Faculty of Engineering & Technology

M.Tech. Mechanical Engineering (Robotics & Automation)

LINEAR ALGEBRA : Matrix algebra, systems of linear equations, eigenvalues and eigenvectors.

CALCULUS : Functions of single variable, limit, continuity and differentiability, mean value theorems, indeterminate forms; evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series;

DIFFERENTIAL EQUATIONS : First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms;

COMPLEX VARIABLES : Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series.

NUMERICAL METHODS : Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules; single and multi-step methods of differential equations.

PROGRAMMING IN C : Data types, Operators, Arrays, functions and Standard Library functions, File I / O, Loops and Logical Constructs, Recursion.

ENGINEERINIG MECHANICS : Statics of Particles, Rigid bodies and their equilibrium, Friction (wedges and screw), Kinematics of particle and rigid bodies (general plane motion), Kinetics of particle and rigid bodies (Newtonian mechanics, Energy and momentum methods).

STRENGTH OF MATERIAL : Stresses and strains (Generalized Hooke's law, Elastic Moduli), Principal stresses and strains, Strain energy, Shear force and bending moment in determinate beams, Deflecton of beams, Torsion of Shafts and springs.

INSTRUMENTATION AND MEASURE : GENERAL CONCEPTS : Instrumentation, measurement, methods and modes of measurement, Instruments – Classificatioin and functional elements of a measure system. Static performance characteristics, errors and uncertainties, propagation of uncertainities, performance parameters, Impedance: Loading and Matching. Graphical representation and curve fitting of data – Equations of approximating curves. Determination of parameters in linear relationship. Method of least square and linear least square curve fitting. Related Numerical problems.

DYNAMIC CHARACTERISTICS OF INSTRUMENTS : Dynamic inputs, formulation of system equations, Dynamic Response. Transducer Elements. Intermediate Elements – Amplifiers, A-D and D-A converters, filters, Terminology and conversions, Data Transmission Elements, Related Numerical Problems.

MEASUREMENTS : Methods and Applications – Force Measurement, Torque and power Measurements, Pressure Measurement, Temperature Measurement : - Non-electrical, electrical and Radiation Methods of Temperature Measurement, Flow measurement – Primary, Secondary and special Methods of flow Measurement, Measurement of liquid Level, Biometrics and Air pollution parameters.