

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. EEE - I Sem L T/P/D C

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(A50211) CONTROL SYSTEMS

Objective :

In this course it is aimed to introduce to the students the principles and applications of control systems in every day life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT - I:

Introduction: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

UNIT - II:

Transfer of Function Representation: Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT- III:

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT - IV:

Stability Analysis in S-Domain: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to $G(s)H(s)$ on the root loci. Basics of PID controllers.

UNIT - V:

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams- Determination of Frequency domain specifications and transfer function from the Bode Diagram- Phase margin and Gain margin-Stability Analysis from Bode Plots.

TEXT BOOKS:

1. Control Systems theory and applications, S. K. Bhattacharya, Pearson.
2. Control Systems, N. C. Jagan, B.S. Publications.

REFERENCE BOOKS:

1. Control Systems, A. Ananad Kumar, PHI.
2. Control Systems Engineering, S. Palani, Tata McGraw Hill.
3. Control Systems, Dhanesh N. manik, Cengage Learning.
4. Control Systems Engineering, I.J Nagrath and M. Gopal, New Age International (P) Limited, Publishers.
5. Control Systems, N. K.Sinha, new Age International (P) Limited Publishers.

Outcome:

After going through this course the student gets a thorough knowledge on open loop and close loop control systems, concept of feedback in control systems, mathematical modeling and transfer function derivations of translational and rotational systems, Transfer functions of Synchros, AC and DC servo motors, Transfer function representation through block diagram algebra and signal flow graphs, time response analysis of different ordered systems through their characteristic equation and time-domain specifications, stability analysis of control systems in S-domain through R-H criteria and root-locus techniques, frequency response analysis through bode diagrams, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.