

ENGINEERING MATHEMATICS-I

CODE: UCE/ME/EE/CS/EC/PC/CH/EI 01C04

1. **Infinite series:** Convergence of Sequence, Bounded Sequence, Monotonic Sequence, Convergent Divergent and Oscillatory Series, Geometric Series, Positive term series, p-series, Comparison Test, D'Alembert's Ratio tests, Raabe's Test, Gauss's Test, Cauchy's Integral Test, Cauchy's Root test, Logarithmic Test.
2. **Calculus of function of one variable:** Successive differentiation, Leibnitz's theorem, Mean Value theorem and Taylor's theorem, expansion of functions into Taylor's and Maclaurin's series, Indeterminate forms.
3. **Function of several Variables:** Partial Derivatives, Chain Rule, Differentiation of Implicit functions, Exact Differentials, Euler's theorem on homogeneous function and its converse. Maxima, Minima and Saddle points, Simple problems in extrema of functions with constraints. Method of Lagrangian Multipliers.
4. **Ordinary Differential Equation:** Linear equations and Bernoulli's equation, Ordinary linear differential equation of nth order, Solution of homogeneous and non-homogeneous equations, Variation of parameters, Solution of simple simultaneous ordinary differential equation.
5. **Laplace Transform:** Transforms of elementary functions, Inverse transforms, properties of Laplace transform. Convolutions. Transforms of periodic functions, unit step functions, shifting theorems. Solutions of ODE's using transforms.

Texts/ References

1. Ordinary Differential Equation: M.D. Raisinghania.
2. Mathematical Analysis: Malik & Arora.
3. Advanced Engineering Mathematics: H.K.Dass.
4. Higher Engg. Mathematics: B.V.Ramana.
5. Advanced Engg. Mathematics: E.Kreyszig.

Engineering Mathematics – II

Paper: M-201

1. Matrices : Algebra of matrices, Vector spaces- linear dependence of vectors, basis, Linear Transformations, Rank and inverse of a matrix, Solution of algebraic equations, consistency conditions, Hermitian, skew-Hermitian and Unitary matrices, bi-linear form, eigen value and eigen vectors. Cayley-Hamilton theorem.

2. Complex numbers : Exponential complex numbers and logarithm of a complex number, circular, hyperbolic and inverse circular functions of complex numbers.

3. Function of a Complex Variable : Limit, continuity and differentiation, Analytic function, Cauchy-Riemann equations, Conjugate functions, Application to two dimensional problems, Taylor's and Laurent's expansions, Branch points, zeros, poles, residues, Cauchy's Integral theorem, simple problems on Contour Integration.

4. Integral Calculus : Improper Integrals, Beta and Gamma function. Double and Triple Integrals, Jacobians and transformation of co-ordinates.

5. Vectors: Scalar and vector triple product, space curves, Serret-Frenet formula, velocity and acceleration-simple problems, moment of force, work done, angular velocity, relative velocity-simple applications.

Vector function of one variable, vector differentiation and integration, gradient, divergence and curl --- Applications.

Stoke's theorem, Green's theorem, Gauss divergence theorem - simple applications to areas, Volumes and centre of Pressure.

Texts/References

1. Mathematical Analysis: Malik & Arora.
2. Advanced Engineering Mathematics: H.K.Dass.
3. Higher Engg. Mathematics: B.V.Ramana.
4. Advanced Engineering Mathematics: E. Kreyszig.
5. Calculus and Analytic Geometry: G.B.Thomas and R.L.Finney.
6. Vector Calculus: M.L.Khanna.

Engineering Mathematics – III

Paper: M-301

1. Probability and Statistics:

1.1. Probability and Random Variable: Axioms of probability, Conditional probability, Independent events, Baye's Theorem, Random variables, Probability mass function, Probability density function - properties, Moments, Moment generating functions and their properties.

1.2. Standard Distributions: Binomial, Poisson Normal distribution and their properties, function of random variables.

1.3. Two-dimensional random variables: Joint distribution, Marginal and conditional distribution, covariance, correlation and regression, Transformation of random variables, Central limit theorem.

1.4. Testing of hypothesis: Sampling distribution, Testing of hypothesis of mean, variance, proportion and differences using Normal, t and Chi-square.

2. Fourier Series: Periodic functions, Fourier series, Dirichlet's conditions, function defined in two or more sub-ranges, discontinuous functions, even function, odd function, half range series, change of interval.

3. Partial Differential Equations: Order, Method of forming Partial Differential Equations, Solution of Equation by Direct Integration, Lagrange's Linear equation, Method of Multipliers, Partial Differential equations non-linear in p,q, Charpits Method, Linear Homogeneous Partial Differential equation, Non-Homogeneous Linear Equations, Method of Separation of variables, Equation of vibrating string, Solution of wave equation by D'Alembert's method, One dimensional heat flow, Two dimensional Heat flow.

Texts/References:

1. Advanced Engineering Mathematics: E. Kreyszig.
2. Advanced Engineering Mathematics: H.K.Dass.
3. A Textbook of Engineering Mathematics: N.P.Bali & Manish Goyal.
4. Advanced Engineering Mathematics: B.S.Grewal.
5. Statistical Methods: Gupta & Kapoor/Kapoor & Sexena.
6. Integral Calculas: Maity & Ghosh.

Mathematics-IV

Code: M-401

Operation Research: Recapitulation of n-tuples of real nos, addition and scalar multiplication of vectors, Convex combination, Linearly dependence and independence, basis and dimension.

Linear programming, Simplex method, Duality, Two-phase method, Big-M method, Dual-simplex method, Transportation and Assignment models, Game theory and solution.

Numerical Analysis: Solution of algebraic and transcendental equations by bisection method, iteration method, Regular-Falsi (False position) method, Newton-Raphson method, Solution of Simultaneous linear equations by Gauss Elimination and Gauss-Seidal method.

Interpolation: Concept of interpolation, difference operators, divided difference interpolation, Newton's forward, backward interpolation, Lagrange's interpolation, Starling and Bessel's interpolation, Numerical differentiation (1st and 2nd order), Numerical integration (Trapezoidal, Simpson's one-third, Weddle's rule).

Numerical Solution of Ordinary differential equation: Taylor's method, Picard's method, Runge's method, Runge-Kutta's method, Euler's method and Euler's modified method, Predictor-corrector method.

Texts/References

1. Linear programming problem, Chakraborty & Ghosh.
2. Advanced Engineering Mathematics: H.K.Dass.
3. Advanced Engineering Mathematics: E. Kreyszig.
4. Numerical Analysis, S.A.Molla.
5. Numerical Analysis, Datta & Jana.
