

Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

Semester VII

L	T	P	C
2	0	2	3

Course Code	2IC702
Course Title	Nonlinear and Digital Control

Course Outcomes (CO):

At the end of the course, students will be able to -

1. interpret the basics of Nonlinear control system
2. illustrate the basics of sampled data control system
3. analyze the nonlinear and discrete time system
4. design controller and observer for discrete time system

Syllabus

**Teaching
Hours**

UNIT 1: Introduction to Nonlinear Control System

Nonlinear system elements, Continuous and discontinuous nonlinearities, Behavior of nonlinear control systems, State space representation of nonlinear system.

03

UNIT 2: Stability Analysis

Introduction to Phase plane analysis, concept of equilibrium point and related stability, Linearization techniques, Stability using Lyapunov method, Feedback Linearization method, related examples.

06

UNIT 3: Digital Control System: Mathematical Modeling

Introduction to Digital control of continuous time system, Overview of sampled data control system. Discrete-time system and Z-Transformation, Modified z-transform, Mapping of s-plane to z-plane, State space description of dynamic system, related examples.

07

UNIT 4: Digital Control System: Analysis

Computation of the solution of discrete time state equations, state space based time response analysis for various inputs, Jury's stability test for the sampled data control system, stability analysis of discrete time system

07

UNIT 5: Digital Control System: Design**07**

Discrete time observer and controller, related examples, Separation Principle for discrete time state model based system

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory Work will consist of minimum 10 experiments based on the above syllabus.

References:

1. M. Gopal, Digital control and state variable methods, New Age International Publication
2. Hasan Khalil, Nonlinear Control, Pearson Education
3. Hasan Khalil, Nonlinear Systems, Pearson Education
4. I.J. Nagrath and M. Gopal, Control System Engineering, New Age International Publication

L= Lecture, T= Tutorial, P= Practical, C = Credit