IIEST, Shibpur

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Erstwhile B E College (Estd 1856)

INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

DEPARTMENT OF MATHEMATICS

SYLLABUS FOR B.TECH. AND B. ARCH 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 neighbourhood of an ordinary point, Legendre differential equation, Legendre polynomials, Orthogonality property, recurrence relations, Bessel differential equation, Bessel functions, recurrence relations.	10

References:

(1) Advanced Engineering Mathematics - E. Kreyszig,
(2) Advanced 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.

First Semester (Only for B. Arch students)

Subject: Mathematics-IA (MA-1102)

Weekly contact periods: 2-1-0 (L-T-P) **Full Marks: 100** **Credit: 3**

Sl. No.	Module name and topics	No. of classes
1.	**Functions of a Single Real Variable:** n-th order derivative, Leibnitz's theorem for successive differentiation, Taylor's theorem with Lagrange's and Cauchy's forms of remainders, Taylor's and Maclaurin's series, expansion of functions, curvature, asymptotes, curve tracing.	15
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 multipliers.	15
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.	6
4.	**Multiple Integral:** Double integral, change of order of integration, Jacobian, change of variables, applications.	6

References:

(1) Advanced Engineering Mathematics – E. Kreyszig,
(2) Engineering Mathematics – B. S. Grewal,
(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.

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 Residue theorem and its application to evaluate real integrals using unit circle and semi-circle (without indentation).	12

References:

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

Second Semester (Only for B. Arch students)

Subject: Mathematics-IIA (MA-1202)

Weekly contact periods: 3-0-0 (L-T-P) **Full Marks: 100** **Credit: 3**

Sl. No.	Module Name and Topics	No. of Classes
1.	**Co-ordinate Geometry**: Two dimensions: Transformation of coordinates – Translation, Rotation, Reduction of general equation of second degree.	4
2.	**Co-ordinate Geometry:** Three dimensions: Coordinates, Direction Cosines, Planes, Straight lines, Spheres, Standard equations of simple surface e.g. cylinders, cones, ellipsoids, Hyperboloids etc.	9
3.	**Vector Algebra:** Sum and products of vectors, Application in Geometry.	4
4.	**Linear Programming:** Geometrical ideas of convex sets, feasible solutions and domains etc. Fundamental theorem of LPP (statement only), Graphical methods, Simplex Algorithm.	7
5.	**Statistics:** Analysis of data (direct and grouped), Frequency Diagrams, Ogive, Histogram, Mean, Median, Mode, Measures of dispersion, Skewness, Kurtosis, Fitting of curves (Least square method), Correlation, Regression.	10
6.	**Differential Equations:** Second order differential equations with constant coefficients, Cauchy-Euler differential equation and Variation of parameters.	8

References:

(1) Analytical Geometry of Two & Three Dimensions & Vector Analysis – R. M. Khan,
(2) Vector Analysis: Schaum's Outline Series – M. Spiegel,
(3) Linear Programming & Game Theory – J. G. Chakraborty & P.R. Ghosh,
(4) Linear Programming & Theory of Games – P. M. Karak,
(5) Statistical Methods – N. G. Das,
(6) Fundamentals of Statistics – A. M. Gun, M. K. Gupta, B. Dasgupta,
(7) An Introduction to Differential Equations – Ghosh & Maity,
(8) Ordinary and Partial Differential Equations – M.D Raisinghania

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

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.