I Year I Semester	**L**	**T**	**P**	**C**
Code: 17MA101	**3**	**1**	**0**	**3**

MATHEMATICS-I

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Develop the ability to solve linear differential equations of higher order and use the knowledge gain to certain engineering problems.
2. Apply techniques of multivariable differential calculus to determine the extreme and series expansions etc. of the functions of several variables
3. Compute the improper integrals using Beta and Gamma functions.
4. Identify/classify and solve the different types of partial differential equations of first order and higher order

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type

e^{ax} , sin ax, cos ax , polynomials in x, $e^{ax}V(x)$, $xV(x)$ - Method of Variation of parameters

Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals

Applications: Evaluation of integrals

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule- -Taylor's and Mc Laurin's series expansion of Functions of two variables– Functional dependence- Jacobian

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints)

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients, RHS term of the type e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, x^n y^n Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **T.K.V.Iyengar, B.Krishna Gandhi, S.Ranganathan, M.V.S.S.N.Prasad**, Engineering Mathematics (Volume-I), S Chand Publications

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg,** Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy,** Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil,** Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.