**13EC42E4-DIGITAL CONTROL SYSTEMS**

Credits: 4  
Hours /week: 4 Hrs Sessional Marks: 40  
Univ.Exam.Duration: 3Hrs Univ.Examination.Marks: 60

**UNIT – I**

Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms.

**UNIT-II**  
Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane. State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it’s Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.  
 **UNIT – III**

Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions forPulseTransferFunction.Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

**UNIT – IV**

Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and LeadLag compensators and digital PID controllers.

**UNIT – V**

Design of state feedback controller through pole placement – Necessary and sufficient conditions,Ackerman’sformula.StateObservers–FullrderandReducedorderobservers.

**TEXTBOOKS:**  
1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition.

2. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.  
 **REFERENCES:**  
1. Digital Control and State Variable Methods by M.Gopal, TMH