ECE183:MATHEMATICS FOR ROBOTICS

L:3 T:1 P:0 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: understand the geometry of linear systems of equations

CO2 :: solve ordinary differential equations by using various numerical techniques

CO3 :: understand interpolation, numerical differentiation, and integration

CO4 :: apply the concept of the calculus of variations for higher-order optimization

CO5 :: employ the concepts of probability theory for engineering applications

CO6 :: develop Lagrangian dynamics of a robot manipulator

Unit I

Coordinate Systems and Matrices : Introduction to Coordinate systems, Differential Length,Area and Volume, Line,Surface and Volume Integrals, Matrix and its decompositions

Unit II

Solution of Linear and Nonlinear Equations : factorization based on eigenvalues, singular value decomposition, solution of nonlinear equations, bisection method, secant method, Newton Raphson method

Unit III

Laplace Transform : Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, applications to solution of ordinary linear differential equations with constant coefficients, simultaneous differential equations

Unit IV

Numerical solution of ordinary differential equations : Numerical methods for initial value problem, Euler and Modified Euler method, Runge-Kutta methods, Multi step methods - Milne method, Lagrange's equation

Unit V

Interpolation, Differentiation and Integration : Newton's divided-difference interpolating polynomials, Lagrange interpolating polynomials, Newton's forward and backward interpolating polynomials, numerical integration - Newton-cotes formulae, trapezoidal rule, Simpson's 1/3 rule

Unit VI

Probability and Stochastic Processes : Baye's theorem, probability distributions and probability mass functions, cumulative distribution functions, probability density functions, mean and variance, binomial, Poisson and normal distribution

Text Books:

1. ADVANCED ENGINEERING MATHEMATICS by R.K.JAIN, Narosa

References:

1. HIGHER ENGINEERING MATHEMATICS by B. S. GREWAL, KHANNA PUBLISHERS