

1.	Title of the course	System Dynamics and Control
2.	Course number	ME308M
3.	Structure of credits	3-0-2-4
4.	Offered to	UG
5.	New course/modification to	New
6.	To be offered by	Department of Mechanical Engineering
7.	To take effect from	January 2023
8.	Prerequisite	Nil
9.	Course Objective(s): To mathematically model the dynamics of real-world systems. To quantitatively measure the performance of a system. To quantify the effects of feedback on stability and performance. To design controllers that achieve specified performance.	
10.	Course Content: Mathematical modelling of systems; Dynamics of robots and vehicles; Taylor series and linearization; Linear, constant-coefficient differential equations; Laplace transform and its properties; Block diagrams and state-space representation of systems; Transfer functions; Steady-state error, settling time, latency, and overshoot; Feedback and control; Open-loop and closed-loop response; Bode plots, gain and phase margin; Poles, zeros, and root locus; Eigenvalues and eigenvectors; Eigen-decomposition of state-space systems; Characteristic polynomial and equation; Design of Proportional-Integral-Derivative (PID) controllers. Laboratory: Free, forced, damped, and undamped vibrations; Active control experiments.	
11.	Textbook(s): 1. Dorf R C and Bishop R H, <i>Modern Control Systems</i> , 10th Edition, Pearson (2014). 2. Ogata K, <i>Modern Control Engineering</i> , 5th Edition, Pearson (2017).	
12.	Reference(s): 1. Hespanha J P, <i>Linear Systems Theory</i> , 2nd Edition, Princeton University Press (2018). 2. Oppenheim A V and Willsky A S, <i>Signals And Systems</i> , 2nd Edition, Pearson (2015).	