

Nirma University
School of Technology, Institute of Technology
Instrumentation & Control Engineering

B. TECH. SEMESTER -IV

L	T	P	C
3	0	2	4

Course Code **2IC404**

Course Title **Control System Design**

Course Learning Outcome:

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

- Analyse the control system using state space modeling
- design state feedback based controller and observer
- design controller using conventional methods

Syllabus

**Teaching
Hours**

UNIT 1: Control system design by using conventional methods

Review of root locus, Preliminary design consideration, Lead compensation
Lag compensation, Lag-Lead Compensation, Parallel Compensation, Compensator
design using frequency response

16

UNIT 2: Controller Modes

ON-OFF, multiposition, floating point controller, Introduction to proportional,
integral and derivative controller modes, Introduction to PI, PD, PID, Realization of
controller with analog and digital controller

10

UNIT 3: Analysis of control system in state space

Overview of Concept of state variable and state model, State transition matrix,
Solution of state equations, Controllability and observability, Duality principle,
equivalence between transfer function & state variable representation.

10

UNIT 4 : Design of a control system in state space

Introduction, pole placement, necessary and sufficient conditions for arbitrary pole
placement, State feedback controller, design of state feedback system, State
observers, Separation principle

9

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 be based on above syllabus with minimum 12 experiments to be incorporated.

References:

- 1) Modern Control Engineering by Katsuhiko Ogata, PHI Publication.
- 2) Control System Engineering by Nagrath & Gopal, New Age International Publication.
- 3) Modern Control System Theory by M.Gopal, New Age International Publication.
- 4) Control System Engineering by Norman S. Nise, Wiley Publication.
- 5) Modern Control System by Dorf and Bishop, Prentice Hall Publication.