Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ECC208	Control Systems	3	0	0	9

Course Objective
To develop an understanding of the basic principles of control theory so that the students can determine the degree of stability of a system and from the design specifications, student should be able to design a controllable and stable system.
Learning Outcomes
Upon successful completion of this course, students will: • have a broad understanding of the basic principles of control theory. • Be able to determine the degree of stability of a system. • be able to design a controllable and stable system from the design specifications.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction:** Introduction to control problem. Industrial control examples. Transfer function models of various systems. Potentiometers, Servomotors, Tachogenerators. Case study.	7	This unit will introduce the concept of a control problem with the help of several real life examples.
2	Closed-loop control systems. Block diagram and Signal flow graph analysis. Concept of states. State-space modelling of general systems. Case study	7	This unit will help student in understanding the methods to simplify complex feedback control systems and modelling the systems using state-space approach.
3	**Basic characteristics of feedback control systems:** stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. Time response. Steady-state errors and error constants. Performance specifications in time-domain. Case study	7	This unit will help in determining various characteristics of control systems like steady state error, time response specifications etc.
4	Concepts of stability and Routh stability criterion. Root locus technique, Cascade and Feedback compensation. Nyquist stability criterion. Frequency response analysis: Polar plot, Nyquist plot, Bode plot, Performance specifications in frequency-domain. Frequency-domain methods of design: Lead, Lag and Lag-lead compensation. Case study.	14	This unit will help in understanding the stability of control systems using various approaches.
5	Basic modes of feedback control: proportional, integral, derivative. Hardware implementation of P, PI and PID controllers. Overview of computer controlled systems. Case study	7	This unit introduces the student to various modes of feedback control and briefly gives an overview of computer controlled modern control systems.

Text book:

1. Nagrath I. J. and Gopal M., "Control Systems Engineering", New Age International (P) Ltd, 6th Edition, 2018.

Reference books:

1. Nise Norman S., `` Control Systems Engineering", Wiley, 6th Edition, 2011.
2. Ogata K, "Modern Control Engineering", Pearson, 5th Edition, 2015.
3. Golnaraghi F., Benjamin C. Kuo, "Automatic Control Systems", McGraw Hill, 10th Edition, 2017.
4. Dorf, R. C., and R. H. Bishop, "Modern Control Systems," 9th ed., Prentice Hall, 2001.
5. Rohrs, C. E., J. L. Melsa, and D. G. Schultz, "Linear Control Systems," McGraw-Hill, 1993.
6. Antsaklis, P. J., and A. N. Michel, "Linear Systems," McGraw-Hill, 1997.