RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
Credit Based Grading System
Electrical Engineering, VI Semester

EE-6005 Elective – II (2) Digital Control System

COURSE CONTENTS

UNIT I

Introduction to Discrete Time Control System Basic building blocks of Discrete time Control system, Sampling Theorem, Z transform and Inverse Z transform for applications for solving differential equations, Mapping between the S-plane and the Z plane, Impulse sampling and Data Hold.

UNIT II

Pulse Transfer Function and Digital PID Controllers The pulse transfer function, pulse transfer function of Closed Loop systems, Pulse transfer function of Digital PID controller, Velocity & Position forms of Digital PID Controller, Realization of Digital Controllers, Deadbeat response and ringing of poles

UNIT III

Design of Discrete Time Control System by conventional methods Stability analysis in Z-plane, Jury stability criterion, bilinear transformations, Design based on the root locus method, Digital Controller Design using Analytical Design Method.

UNIT IV

State Space Analysis of Discrete Time Control System State space representation of discrete time systems, Solution of discrete time state space equations, Pulse transfer function matrix, Eigen Values, Eigen Vectors and Matrix Diagonalization, Discretization of continuous time state space equations, Similarity transformations.

UNIT V

Pole Placement and Observer Design Concept of Controllability and Observability, Useful transformations in state space analysis and design, Stability improvement by state feedback, Design via pole placement, State observers. Optimal Control Quadratic Optimal Control and Quadratic performance index, Optimal state regulator through the matrix riccati equations, Steady State Quadratic Optimal Control.

Reference Books:

1. Discrete Time Control systems by K. Ogata, Prentice Hall, Second Edition.
2. Digital Control and State Variable Methods by M. Gopal, Tata McGraw Hill.
3. B. C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition
4. Digital control of Dynamic Systems by G.F.Franklin, J.David Powell, Michael Workman 3rd Edition, Addison Wesley .
5. Digital Control Engineering by M. Gopal, Wiley Eastern Ltd.
6. Digital Control by Kannan Moudgalya, John Wiley and Sons.
7. Digital Control Systems by Contantine H. Houpis and Gary B. Lamont, 2nd Edition, McGraw-Hill International.