MLR Institute of Technology

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COURSE DESCRIPTION

Course Name	**:**	**Mathematics-I**
Course Code	**:**	**A10002**
Class	**:**	**I B.Tech**
Branch	**:**	**Common for all branches**
Year	**:**	**2014 – 2015**
Course Coordinator	**:**	**Mr. Ch. Achi Reddy,**
Course Faculty	**:**	**Mr. N.Amarnath, Mr. A. Anil Prakash, Mrs. Hemalatha**

Course Overview :

Many of the new wonders that we take for granted in our modern technological society have mathematical ideas and applications as their basis, though this role is often hidden from view. Complex economic and planning decisions, scientific discoveries that improve our lives, and new technologies and products are often possible only after mathematical or statistical analysis, or a computer visualization, simulation, design and implementation based on mathematics. Therefore, mathematicians, as well as mathematically educated scientists, engineers and economists, make important daily contributions in the understanding and advancement of science, the improvement and discovery of new technology, and decision-making and planning in business, industry and government.

The Iyr. mathematics curriculum is designed to contribute to this foundation by ensuring that students are familiar with basic mathematical and statistical concepts, and mathematical and statistical reasoning. Students will also understand the use of mathematics in other disciplines as well as developing an appreciation of mathematics as a discipline in its own right. In addition, students will learn to be competent users of mathematics, especially in problem solving, and be able to effectively communicate mathematically.

Course Objectives :

1. Identify and classify homogeneous and nonhomogeneous equations/systems, autonomous equations/systems, and linear and nonlinear equations/systems.
2. Solve first order differential equations using standard methods, such as separation of variables, integrating factors, exact equations, and substitution methods; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.
3. Solve second and higher order equations using reduction of order, undetermined coefficients, and variation of parameters; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.
4. Solve systems of equations and use eigenvalues and eigenvectors to analyze the behavior and phase portrait of the system; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.
5. Use LaPlace transforms to solve initial value problems.
6. Solve boundary value problems and relate the solution to the Fourier series; use these methods to solve analyze real-world problems in fields such as economics, engineering, and the sciences.

Course Outcomes :

Students show the ability to

a. Demonstrate their problem solving skills, including their ability to interpret problem situations, choose among several potentially appropriate mathematical methods of solution, persist in the face of difficulty, and present full and cogent solutions that include appropriate justification for their reasoning.
b. Understand and be able to articulate the differences between inductive and deductive reasoning. In particular, students will appreciate the role of mathematical proof in formalizing deductive reasoning and as a means of conveying mathematical knowledge, and to understand the differences between proofs and other less formal arguments.
c. Utilize and describe mathematical ideas from multiple perspectives, including the internal connections between geometry, algebra, and numerical computation, as well as the connections between theory and applications. This flexibility should be evident in students' approach to problem solving as well as their ability to communicate their solutions and methods.
d. Demonstrate an understanding of mathematical content (including the limits to its application) that goes beyond mere fluency in using mathematical symbols, language and formulas.
e. Students will use the derivative as an important problem-solving tool for real-world situations. Students will also briefly look at indefinite and definite integrals.
f. Students will predict properties of curves from their derivative.
g. Students will be able to explain how differential calculus combines geometric ideas of slope, real-world concepts of rates and analytical concepts of derivatives to give a unified perspective of mathematics.

I year, B. Tech
MATHEMATICS-I

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UNIT-I :

Theory of Matrices: Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix, Elementary row and column transformations- Elementary matrix, Finding rank of a matrix by reducing to Echelon and normal forms. Finding the inverse of a non-singular square matrix using row/ column transformations (Gauss- Jordan method). Consistency of system of linear equations (homogeneous and nonhomogeneous) using the rank of a matrix. Solving m x n and n x n linear system of equations by Gauss elimination. Cayley-Hamilton Theorem (without proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation – Orthogonal Transformation. Eigen values and eigen vectors of a matrix. Properties of eigen values and eigen vectors of real and complex matrices. Finding linearly independent eigen vectors of a matrix when the eigen values of the matrix are repeated. Diagonalization of matrix – Quadratic forms up to three variables. Rank – Positive definite, negative definite, semi definite, index, signature of quadratic forms. Reduction of a quadratic form to canonical form.

UNIT – II :

Differential calculus methods. Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function. Functions of several variables: Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers.

UNIT – III :

Improper integration, Multiple integration & applications: Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions Multiple integrals – double and triple integrals – change of order of integration-change of variables (polar, cylindrical and spherical) finding the area of a region using double integration and volume of a region using triple integration.

UNIT – IV :

Differential equations and applications Overview of differential equations- exact, linear and Bernoulli (NOT TO BE EXAMINED). Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories. Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type f(X) = e ax, Sin ax, Cos ax, and x n, e ax V(x), x n V(x), method of variation of parameters. Applications to bending of beams, Electrical circuits and simple harmonic motion.

UNIT – V :

Laplace transform and its applications to Ordinary differential equations Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem – Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace

Transforms of derivatives and integrals of functions, Convolution theorem –- Solving ordinary differential equations by Laplace transforms.

TEXT BOOKS:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
3. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
4. Engineering Mathematics – I by G. Shanker Rae & Others I.K. International Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6ht Edi, 2013, Chapman & Hall/ CRC
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education