Subject: Control of Robotic Systems (OE-7)								
Program: B. Tech. (All Branches; Except Mech.)				Subject Code: ME0635			Semester: VI	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE) Theory	Continuous Internal Evaluation (CIE) Practical	Total Marks
2	0	2	3	16/40	16/40	24/60	24/60	200

Course objective:

This course aims to develop the understanding of control systems, its designing and application.

Course Outcomes (CO):
1. To learn the fundamentals of MATLAB software
2. Know the transfer function, signal flow graph representation of linear systems & their controlling actions
3. Understand concept of time, frequency response as well as concept of state-space models and their relation to frequency domain models
4. Understand the methodology for modelling dynamic systems with concept of stability

Course Contents:

Unit	Contents	Hours
1	**MATLAB for Control system** Basics, Language Fundamentals, Mathematical Operations, Graphics, Programming	03
2	**Basics of Control** Control Systems: Types of Controllers, Introduction to closed loop control, Differential Equation, Transfer function, Block diagram, Signal Flow Graph,	04
3	**Time Response and Frequency Response** Time Response, Routh-Hurwitz test, relative stability, Root locus design, construction of root loci, phase lead and phase-lag design, lag-lead design, Frequency response, Bode, polar, Nyquist plot.	08
4	**Linear Control** Concept of states, state space model, different form, controllability, observability; pole placement by state feedback, observer design, P, PI & PID Controller, control law partitioning, modelling and control of a single joint.	08

Reference Books:
1. M. Gopal, Control Systems, McGraw-Hill (2012)
2. K. Ogata, "Modern Control Engineering", Prentice Hall India (2009).
3. M. Spong, M. Vidyasagar, S. Hutchinson, Robot Modeling and Control, Wiley & Sons, (2005).
4. J. J. Craig, "Introduction to Robotics: Mechanics and Control", 3rd edition, Addison- Wesley (2003).
5. S. K. Saha, Introduction to Robotics 2e, TATA McGraw Hills Education (2014).
6. Thomas Kailath, "Linear Systems", Prentice Hall (1980). 7. AlokSinha, "Linear Systems: Optimal and Robust Control", Taylor & Francis (2007).

List of Practical /Tutorials:
1. Reviewing the fundamentals of MATLAB software
2. Determination of transfer function parameters of field-controlled DC Servo motor
3. Stability analysis of linear system
4. Plot the Root Locus
5. Basics of Simulink
6. Use of Simulink for ROS
7. AC/DC Position control system
8. Design and perform Nyquist and Bode Plot
9. Stepper Motor control system
10. Implementation of P, PI and PID controller
11. Interfacing of Hardware and software with MATLAB
12. Programming and simulation of a robot in MATLAB