Gujarat University

Choice Based Credit System (CBCS)

Syllabus for B. Sc. Semester III (Mathematics)

MAT 201: Advanced Calculus-I (Theory)

Hours: 4 /week **Credits: 4**

Unit-1: Limit-Continuity of function of several variables and partial derivatives:

Introduction to function of several variables, rectangular and spherical neighbourhood of a point in R^n, Limit of function of several variables, concept of iterated limits, limit and path, continuity of function of several variables.

Unit-II: Differentiability of function of several variables-I

Directional derivatives, Introduction to partial derivatives, different notations and its geometric interpretation, higher order partial derivatives and problems. Differentiability of function of two variables, theorems on differentiability conditions and their converses, Schwartz's theorem and Young's theorem.

Unit-III: Differentiability of function of several variables-II

Differential of function of two variables, Chain rules for differentiability, derivatives of implicit functions. Homogeneous functions, Euler's theorem for homogeneous functions of n-variables, Extreme values of functions of two variables and its theorems, Lagrange's method of undetermined multipliers (only problems to be asked).

Unit-IV: Applications of partial derivatives

Taylor's Theorem for function of two variables (proof of two variables only), Maclaurin's theorem, problems on Taylor and Maclaurin theorems, Concept of multiple points, double points, different types of double points and examples, radius of curvature for Cartesian-parametric-polar equations of a curve in R^2.

Reference Books:

1. Mathematical Analysis – S. C. Malik and Savita Arrora, Second Edition, New Age Int. (P) Ltd.
2. Differential Calculus – Shanti Narayan.
3. Calculus - David V. Widder- PHI-second edition.
4. Advanced Calculus Volume II – T. M. Apostol.
5. Calculus - James Stewart.
6. Calculus with Early Transcendental functions - James Stewart, Indian Edition, Engage Learning India Pvt Ltd.
7. Calculus & Analytic Geometry - G. B. Thomas & R. L. Finney Addison- Wesley pub. India.
8. A course in Multivariable Calculus & Analysis – S. R. Ghorpade & B. V. Limaye, Springer India.
9. All the Mathematics you missed but need to know - Thomas A. Garrity, Cambridge Uni.Press.

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Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester III (Mathematics)
MAT 202: Linear Algebra-I (Theory)

Hours: 4 /week **Credits: 4**

Prerequisites: Relation, Equivalence Relation, Binary Operation.

Unit I:

Vector space: Definition, Examples, Properties, Subspaces, Necessary and Sufficient Condition to be a Subspace, Span of a Set, Examples of Subspaces, Intersection, Addition and Direct Sum of Subspaces., Linear Variety.

Unit II:

Finite Linear Combination, Linear Dependence/Independence and their properties (with proof), Examples regarding Linear Dependence/ Independence. Dimension and Basis of a vector space, Dimension Theorem.

Unit III:

Linear Transformations: Definition and Examples. Range and Kernel of a Linear Map and results regarding them. Rank and Nullity of a Linear Map, Rank – Nullity Theorem. Examples for verification of Rank – Nullity Theorem. Inverse of a Linear Map, Consequences of Rank – Nullity Theorem. Isomorphism.

Unit IV:

Matrix associated with a Linear Map, Linear Map associated with a Matrix. Linear operations in $\boldsymbol{\mu}_{m,n}$, Only introduction of L(U,V) and Isomorphism between L(U,V) and $\boldsymbol{\mu}_{m,n}$, Dimension Theorems for $\boldsymbol{\mu}_{m,n}$ and L(U,V). Rank – Nullity of Matrices and verification of the Rank-Nullity Theorem for Matrices.

Text Book:

An Introduction to Linear Algebra – V. Krishnamurthy & others. (Affiliated East-West press, New Delhi)

Reference Books:

1. Linear Algebra a Geometric Approach - S. Kumaresan, PHI.
2. Linear Algebra with Applications – Otto Bretscher– 3rd ed. –Pearson Education.
3. An Introduction to Linear Algebra – I. K. Rana , Ane Books Pvt. Ltd., New Delhi.
4. Theory and Problems of Linear Algebra – R. D. Sharma, I K Int. Publishing House Pvt. Ltd.
5. Matrix and Linear Algebra – K. B. Datta, Prentice Hall, New Delhi.
6. Linear Algebra: Theory & Appl. - Ward Cheney & David Kincaid Viva Books, Jones & Bartlett.
7. Vector Calculus, Linear Algebra & Differential Forms: A unified approach - Hubbard J. & Hubbard B. Prentice Hall 1999
8. Introduction to Linear Algebra - Serge Lang, Springer, India.
9. Finite Dimension Vector Spaces - P. R. Halmos.
10. Linear Algebra Problem Book - P. R. Halmos.
11. Linear Algebra with Applications - Jeanne, L. Agnew & Robert C. Knapp Brooks / Col publishing Co, California.
12. A First Course in Linear Algebra – Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata.McGraw-Hill Edu. Pvt. Ltd.

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Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester III (Mathematics)
MAT 203:Practicals(Based on MAT201, MAT202 and Numerical Methods-I)

Hours: 6 /week **Credits: 2.5**

List of Practicals:

Unit I:

1. Problems on different types of errors.
2. To find missing terms from the given table and to express a polynomial in terms of factorial notations.
3. Newton's forward interpolation and Newton's backward interpolation.
4. Gauss's forward interpolation and Gauss's backward interpolation

Unit II:

5. Stirling's, Bessel's and Everette's interpolation.
6. Lagrange's interpolation and Newton's divided interpolation
7. Inverse interpolation for equispaced arguments (Only Newton's forward interpolation and Newton's backward interpolation and Gauss's forward interpolation)
8. Inverse interpolation for unequispaced arguments (Newton's divided and Lagrange's inverse interpolation)

Unit III:

9. Gauss elimination method.
10. Gauss Jacobi iterative method.
11. Gauss Seidel iterative method.
12. Curve Tracing- 1 (Cartesian curves in R^2), Catenary, $y = x^3$, $y^2(a-x) = x^3$ (Cissoid). Curve Tracing-2 (Parametric and Polar curves in R^2), Cardioid, Cycloid, Astroid, Spiral.

Unit IV:

13. Examples on Limit, Continuity and Differentiation of functions of several variables using definition.
14. Examples on Euler's theorem and Examples on Extreme values.
15. Examples on subspace, bases and dimension theory.
16. Matrix Associated with Linear map and linear map associated with matrix.

Reference Books:

1. Numerical Analysis and Computational Procedures –S.A.Mollah.
2. Elementary Numerical Analysis - Shastry.
3. Numerical Mathematical Analysis - James Scarborough.
4. Numerical Analysis - S. Kunz.
5. Numerical Methods for Scientific and Engeenering Computation- 6th Edition, M. K. Jain, S. R. Iyengar, R. K. Jain, New Age International Publishers.

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