UNIVERSITY ⚜ OF MYSORE
Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/55/2024-25

Dated: 20.07.2024

Notification

Sub:-Syllabus and Scheme of Examinations of Mathematics (UG) Programme (I & II Semester) from the Academic year 2024-25.

Ref:-1. Decision of Board of Studies in Mathematics (CB) meeting held on 06-06-2024.
2. Decision of the Faculty of Science & Technology meeting held on 19-06-2024.
3. Decision of the Academic Council meeting held on 28.06.2024.

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The Board of Studies in Mathematics (CB) which met on 06-06-2024 has resolved to recommend& approved the Syllabus and Scheme of examinations of Mathematics (UG) programme (I & II Semester) with effect from the Academic year 2024-25.

The Faculty of Science & Technology and Academic Council at their meetings held on 19-06-2024 and 29-06-2024 respectively has also approved the above said Syllabus and Scheme of examinations hence it is hereby notified.

The Syllabus and Scheme of Examinations content may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Registrar
Registrar
University of Mysore
Mysore

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Mathematics, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DOS in Mathematics, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council, Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
10. Office Copy.

UNIVERSITY OF MYSORE

Bachelor of Science (B.Sc.)
Curriculum structure for undergraduate Programme for
2024-25 Syllabus for Mathematics

Sem	Sl. No.	Code	Title of the Paper		Teaching Hours/week	Credit Pattern L:T:P	Credit Value	marks		
								C1	C2	C3
I	01	DSC-MAT-01	Algebra-I and Calculus-I	Practical-01	4+2	4:0:1	5	10	10	80
II	02	DSC-MAT-02	Algebra-II and Calculus-II	Practical-02	4+2	4:0:1	5	10	10	80

Assessment Pattern for Theory

Assessments comprise broadly of two components namely formative and summative which should be in the proportion of 20% : 80%.

1. **Formative or Internal Assessments.** This should comprise of two components namely C_1 and C_2. Each of C_1 and C_2 should carry equal weights (namely 10 marks each).

   (a) C_1 **component.** A test must be conducted for 10 marks in the eighth week.

   (b) C_2 **component.** Any of the assessments such as seminar/assignment/quiz can be conducted for 10 marks or a test can be conducted for 10 marks.

2. **Summative Assessment.** This may be named as C_3 component and this should be conducted for 80 marks. The question paper pattern should be as follows:

PART-A

1. **Question 1.** Answering 10 out of 12 questions each carrying 2 marks (Total 20 marks). three questions from each of the unit should be given.

PART-B

2. **Question 2.** (From Unit 1 and carries 15 marks)

 (a) (5marks)
 (b) (5marks)
 (c) (5marks)

OR

3. **Question 3.** (From Unit 1 and carries 15 marks)

 (a) (5marks)
 (b) (5marks)
 (c) (5marks)

PART-C

4. **Question 4.** (From Unit 2 and carries 15 marks)

 (a) (5marks)
 (b) (5marks)
 (c) (5marks)

OR

5. **Question 5.** (From Unit 2 and carries 15 marks)

 (a) (5marks)
 (b) (5marks)
 (c) (5marks)

PART-D

6. **Question 6.** (From Unit 3 and carries 15 marks)

 (a) (5marks)
 (b) (5marks)
 (c) (5marks)

OR

7. **Question 7.** (From Unit 3 and carries 15 marks)

  (a) (5marks)

  (b) (5marks)

  (c) (5marks)

PART-E

8. **Question 8.** (From Unit 4 and carries 15 marks)

  (a) (5marks)

  (b) (5marks)

  (c) (5marks)

OR

9. **Question 9.** (From Unit 4 and carries 15 marks)

  (a) (5marks)

  (b) (5marks)

  (c) (5marks)

Assessment Pattern for Practical

Assessment comprises of two components namely formative and summative which should be in the proportion of 20%-80% (10 marks & 40 marks)

1. **Formative or Internal Assessment:** This should comprise of two components namely C1 and C2. C1 should carry 05 marks and C2 should carry 05 marks.

   (a) **C1 Component:** Internal test should be conducted for 05 marks in the eighth or ninth week.

   (b) **C2 Component:** Assignment comprising of two programs of his/her own apart from the programs prescribed in the lab manual (if any) has to be submitted for 05 marks in the fifteenth or sixteenth week

2. **Summative Assessment:** This may be named as C3 component and this should be conducted for 40 marks of 3 hrs duration. Practical related viva voice should be conducted for 4 marks and record should be evaluated for 4 marks. A test of writing and executing programs should be conducted for 32 marks. The question paper pattern should be as follows:

Question: Answer all the questions. Each carries 8 marks.

1. (a) Program from Unit 1 (Carries 5 marks for code and 3 marks for execution)

   Or

   (b) Program from Unit 1 (Carries 5 marks for code and 3 marks for execution)

2. (a) Program from Unit 2 (Carries 5 marks for code and 3 marks for execution)

   Or

   (b) Program from Unit 2 (Carries 5 marks for code and 3 marks for execution)

3. (a) Program from Unit 3 (Carries 5 marks for code and 3 marks for execution)

   Or

   (b) Program from Unit 3 (Carries 5 marks for code and 3 marks for execution)

4. (a) Program from Unit 4 (Carries 5 marks for code and 3 marks for execution)

   Or

   (b) Program from Unit 4 (Carries 5 marks for code and 3 marks for execution)

SYLLABUS
Semester-I
Algebra - I and Calculus I

Unit I - Mathematical Logic and Boolean Algebra   16 hours

Introduction to propositional logic: Propositions, logical connectors, truth tables, logical equivalences, tautology, contradiction and contingent statements, negations, contra positive, converse and inverses of given statements; **Theory of inference:** Modus Ponens, Modus Tollens, Hypothetical Syllogism, Disjunctive syllogism (Premises, conclusion and tautology governing them); **Methods of proofs:** Discussion on necessity of proof, direct proofs, contradiction method, contrapositive method and mathematical induction (explanation with simple examples);
Boolean Algebra: Definition, examples, laws of Boolean Algebra; Normal disjunctive form, prime implicants, Karnaugh map theorem for reducing logical circuits.

Unit II - Theory of equations   16 hours

Polynomials: Euclid's algorithm, Polynomials with integral coefficients, Remainder theorem, Factor theorem, Fundamental theorem of algebra(statement only); **Some facts and concepts:** Synthetic division method, Irrational and complex roots occurring in conjugate pairs, Relation between roots and coefficients of a polynomial equation, Symmetric functions, Transformation, Reciprocal equations, Descartes' rule of signs, Multiple roots, Standard methods: Solving cubic equations by Cardon's method, Solving quartic equations by Descarte's Method.

Unit III - Introduction to Calculus   16 hours

Limits and Continuity. Introduction to real number system, intervals, concepts of supremum and infimum (introduction with examples), least upper bound axiom (mention), Archimedian property (proof), Absolute value of real numbers, Basic inequalities involving modulus, triangular inequality and related inequalities, Bernoulli's inequality (mention); **Functions and graphs:** Recapitulation of function of one variable, graphs of certain standard one variable functions; **Introduction to limits:** $\epsilon - \delta$ definition of limits, problems on verifying limits through $\epsilon - \delta$ definition, concepts of left hand limit and right hand limit (definition and problems), Algebra of limits, continuity of a function, algebra of continuous functions, some standard examples of continuous functions; **Differentiability:** Definition & geometric interpretation, recapitulation of derivatives of hyperbolic functions, concepts of left hand and right hand derivatives, differentiability and continuity.

Unit IV - Differential Calculus I   16 hours

Standard theorems on continuous functions on closed intervals. Boundedness, attainment of bounds, intermediate value theorem (with proofs); **Additional theorems.** Rolle's theorem , Lagrange mean value theorem, generalized Cauchy mean value theorem (Proof and problems); **Taylor's theorem** - Proof of Taylor's theorem and Problems on Taylor's and Maclaurin's series. **Indeterminate forms.** L'Hospital rule and related problems.

References.

Unit I

1. For the methods of proofs

    (a) Discrete Mathematics and its Applications, *Kenneth Rosen*, Tata McGrawhill

    (b) The tools of Mathematical Reasoning, *Tamara J. Lankins*

    (c) A textbook of B.Sc. Mathematics - Part I, *G K Ranganath and C S Sampan-giram*

    (d) College Mathematics, *N Rudraiah*, Sapna Book House

2. For the inference theory of propositional and predicate logic

    (a) A textbook of B.Sc. Mathematics - Part I, *G K Ranganath and C S Sampan-giram*, S. Chand publications

    (b) College Mathematics, *N Rudraiah*, Sapna Publications

3. For Boolean algebra

    (a) A Beginner's Guide to Discrete Mathematics, *W. D. Wallis*, Second Edition, Birkhäuser, (2023) [Chapter 3].

Unit II.

1. Theory of equations, *J. V. Uspensky*, McGraw-Hill Inc.,US

2. University Algebra, *N.S. Gopala Krishnan*, New Age International (P) Limited.

3. Algebra, *Natarajan, Manicavasagam Pillay and Ganapathy*.

Unit III and IV

1. Schaum's Outline of Calculus, *Frank Ayres and Elliott Mendelson*, 5th ed. USA:Mc. Graw Hill, 2008.

2. Differential Calculus, *Shantinarayan*, S. Chand & Company, New Delhi.

3. Calculus, *Shanthinarayanan & T. K. Manicavachogam Pillay*, S. Viswanathan Pvt. Ltd., vol. I & II.

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Semester I
PRACTICAL 1: ALGEBRA I AND CALCULUS I
(2 Hours/Week per Batch of not more than 19 Students)
Mathematics Practical with FOSS tools for Computer Programs

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Suggested Software: Maxima/Scilab/Python/Maple/Matlab/Mathematica/R. At least two programs from each unit should be taught. A total of 10 programs should be taught.

Suggested Programs:

Unit 1:

1. Construction of truth tables for compound propositions.

2. Verification of tautology and contradiction.

3. Proving logical equivalence.

4. Problems on Karnaugh map theorem for reducing logical circuits.

Unit 2:

1. Solving polynomial equations – having irrational or complex roots, reciprocal equations, using relation between rootas and coefficients etc.

2. Descarte's rule of signs.

3. Solving cubic equations using Cardon's method.

4. Solving bi-quadratic equations using Descarte's method.

Unit 3:

1. Verification of Limits using $\epsilon - \delta$ definition.

2. Finding limits using the concept of left hand and right hand limits and graphical representation.

3. Problems on Continuity of a function and graphical representation.

4. Problems on Differentiability using first principle and graphical representation.

Unit 4:

1. Verification of Lagrange's mean value theorem.

2. Verification of Cauchy's mean value theorem.

3. Finding Taylor's and Maclaurin's series (with & without using single line command).

4. Problems on indeterminate forms (with & without using single line command).

Semester II
Algebra-II and Calculus II

Unit I - Matrices and Determinants   16 hours

Recapitulation of matrices and determinants: Types of matrices, symmetric and skew-symmetric, minors, adjoint (mentioning of elementary results), determinant and properties of determinants, algebra of Matrices; **Row - column operations - Echelon form:** Row and column reduction to Echelon form, Rank of a matrix, Inverse of a matrix by elementary operations; **System of linear equations:** 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; **Cayley-Hamilton theorem (without proof)** Verification, Inverse and powers of matrices by Cayley-Hamilton theorem.

Unit II -Differential Calculus II   16 hours

Leibnitz theorem and its applications. Successive differentiation, n^{th} - derivatives of standard functions, Leibnitz theorem (with proof) and applications; **Behavior of functions.** Increasing & decreasing functions, Maxima, Minima (with no applications problems), concavity, convexity and points of in flexion; **Polar coordinates.** Polar coordinates, angle between the radius vector and tangent. Angle of intersection of two curves (polar forms), Derivative of an arc in Cartesian, parametric and polar forms (Derivation and problems)

Unit III - Partial derivatives   16 hours

Multivariable functions. Functions of two or more variables, Explicit and Implicit functions neighbourhood of a point (for two variable functions), Limits and continuity of two variable functions (Problems); **Partial derivatives.** Definition and problems, Homogeneous functions - Euler's theorem and its extension (Proofs and problems), total derivatives, differentiation of implicit and composite functions, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables.

Unit IV - Integral Calculus - I   16 hours

Notion of integration. Recapitulation of definite integral as limit of a sum (without problems); First and second Fundamental theorem of calculus (Only statements), Properties of definite integrals (mention), introduction to indefinite integrals (recalling some standard integrals); Recapitulation of techniques of integration (Substitution, by parts, Integration of algebraic rational functions - by partial fractions & completing the square) Reduction formulas. Reduction formulae for $\int \sin^n(x)\,dx, \int \cos^n(x)\,dx, \int \sin^m(x)\cos^m(x)\,dx, \int \tan^n(x)\,dx, \int \cot^n(x)\,dx, \int \sec^n(x)\,dx, \int \csc^n(x)\,dx, \int x^n \sin(x)\,dx, \int x^n \cos(x)\,dx, \int x^n e^{ax}\,dx$ (Derivations and related problems along with definite limits cases).

References.

1. Theory of Matrices, *B S Vatsa*, New Age International Publishers.

2. Matrices, *A R Vasista*, Krishna Prakashana Mandir.

3. University Algebra, *N.S. Gopala Krishnan*, New Age International (P) Lim- ited.

4. Algebra, *Natarajan, Manicavasagam Pillay and Ganapathy*.

5. Calculus, *Lipman Bers, Holt, Rinehart & Winston*.

6. Schaum's Outline of Calculus, *Frank Ayres and Elliott Mendelson*, 5th ed. USA:Mc. Graw Hill, 2008.

7. Integral Calculus, *Shanthinarayan*, New Delhi: S. Chand and Co. Pvt. Ltd.

8. Integral Calculus, *Shanthinarayan and P K Mittal*, Reprint. New Delhi: S. Chand and Co. Pvt. Ltd., 2013.

9. Text Book of B.Sc. Mathematics, *G K Ranganath*, S Chand & Company.

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Semester II
PRACTICAL 1: ALGEBRA II AND CALCULUS II
(2 Hours/Week per Batch of not more than 19 Students)
Mathematics Practical with FOSS tools for Computer Programs

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Suggested Software: Maxima/Scilab/Python/Maple/Matlab/Mathematica/R. At least two programs from each unit should be taught. A total of 10 programs should be taught.

Suggested Programs:

Unit 1:

1. Finding minor and cofactors of a given matrix.

2. Reducing to echelon form using elementary operations.

3. Checking consistency & solving system of linear equations.

4. Cayley-Hamilton theorem – Verification & Finding inverse.

Unit 2:

1. Verification of Leibnitz theorem.

2. Finding functions as increasing or decreasing. Finding maxima or minima.

3. Problems on Angle of intersection of two curves.

4. Problems on derivative of an arc – Cartesian, polar and parametric form.

Unit 3:

1. Finding partial derivatives.

2. Verification of homogeneous functions, Euler's theorem and Euler's extension theorem.

3. Problems on Jacobian and its standard properties.

4. Problems on Taylor's & Maclaurin's series for functions of two variables.

Unit 4:

1. Problems on definite integral as a limit of a sum.

2. Verification of Fundamental theorem of calculus.

3. Problems on different techniques of integration (with & without using single line command).

4. Verification of Reduction formula.