properties of rings, Integral Domain, Fields- standard theorems, Subrings, Ideals, Principal, Prime and Maximal ideals -Definition, examples and standard properties, Quotient rings, Homomorphism, Isomorphism – properties, Kernel of homomorphism and standard theorems..Fundamental theorem of homomorphism of rings.

14 hours

Unit-II: Solution of Second Ordinary Differential Equations with Variable Coefficients:

Solution of ordinary second order linear differential equation with variable coefficients by the methods:

1. When a part of complementary function is given
2. Changing the independent variable
3. Changing the dependent variable
4. Variation of parameters
5. When a first integral is given (exact equation)

14 hours

Unit-III: Laplace Transforms:

Definition and basic properties, Laplace transforms of e^{kt} , $coskt$, $sinkt$, t^n, $coshkt$ and $sinhkt$, Laplace transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{t}$ – problems, Laplace transform of derivatives of functions, Laplace transforms of integrals of functions, Laplace transforms of periodic functions.

14 hours

Unit-IV: Inverse Laplace Transforms:

Inverse Laplace transforms – basic properties and problems, Convolution theorem and problems, Inverse Laplace transforms by convolution theorem, solutions of integral equations, Applications of Laplace transforms to solve first and second order differential equations with constant coefficients.

14 hours

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. A Course in abstract algebra, Vijay K Khana and S K Bhambri, Vikas Publications.
4. A text book of B.Sc. Mathematics – G K Ranganath, S Chand and Company.
5. Golden Algebra – N P Bali, Golden Maths Series.
6. Ordinary & Partial Differential Equations – M D Rai Singhania, S Chand Publications.
7. Differential equations - N P Bali, Golden Maths Series.
8. Higher Engineering Mathematics - B. S. Grewal.
9. Laplace Transforms – Murray R, Spiegel, Schaum's outline series.

PRACTICAL PAPER

SEMESTER – IV

24MCM-P4: Algebra-III, Differential Equations-III and Laplace Transforms

Practical Hours: 4 Hours/Week **Credits: 2**
Total Practical Hours: 56 Hours **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.
- Enhance the skills in programming.
- Acquire knowledge of practical applications of algebra, differential equations and Laplace Transforms 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, differential equations and Laplace Transforms studied in **24MCM-T4** by using FOSS tools.
- Acquire knowledge of applications of algebra, differential equations and Laplace Transforms through FOSS.

Practical / Lab Work to be performed in Computer Lab (FOSS)
Suggested Software: Maxima / Scilab /Python.

1. Program to find whether given finite set is a ring or not.
2. Program to show whether given subset of a finite ring is a subring or not.
3. Program to find whether given subset of a finite ring is an ideal or not.
4. Program to find whether given function is a homomorphism or not.
5. Program to find solution of differential equations by finding complimentary function.
6. Program to find solution of differential equations by changing independent variable.

7. Program to find solution of differential equations by changing dependent variable.
8. Program to test for exactness and solve the differential equation of second order.
9. Program to find the Laplace transform of some standard functions.
10. Program to evaluate some definite integrals using Laplace transform.
11. Program to find the Laplace transform of periodic functions.
12. Program to find the inverse Laplace transform of simple functions.
13. Program to verify Convolution Theorem.
14. Program to find inverse Laplace Transform by convolution theorem
15. Program to solve ordinary linear differential equation using Laplace transform.
16. Program to solve Integral equation using Laplace transform.

24EL/OP:MT -2: Mathematics Elective -II

TOTAL HOURS: 32

Course Learning Objectives: This course will enable the students to Learn to

- To understand how to define decision variables, objective functions and constraints.
- To apply LPP to resource allocation, Production planning and Scheduling.
- To understand the variability in data
- To learn different measures of dispersion such as range, mean deviation, standard deviation. and variance

Course Outcomes: This course will enable the students to:

By the end of the course the students will be able to

- Solve LPP using graphical method (two variable) and simplex method.
- Compute various measures of dispersion for ungrouped and grouped data.
- Apply measures of dispersion in practical contexts like economics, business and social sciences.

UNIT – I: LINEAR PROGRAMMING PROBLEM (LPP):

Definition of a norm in R^n, Convex Sets- examples, convex combination of Vectors, Linear inequalities in one and two variables, Graphical representation of linear inequalities and their solution set, Meaning of Linear Programming problem, Standard form of LPP and its matrix version. Definition of feasible solution, Basic solution, Basic feasible solution and Optimum solution, Solution of LPP (TWO variables) by Graphical method and Simplex Method. **16 Hours**

UNIT-II: STATISTICS:

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

16 Hours

REFERENCES:

(1) Introduction to Linear Programming – D.C. Sanyal and K Das
(2) Linear Programming –R K Pandey
(3) Operations Research – Theory and Applications by J.K. Sharma
(4) Mathematical Logic: A first Course- Joel W Robbin.
(5) An introduction to Logic: A S Thakur

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 semester

• Attendance	-	05 Marks
• Record/Journal	-	05 Marks
	Total	**10 Marks**

Internal Assessment for Elective Paper III and IV semester

• Test	-	05 Marks
• Attendance + Assignment	-	05 Marks
	Total	10 Marks

THEORY EXAMINATION QUESTION PAPER PATTERN
SEMESTERS III AND IV

B.Sc., Semester – III- and IV-Degree Examination: 2025-26
(Semester Scheme; New Syllabus: 2025-26)
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. From Unit-I
11. From Unit-II
12. From Unit-III
13. From Unit-IV

QUESTION PAPER PATTERN FOR PRACTICAL PAPER EXAMINATION

(SEMESTERS I –VI)

Duration: 3 Hrs

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

Total — **40Marks**

QUESTION PAPER PATTERN FOR ELECTIVE PAPER
(SEMESTER-III AND IV)

B.Sc. Semester-III- & IV-Degree Examination; 2025-26

(Semester Scheme; New Syllabus: 2025-26)

SUBJECT: Mathematics

Paper: _____

Paper Code: _____

Time: 2 Hours — **Max. Marks: 40**

Instructions to candidates:

1) All sections are compulsory
2) Draw neat and labelled 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)