

MA 11001 Semester/Year : First Semester (FOR ALL BRANCHES)	Mathematics-I (Linear Algebra & Calculus)	L-T-P-C 3- 0-0- 3
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Pre-requisite: *Matrix and determinants, Limit, Continuity, Differentiability, Basic idea of integration.*

Linear Algebra: (8L)

R^n as a vector space, Linear dependence and independence of vectors in R^n , Basis & Dimension ; Rank and nullity of a matrix, Elementary transformations, Consistency of a System of linear equations & their solutions by Direct Methods: Gaussian Elimination method, Gauss-Jordan method; Eigenvalues & Eigenvectors, Hermitian, Skew-Hermitian & Unitary matrices, Cayley-Hamilton's theorem & its applications.

Infinite Series: (8L)

Definition of Sequence & Infinite series, Convergence & Divergence of real Sequence & Infinite Series, Tests of Convergence of positive term infinite series: Comparison Test, D' Alembert's Ratio Test, Raabe's Test, Cauchy's root Test, Integral Test, Alternating Series, Leibnitz's Test (all tests without proofs).

Differential Calculus: (14L)

Successive Differentiation, Leibnitz's Theorem, Rolle's theorem, Lagrange's & Cauchy's Mean value theorems, Curvature, Radius & centre of curvature, Partial differentiation, Euler's theorem, Jacobian, Taylor's & Maclaurin's Theorems with Lagrange's form of remainder for functions of one and two variables, Expansions of functions of one and two variables, Extreme values for functions of two or more variables, Lagrange's method of undetermined multipliers.

Integral Calculus: (6L)

Reduction Formulae. Application of integrals in Quadrature, Rectification, Volume and surface area of solids of revolution.

Text Books:

1. Jr. Joel Hass, C. Heil & M.D. Weir, Thomas' Calculus, 14th Edition, Pearson Education, 2018.
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd., 2015.
3. S. C. Malik, S. Arora, Mathematical Analysis, 7th Edition, New Age Int. Publishers, 2005.

Reference Books:

1. B.C. Das & B.N. Mukherjee, Differential Calculus, U. N. Dhur & Sons Pvt. Ltd., 55th Edition, 1949.
2. B.C. Das, B.N. Mukherjee, Integral Calculus, U. N. Dhur & Sons Pvt. Ltd., 57th Edition, 1938.
3. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publisher, 2017.
4. F. Ayres, Theory and Problems of Matrices, Schaum's Outline Series, 1st Edition, 1962.

Course Objectives:

1. To make the students knowledgeable in the area of system of linear equations together with Solution techniques and applications in engineering problems.
2. To make the students knowledgeable in the area of infinite series and their convergence so that they may be familiar with limitations of series approximations of functions arising in Mathematical Modelling.
3. To make the students familiar in the area of application of differentiation, expansion of functions, and finding Extreme values of functions.
4. To enable the students to evaluate definite integrals and their application in finding area, length, volume and surface area of solids of revolution.

Course Outcomes:

On completion of this Course,

1. The students will be able to apply the consistency concepts, eigenvalues and eigenvectors concepts in engineering problems.
2. The students will be able to apply the concept of convergence of infinite series in mathematical & engineering problems.
3. The students will be capable to apply the knowledge of differentiation in expansion of functions and optimizing functions appearing in engineering and daily life problems.
4. The students will be able to apply knowledge of integration in finding area, length of arc of curves, volume and surface area appearing in engineering and real life problems.

MA 11002 Semester/Year : Second Semester (For EE, ECE, EIE)	Mathematics-II (Differential Equation & Integral Transform)	L -T-P- C 3- 0 - 0 - 3
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Pre-requisite: *Linear Algebra and Calculus.*

Ordinary Differential Equation: (8L)

Exact differential equation of first order, integrating factors. Second & higher order linear differential equations with constant coefficients, Homogeneous (Cauchy's) linear differential equation, Method of variation of parameters.

Partial Differential Equation: (10L)

Formation of partial differential equations (PDE), Solution of PDE by direct integration, Lagrange's linear equation & its solution, Non-linear PDE of first order, Charpit's method of solution, Homogeneous and Non-homogeneous linear equations with constant coefficients, Boundary and initial value problems (Dirichlet and Neumann type). Second order PDE with constant coefficients and their classification to elliptic, parabolic and hyperbolic type, solution by the method of separation of variables.

Laplace and Z-Transform: (9L)

Basic idea of Integral Transform, Laplace and inverse Laplace transforms & their properties, Convolution Theorem, Solution of ODE by Laplace transform method. Z-transform and their properties, Solution of difference equations.

Fourier Series and Fourier Transform: (9L)

Periodic functions, Fourier series representation of a function, half range series, Fourier integral formula. Fourier Transform, Fourier sine and cosine transforms. Linearity, scaling, frequency shifting and time shifting properties. Convolution theorem, Applications to boundary value problems.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd., 2015.
2. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publisher, 2017.

Reference Books:

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S.Chand & Company Ltd, 2020.
2. G.F. Simmons, Differential Equations, Tata McGraw-Hill, 2nd edition, 2017.
3. S. Sreenadh, Fourier Series and Integral Transforms, S. Chand Publication, 2014.

Course Objectives

1. To enable the students understand the basic ideas of ordinary differential equations and their solutions and also the application of series in solving ordinary linear differential equation.
2. To enable the students understand the basic ideas of partial differential equations and their solutions and also the applications in IVP & BVP.
3. To enable the students to solve ODE/Difference equations by using Laplace and Z-transform.
4. To enable students in clearing the basic concepts on Fourier series, Fourier Transform and to solve BVP.

Course Outcomes

On completion of this course

1. The students will be able to apply ordinary differential equations in engineering and real life problems.
2. The students will be capable to apply partial differential equations in engineering and real life problems.
3. The students will be able to apply Laplace/Z-transform in engineering problems.
4. The students will be able to apply Fourier transform in engineering problems.

MA 11002 Semester/Year : Second Semester (For CE, CSE, ME)	Mathematics-II (Differential Equation, Integral Transform & Numerical Analysis)	L -T-P- C 3- 0 - 0 - 3
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Pre-requisite: *Linear Algebra and Calculus.*

Ordinary Differential Equation: (8L)

Exact differential equation of first order, integrating factors. Second & higher order linear differential equations with constant coefficients, Homogeneous (Cauchy's) linear differential equation, Method of variation of parameters.

Partial Differential Equation: (9L)

Formation of partial differential equations (PDE), Solution of PDE by direct integration, Lagrange's linear equation & its solution, Non-linear PDE of first order, Charpit's method of solution, Homogeneous and Non-homogeneous linear equations with constant coefficients. Second order PDE with constant coefficients, solution by the method of separation of variables.

Laplace and Fourier Transform: (10L)

Basic idea of Integral Transform, Laplace and inverse Laplace transforms & their properties, Convolution Theorem, Solution of ODE by Laplace transform method. Periodic functions, Fourier series representation of a function, half range series, Fourier integral formula. Fourier Transform, Fourier sine and cosine transforms. Linearity, scaling, frequency shifting and time shifting properties. Convolution theorem.

Numerical Analysis: (9L)

Finite difference, Interpolation: Newton's forward and backward interpolation formulae, Lagrange's formula. Solution of algebraic and transcendental equations: Fixed point Iteration method, Bisection, Secant, Newton Raphson Method. Solution of system of linear equations by Iterative Methods: Gauss Jacobi's method & Gauss-Seidel method. Solution of ODE: Picard's method, Taylor series method and Runge-Kutta method (Fourth order).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd., 2015.
2. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publisher, 2017.

Reference Books:

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S.Chand & Company Ltd, 2020.
2. G.F. Simmons, Differential Equations, Tata McGraw-Hill, 2nd edition, 2017.
3. M. K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Method for Scientific and Engineering Computation, 2022.
4. S. Sreenadh, Fourier Series and Integral Transforms, S. Chand Publication, 2014.

Course Objectives

1. To enable the students understand the basic ideas of ordinary differential equations and their solutions and also the application of series in solving ordinary linear differential equation.
2. To enable the students understand the basic ideas of partial differential equations and their solutions and also the applications in IVP & BVP.
3. To enable the students to solve ODE/PDE by using Laplace and Fourier transforms.
4. To enable students to clear their basis concept on solutions of algebraic/transcendental equations and ODE by numerical techniques.

Course Outcomes

On completion of this course

1. The students will be able to apply ordinary differential equations in engineering and real life problems.
2. The students will be capable to apply partial differential equations in engineering and real life problems.
3. The students will be able to apply Laplace/Fourier transform in engineering problems.
4. The students will be able to apply numerical techniques in engineering problems.