**GUJARAT TECHNOLOGICAL UNIVERSITY**

**Integrated M.Sc. (Information Technology)**

**Semester: I**
**Subject Name: Mathematics-I**
**Subject Code: 1310502**

## Teaching and Examination Scheme:

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 3 | 2 | 0 | 5 | 70 | 30 | 30 | 20 | 150 |

## Content:

| Sr. No. | Content | Teaching Hours | Module Weightage (%) |
|---|---|---|---|
| 1. | **Matrix Theory:** Elementary row and column operations on a matrix, Rank of matrix – Normal form – Inverse of a matrix using elementary operations –Consistency and solutions of systems of linear equations using elementary operations. | 08 | 15 |
| 2. | **Eigen Values and Eigen Vectors:** Characteristic roots and vectors of a matrix - Caley-Hamillton theorem and its applications,Complex matrices, Hermitian and Unitary Matrices - Reduction to diagonal form - Reduction of a quadratic form to canonical form – orthogonal transformation and congruent transformation.. | 10 | 20 |
| 3. | **Differential Calculus:** Rolle's theorem; Mean value theorem; Taylor's and Maclaurin's theorems with remainders, Expansions; Indeterminate forms; Functions of several variables, PartialDifferentiation, Total Differentiation, Euler's theorem and generalization, maxima and minima of functions of several variables (two and three variables) – Lagrange's method of Multipliers; Change of variables – Jacobians. | 12 | 25 |
| 4. | **Ordinary Differential Equations:**<br>First-order ordinary differential equations, Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.<br>Ordinary differential equations of higher orders, Homogeneous Linear ODEs of Higher Order, Homogeneous Linear ODEs with Constant Coefficients, Euler–Cauchy Equations, Existence and Uniqueness of Solutions, Linear Dependence and Independence of Solutions, Wronskian, Nonhomogeneous ODEs, Method of Undetermined Coefficients, Solution by Variation of Parameters. | 12 | 30 |
| 5. | Determinants and their properties, Cramer's rule. | 02 | 10 |

**Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley and Sons.
2. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.
3. Thomas' Calculus, Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, 2008.
5. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009.

**Course Outcomes:**

After learning the course, the students should be able to:

1. Solve linear system equation
2. Students will be able to use eigenvalues and eigen vectors in Control theory, vibration analysis,electric circuits, advanced dynamics, and quantum mechanics.
3. Determine the power series expansion of a function, Estimate the maxima and minima ofmultivariable functions
4. To apply effective mathematical tools for the solutions of the first order and Higher-orderordinary differential equations.
5. To know the basic knowledge of Determinants and applications of Cramer's rule