

Indian Institute of Engineering Science and Technology, Shibpur

Department of Mathematics

B.Tech. Programme

First Semester (For all Engineering Branches)

Subject: Mathematics-I (MA-1101)

Weekly contact periods: 3- 1 - 0 (L – T - P)

Full Marks: 100

Credit-4

Sl. No.	Module Name and Topics	No. of Lecture Classes
1.	Functions of Single Real Variable: n-th order derivative, Leibnitz's theorem for successive differentiation, Rolle's theorem, M.V.T's of differential calculus, Taylor's theorem with Lagrange's and Cauchy's forms of remainders, Taylor's and Maclaurin's series, expansion of functions, curvature, asymptotes.	9
2.	Functions of Several Real Variables: Partial derivatives, chain rule, differential and small error, Euler's theorem for homogeneous functions, Taylor's theorem(statement only), expansion of functions of two real variables, maxima and minima, Lagrange's method of undetermined multipliers.	7
3.	Infinite Series: Concept of convergence, Geometric series and p-series, Comparison test, D'Alembert's ratio test, Cauchy's root test, Raabe's test, Gauss' test, Power series, radius of convergence.	4
4.	Multiple Integrals: Double integral, change of order of integration, Jacobian, change of variables, applications.	4
5.	Improper Integrals : Definition, Convergence, Cauchy's principal value, Comparison test, μ -test, Beta and Gamma functions and their properties, relation between Gamma function and Beta function.	5
6.	Ordinary Differential Equations : Higher order ordinary differential equations with constant coefficients, Euler's equation, method of variation of parameters, series solution in the neighborhood of an ordinary point, Legendre differential equation, Legendre polynomials, Orthogonality property, recurrence relations, Bessel differential equation, Bessel functions, recurrence relations.	10
	First half: Sl. No. 1,2,3 Second half: Sl. No. 4,5,6	39

Suggested Reading: (1) Advanced Engineering Mathematics - E. Krysizg (2) Engineering Mathematics- S.S.Sastry (3) Introductory Course in Differential Equations- Daniel A. Murray (4) Differential Calculus – B.C. Das & B.N.Mukherjee (5) Integral Calculus – B.C. Das & B.N.Mukherjee (6) Advanced Calculus- D.V. Widder.

Indian Institute of Engineering Science and Technology, Shibpur

Department of Mathematics

B.Tech.Programme

Second Semester (For all Engineering Branches)

Subject : Mathematics-II (MA-1201)

Weekly contact periods: 3- 1 - 0 (L – T - P)

Full Marks: 100

Credit-4

Sl. No.	Module Name and Topics	No. of classes
1.	Vector Space and Linear Transformation: Definition, subspace, linear combination, linear dependence and independence of vectors, span, basis, dimension of a vector space, linear transformation and some elementary properties.	6
2.	Matrices: Concept of Rank of matrices, reduction to Normal and Echelon forms, consistency of a system of linear equations, Orthogonal matrix, Hermitian and Unitary matrices, eigenvalues and eigenvectors, similarity transformation, diagonalization.	8
3.	Vector: Brief review of vector algebra, Shortest distance between skew lines, work done by a force, moment of a force about a point and about an axis, motion of a rigid body about a fixed axis, Directional derivatives, Gradient, Divergence, Curl, Line integral, Surface integral, Volume integral, Irrotational vector field, Gauss' divergence theorem and Stokes' theorem (statements only), Green's theorem in the plane, illustrations.	8
4.	Fourier Series: Fourier series, Dirichlet's conditions, Half range series as Fourier sine and cosine series.	5
5.	Complex Variables : Introduction to Complex variable, Function, concept of limit and continuity, Derivative of complex function, Analytic function, Cauchy- Riemann equations, Harmonic function, line integral, Cauchy-Goursat theorem (statement only), Cauchy's Integral formula, Generalized Cauchy's Integral formula (Statement only), Taylor's and Laurent's series (statements only), Type of singular points, Residue, Cauchy's	12

	Residue theorem and its application to evaluate real integrals using unit circle and semi-circle (without indentation).	
	First half: Sl. No. 1,2,4 Second half: Sl. No. 3,5	39

Suggested Reading: (1) Advanced Engineering Mathematics - E. Krysizg (2) Engineering Mathematics - B. S. Grewal (3) Engineering Mathematics - S. S. Sastry(4) Higher Algebra- Chakraborty & Ghosh (5) Vector Analysis – Ghosh & Maity.

Indian Institute of Engineering Science and Technology, Shibpur
Department of Mathematics

B.Tech. Third Semester (For all Engineering Branches)

Subject : Mathematics-III

(MA-2101)

Weekly contact periods: 3– 0 - 0 (L – T - P)

Full Marks: 100

Credit- 3

Sl. No	Module Name and Topics	No. of Lecture Classes
1.	Probability: Axiomatic approach to probability theory, Univariate probability distributions – discrete and continuous. Standard distributions: Binomial, Poisson, Geometric, Exponential, Normal, Uniform and Gamma. Bivariate distributions – concepts of joint and conditional distributions, Mathematical expectation, variance and covariance. Correlation coefficient. Tchebycheff's inequality.	13
2.	Statistics: Concept of Statistics, Idea of sample correlation coefficients, curve fitting: Method of Least Square, Simple Regression models.	5
3.	Laplace Transform: Definition, Laplace transform of elementary functions, basic operational properties, Inverse Laplace transform, Convolution theorem, applications to initial value problems involving Ordinary Differential Equations.	8
4.	Linear Programming Problem: Basic solution, reduction of feasible solution to basic feasible solution, convex combination, convex set, extreme points, hyperplanes, slack and surplus variables, Simplex Method, Charnes' Big-M method.	13
	First half: Sl. No. 1,2 Second half: Sl. No. 3, 4	39

References :

- (1) Introduction to the theory of statistics – Mood, Graybill & Boes
- (2) Introduction to probability Theory – Hoel, Port & Stone
- (3) A first course in probability – S.M. Ross
- (4) Groundwork of Mathematical Probability and Statistics – Amritava Gupta
- (5) Linear programming – P.M. Karak
- (6) Linear programming and Game theory- J.G. Chakraborty & P.R. Ghosh
- (7) Operational Mathematics – R.V. Churchill
- (8) Schaum's Outline of Laplace Transforms, Murray R. Spiegel, McGraw Hill, 1965.

Indian Institute of Engineering Science and Technology, Shibpur
Department of Mathematics

Five Year Integrated Dual Degree (B. Tech. –M. Tech.) Programme
Seventh Semester (Open Elective - For all Engineering Branches)
Subject: Operations Research (MA-731/1)

Weekly contact periods: 2-1-0 (L-T-S)

Full Marks: 100

Credit – 3

Sl. No.	Module and Topics	No. of Lecturer Classes
1.	Duality: Concept of duality- Formulation of primal- dual problems, Rules for forming dual problem from a primal problem in l.p.p., Fundamental properties of duality, Duality and simplex method.	8
2.	Transportation Problem: Introduction, Mathematical model of transportation problem, Finding initial basic feasible solution, Optimality test unbalanced transportation problem.	7
3.	Assignment Problem: Introduction, Mathematical formulation of assignment problem, Solution of an assignment problem, Unbalanced assignment problem, The travelling salesman problem.	6
4.	Integer Programming: Introduction, Gomory's cutting plane method for solution of integer programming problem, Branch and bound method for solution integer programming problem.	5
5.	Sensitivity Analysis: Introduction, Changes in the cost parameters, Changes in the requirement parameters, Addition and deletion of a new variable, Addition and deletion of a new constraints.	8
6.	Non-linear Programming: Introduction, Lagranges method for solution of a non-linear programming problem, Non-linear programming with equality and inequality constraints, Khun-Tucker conditions, Solutions using KTP conditions.	8
	First half: Sl. No. 1,2,3 Second half: Sl. No.4,5,6	42

Suggested Reading: (1)Operations Research – H. Taha(2) Operations Research – R. Panneerselvam (3) Operations Research – P. K. Gupta (S. Chand)