Hours: 4 /week   Credits: 4

Unit-1:
Limit-Continuity of function of several variables
Introduction to function of several variables, rectangular and spherical neighbourhood of a point in Rn, Limit of function of several variables, concept of iterated limits, limit and path, continuityof 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 2-variables, Taylor's Theorem for function of two variables (proof of two variables only),Maclaurin's theorem, problems on Taylor and Maclaurin theorems

Unit-IV:
Applications of partial derivatives
Extreme values of functions of two variables and its 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.

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.

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 inμm,n, Rank – Nullity of Matrices and verification of the Rank-Nullity Theorem for Matrices, and its examples in R^2 and R^3

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. Vector Calculus, Linear Algebra & Differential Forms: A unified approach - Hubbard J. & Hubbard B. Prentice Hall 1999
3. Introduction to Linear Algebra - Serge Lang, Springer, India.
4 .A First Course in Linear Algebra – Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata.McGraw-Hill Edu. Pvt. Ltd.

Shri Govind Guru University, Godhra
Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester III (Mathematics)
MAT 203: Practicals (Based on MAT 201, MAT 202 and Linear Algebra)

Hours: 6 /week   Credits: 2.5

List of Practicals:

1. Problems on different types of errors.
2. To find missing terms from the given table.
3. Express a polynomial in terms of factorial notations.
4. Examples on Limit, Continuity and Differentiation of functions of several variables using definition.
5. Examples on Euler's theorem and Examples on Extreme values.
6. Examples on subspace, bases and dimension theory.
7. Examples on Linear transformations.
8. Matrix Associated with Linear map and linear map associated with matrix.
9. Examples on Lagrange's method of undetermined multipliers.
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.

Reference Books:

1. Mathematical Analysis – S. C. Malik and Savita Arrora, Second Edition, New Age Int.(P) Ltd.
2. Differential Calculus – Shanti Narayan.
3. An Introduction to Linear Algebra – V. Krishnamurthy & others. (Affiliated East-West press, New Delhi)
4. Linear Algebra a Geometric Approach - S. Kumaresan, PHI.
5. Vector Calculus, Linear Algebra & Differential Forms: A unified approach – Hubbard J. & Hubbard B. Prentice Hall 1999
6. Introduction to Linear Algebra - Serge Lang, Springer, India.
7 .A First Course in Linear Algebra – Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata.McGraw-Hill Edu. Pvt. Ltd.

Shri Govind Guru University, Godhra
Choice Based Credit System (CBCS)
Syllabus for B. Sc. Semester IV (Mathematics)
MAT 204: Advanced Calculus-II(Theory)

Hours: 4 /week   Credits: 4

Unit I: Multiple integrals
Introduction to double integral, repeated or iterated integral, double integral over a closed region, evaluation of double integral, changing the order of double integral, triple integrals, Iterated triple integrals, Geometrical interpretation of double and triple integrals and problems based on it, Introduction to Jacobian(only definition), transformation of double and triple integrals.

Unit II: Beta and Gamma functions
Definition of beta and gamma functions, properties of beta and gamma functions, relation between beta and gamma functions, duplication formula, evaluation of definite integrals using beta-gamma functions and its examples.

Unit III: Line surface and Vector Calculus
(a) Definition of line integral, Green's theorem, surface and volume integral, Gauss's divergence theorem, verification of the two theorems and problems based on the theorems.
(b) Definition of gradient, divergence and curl, properties of theses operators.

Unit IV: Partial Differential Equations
Formation of' Partial differential equations by the elimination of Arbitrary constants and arbitrary functions. Partial differential equations of the first order, the complete and particular integrals, Lagrange's solution of' the linear equation. Some special types of equations which can be solved easily by the methods other than Charpit's method.

Reference Books:
1. Mathematical Analysis – S. C. Malik and Savita Arrora, Second Edition, New Age Int. (P) Ltd.
2. Integral calculus – Shanti Narayan.
3. Calculus – Second Edition, David V. Widder, PHI.
4. Ordinary and Partial Differential Equations – Nita H Shah, PHI Learning.
5. Partial Differential Equations - T. Amarnath.

MAT 205: Numerical Analysis (Theory)

Unit-1: Finite Differences table and theory of interpolation:
Ascending and Descending differences, Symbolic operators, Difference of polynomial, Factorial polynomials, Gregory-Newton's forward and backward interpolation formula.

Unit-2: Central Differences interpolation.
Gauss forward and backward interpolation formula, Sterling interpolation formula, Bessel's interpolation formula.

Unit-3: Divided Differences Interpolation Formula for unequal intervals and Numerical Integration:
Newton's divide difference interpolation formula, Lagrange's interpolation formula unequal intervals. Numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.

Unit-4: Numerical Solution of Differential equations of first Order and Algebraic equations :
Taylor's method, Picard's method, Newton-Raphson formula, method of false position and their examples.

Reference books:
1. **Numerical Analysis** Kunz McGraw Hill
2. **Numerical Analysis** R. Gupta AnmolPub.Pvt.Ltd, New Delhi.
3. **Numerical Analysis** P.N.ChatterjiRajson'sPrakashanmandir, Meerut.
4. **Numerical Analysis and Computational Procedures,** S.A.Mollah, New Central Book Agency, Calcutta.

Hours:6/week   Credits:2.5

List of Practicals:

1. Graphical method to find a real root of an equation.
2. Bisection method to find a real root of an equation.
3. False position method and Newton-Raphson's method to find a real root of an equation.
4. Examples on Newton's forward and Newton's backward interpolation.
5. Examples on Gauss's forward and Gauss's backward interpolation.
6. Examples on Stirling's and Bessel's interpolation.
7. Examples on Lagrange's interpolation and Newton's divided interpolation.
8. Examples on Numerical differentiation for equal and unequal intervals: Newton's forward and Backward, Gauss's forward, Newton's divided differentiation formula.
9. Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Taylor's method and Picard's method
10. Problems on change of the order of integration.
11. Problems on line integrals.
12. Problems on Beta and Gamma functions