Nirma University
School of Technology, Institute of Technology
B. Tech (Electronics and Communication Engineering)
Semester IV

L	T	P	C
2	0	2	3
Course Code	**2IC421**		
Course Title	**Control Systems**		

Course Learning Outcomes (CLO):

After successful completion of the course, student will be able to

- interpret and analyze stability and feedback characteristics of liner control system
- develop an ability to analyze time response of control system
- infer and simulate frequency response of control system
- illustrate basics of state space for linear time-invariant control system

Syllabus :

Teaching hours :

UNIT 1: Introduction to control systems

Introduction to linear control, open loop and closed loop control system. **01**

UNIT 2: Nonlinear control system

Introduction to nonlinear control, basics of physical nonlinearities, basic control system components. **02**

UNIT 3: Transfer function of physical system

Introduction and determination of transfer function, systems analogy, block diagram representation, signal flow graph. **04**

UNIT 4: Feedback characteristics and stability of control system

Feedback and non-feedback systems, Sensitivity of the control system, Control of disturbance by use of feedback, Necessary condition for stability, R-H criterion. **04**

UNIT 5: Time domain analysis

Typical test signals, Time response of first order system, Time response specifications, Steady state error and error constants. **05**

UNIT 6: Root locus analysis

Construction of root locus, steps to solve the problem on root locus, stability analysis of control system using root locus plots. **05**

UNIT 7: Frequency response analysis

Introduction to bode diagrams, construction of bode plots, nyquist plots, nyquist stability criterion, relative stability using frequency response analysis. **06**

UNIT 8: State variable analysis

Concept of state, state variable and state model, State space representation, solution of state equation, Derivation of transfer function from state model. **03**

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 12 experiments based on the above syllabus.

Suggested Readings :

1. U.A. Patel, Control System Engineering, Mahajan Publication.
2. Nagrath & Gopal, Control System Engineering, New Age International Publication.
3. M.Gopal, Modern Control System Theory, New Age International Publication.
4. Noman S. Nise, Control System Engineering, Wiley Publication.

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