CONTROL SYSTEMS

Paper Code **ECS-503**

Course Credits 4

Lectures/ Week 3

Tutorials/ Week 1

Course Description

UNIT – I

Basic Control System Components: Classification of Systems, Block Diagrammatic description, Reduction of Block diagrams. Properties of systems: Linearity, Time Invariance, Stability, Causality.

UNIT – II

Open Loop and Closed Loop (Feedback) System. Transfer Function, Impulse Response, Signal Flow Graphs and their use in determining function of systems Poles, zeroes and their significance, stability analysis of these systems, Routh –Hurwitz criterion.

UNIT - III

Transient and steady state analysis of LTI systems and Frequency Response, Tools and Techniques of LTI Control Systems-Root Locus, Bode Plot, Nyquist Plot.

UNIT - IV

Control Systems compensators: Elements of lead and lag compensation, Elements of proportional-Integral-Derivative (PID) control. State Variable representation and solution of state equations of LTI systems, controllability and observability, Liapunov stability analysis.

UNIT – V

Digital and Microprocessor based control Systems: Introduction, Configurations of computer control, Control

	Algorithms, Jury's stability criterion of digital control Systems, Microprocessor based control systems.
Pre –Requisite	Signals and Systems
Course/ Paper	
Text Book	M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 3rd Edition.
Reference Books	1. I.J. Nagrath and M.Gopal, "Control System Engineering", Wiley Eastern, Second edition, 1982. 2. K.Ogata, "Modern control Engineering", Prentice Hall of India, 1989. 3. William A. Wolovich, "Automatic Control Systems-Basic Analysis and design", Oxford, 2011. 4. Kuo, "Digital Control Systems", Oxford, Reprint 2013.
Course Outcome	**CO1.**Thorough understanding of Control system and its classification, Ability to determine transfer function of system using Block Diagram Reduction technique and derive mathematical models of mechanical control system. **CO2.**Ability to determine transfer function of system using Signal Flow Graph technique, capability to define stability conditions of system using Routh Hurwitz Criteria. **CO3.**Ability to perform time response analysis of first order and second order LTI systems for various inputs and to perform frequency response analysis of LTI system using Root Locus, Bode Plot and Nyquist Plot. **CO4.**Understanding of various types of Compensation techniques in control system, Ability to perform state space analysis of LTI system and compute Controllability and Observability of LTI system. **CO5.**Understanding of Digital and Microprocessor based control systems and their stability criteria.