IV Year-II Semester		L	T	P	C
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DIGITAL CONTROL SYSTEMS (R1642021)

Prerequisite Course:

Control systems

Course Description and Objectives:

This course focuses on the analysis and design of digital control systems.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Learn the advantages of discrete time control systems and the "know how" of	3
2	Understand z–transformations and their role in the mathematical analysis of	3
3	Stability criterion for digital systems and methods adopted for testing the same	6
4	The conventional and state space methods of design are also introduced.	5

Syllabus:

UNIT I:

Objective: Understand the concepts of digital control systems and assemble various components associated with it. Advantages compared to the analog type.

Introduction and signal processing

Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT II:

Objective: Learn the theory of z–transformations and application for the mathematical analysis of digital control systems.

Z–transformations

Z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT III:

Objective: Can represent the discrete–time systems in state–space model and evaluation of state transition matrix.

State space analysis and the concepts of Controllability and observability

State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests(without proof).

UNIT IV:

Objective: Examine the stability of the system using different tests.

Stability analysis

Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.

UNIT V:

Objective: Study the conventional method of analyzing digital control systems in the w–plane.

Design of discrete–time control systems by conventional methods

Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane.

UNIT VI:

Objective: Study the design of state feedback control by "the pole placement method."

State feedback controllers:

Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

TEXT BOOKS:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

REFERENCE BOOKS:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.