

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE MODULE

Faculty Name:			Academic Year: 2026-27				
Department: Mechanical Engineering							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BME703	Control Engineering	Core	MOM, Mathematics	3	0	0	40
Course Learning Objectives: - Study the fundamental concepts of Control systems and their mathematical modelling. - Study the concept of time and frequency response of the system. - Study the stability analysis of the control system.							
Topics Covered as per Syllabus							
Module 1							
Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback requirements of an ideal control system.							
Types of controllers: Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.							
Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, models of thermal systems and models of hydraulic systems.							
Module 2							
Block Diagrams and Signal Flow Graphs: Transfer Functions definition, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason's gain formula.							
System Compensation: Series and feedback compensation, Lead compensator, Lag Compensator.							
Module 3							
Transient and Steady State Response Analysis: Introduction, test inputs, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. Steady state error, error constants.							
Module 4							
System stability: Routh's stability Criterion							
Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.							
Module 5							
Frequency Response Analysis: Polar plots, Nyquist stability criterion, Bode Plots, Determination of phase margin and gain margin using Bode plot.							

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List of Textbooks:

1. Modern Control Engineering, Katsuhiko Ogatta, Pearson Education, Fifth edition.
2. Modern Control Systems, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley, 13th Edition.
3. Control Systems Principles and Design, M.Gopal, Fourth Edition, TMH.
4. Automatic Control Systems, Benjamin C. Kuo, Farid Golnaraghi, McGraw Hill Education, 10th Edition

Reference Books:

1. Modern control Engineering K. Ogata Pearson 5th Edition, 2010
2. Control Systems Engineering Norman S Nice Fourth Edition, 2007
3. Modern control Systems Richard C Dorf Pearson 2017

Course Outcomes

At the end of the course, the student will be able to

1. Explain the control system and its types, control actions and develop system governing equations for physical models (Mechanical, Electrical, Thermal &Hydraulic Systems)
2. Analysis on the response of control system for standard test signals.
3. Apply block diagram & signal flow representations to obtain transfer function of control systems.
4. Analyze the stability of transfer functions in complex domain and frequency domain.

Scheme Off Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), should have a mix of topics under that module.
3. The students must answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code: BME703				TITLE: Control Engineering				Faculty Name:				
List of Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	
	CO-1	3	3	3	2	-	-	-	-	-	2	-
	CO-2	3	3	3	3	-	-	-	-	-	-	-
	CO-3	3	3	2	2	-	-	-	-	-	2	-
	CO-4	3	3	2	3	-	-	-	-	-	2	-
	Program Specific Outcomes											
	PSO1						PSO2					
CO-1	1						-					
CO-2	-						-					
CO-3	-						-					
CO-4	-						-					

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribution