

Medi-Caps University

M.Tech Mechanical I-SEM

Subject Code	Courses	L	T	P	Hrs.	Credits
ME101	Mathematics	4	0	0	4	4

In relation to mechanical engineering applications, such as, heat transfer, fluid mechanics, vibrations, the following topics will be covered:

Unit-I

Linear algebra: Vector spaces, subspaces, Sum and direct sum of subspaces, Linear span, Linear dependence, independence and their basic properties, Basis, Linear transformations and their representation as matrices, the algebra of linear Transformations, The rank- nullity theorem, Eigen value analysis.

Unit-II

Numerical Methods: Solution of linear system of algebraic equation solution using Gauss elimination and Gauss sedial methods, ill conditioned matrix, method to improve accuracy of ill conditioned system, Power method to solve Eigen value problems. Concept of explicit and implicit methods, Solution of differential equation using multi-step methods: Runge-Kutta and Predictor-Corrector methods, shooting method to solve boundary value problems, Lagrange interpolation, splines interpolation.

Unit-III

Partial differential equations: Characteristics and classification of second order PDEs. Separation of variables. Numerical solution of PDE(Laplace, Poisson, Heat, Wave) using finite difference methods: Elliptic partial differential equations, Parabolic PDE, Crank-Nicholson Method(Two-Dimensional Parabolic PDE), Hyperbolic PDE (Two-Dimensional Hyperbolic PDE).

Unit-IV

Fourier transform: Review of Fourier transform, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Short time Fourier Transform(STFT) and their properties.

Unit-V

Probability distribution and Reliability: Probability distribution with the Concept of continuous distribution functions, Normal distribution, Exponential distribution, Memory less property, Hypo exponential, Weibull distribution.

Introduction to reability, Measure of reliability, reliability functions, derivation of reliability function, failure rate and failure models, mean time to system failure (MTSF), Failure time distribution. System configuration: series and parallel, k out of n systems, Redundancy.

Text/Reference Books

1. S. P. Venkateshan, Prasanna Swaminathan, Computational Methods in Engineering, Ane Books
2. Steven C. Chapra, Numerical Methods for Engineering, Mc-Graw Hill Education.
3. Gilbert Strang, Computational Science and Engineering, Wellesley-Cambridge Press.
4. B. S. Grewal, Higher Engineering Mathematics, Khanna Publ.
5. T. Veerajan , Probability, Statistics and Random Processes, Tata McGraw Hills, New Delhi, 2002.
6. E. Balagurusamy, Reliability Engineering, Tata McGraw-Hill Education, 1984.
7. A.k. Sharma, Linear Algebra, , Discovery Publishing House, 2007.
8. Shrinivasan Keshav ,Mathematical Foundation of computer networking , Pearson Eduaction,2013