II B.Tech – II Semester
(20EE4634) ADVANCED CONTROL SYSTEM DESIGN

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	-	-	4

Pre-Requisites: Control Systems

Course Objectives: At the end of the course, the students are supposed to

- provide a theoretical understanding of advanced linear control systems and strategies
- Apply the optimal and robust controller design procedures to dynamic systems
- impart knowledge on intelligent control system design
- analysis of MIMO control loops and exploit SISO design methods into MIMO design problems

UNIT-I: Spate Space Methods For Control System design

Introduction to state space approach. Solution of the state vector differential equation-Transient solution from a set of initial conditions. Controllability and Observability relating Pole-zero cancellation. State variable feedback design: Pole Placement. State Observer. Effect of full-order state observer on a closed-loop system. Reduced-order state observer.

UNIT-II: Optimal Control System Design

Review of Optimal control-Types of optimal control-selection of the performance index. linear quadratic regulator-tracking problem. Kalman filter-state estimation process-single and multi-variable estimation process. Linear Quadratic Gaussian control system design. $H_2 \& H_\infty$ −Optimal control

UNIT-III: Robust Control System Design

Introduction. Internal Model Control(IMC)-structured and unstructured model uncertainty. Robust stability and Performance. Multivariable $H_2 \& H_\infty$ − robust control

UNIT-IV: Intelligent Control System Design

Intelligent control systems-Intelligent in the machines-Control system structure. Fuzzy logiccontrol systems. Neural network control systems-Neurofuzzy Control. Genetic Algorithm and their application to control design.

UNIT-V: MIMO Control Loop Analysis and Design

Models for multivariable systems, the basic MIMO control loop, closed-loop stability, steady-state response for step inputs, frequency domain analysis, robustness issues. Exploiting SISO techniques in MIMO control-completely decentralized control-pairing of inputs and outputs, robustness issues in decentralized control, feed forward action in decentralized control converting MIMO problems to SISO problems.

Course Outcomes:

After successful completion of the course, the students will be able to:

S.No	Course Outcome	BTL
1.	Apply the time-domain methods for modelling, analysing linear time-invariant (LTI) dynamic systems.	L3
2.	Execute a wide variety of state variable feedback and optimal control system design methods for linearized dynamic systems	L3
3.	Apply robust and intelligent control system design methods for linearized dynamic systems	L3
4.	To exploit the SISO design methods to MIMO problems and analyze the issues of robustness	L4

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	-	-	-	-	-	-	-	-	-	1	2	2
CO2	3	-	2	-	-	-	-	-	-	-	-	1	2	2
CO3	3	-	-	-	-	-	-	-	-	-	-	1	1	2
CO4	3	-	2	-	-	-	-	-	-	-	-	1	1	2

Text Books:

1. -Ronald S Burns. “Advanced Control Engineering”, ISBN:0-7506-5100-8
2. -Graham C. Goodwin, Stefan F. Graebe, Mario E. Salgado, “CONTROL SYSTEM DESIGN”, Pearson, ISBN: 978-0139586538

Reference Books:

1. *Bernard Friedland* “Advanced Control System Design”, Prentice-Hall, 1996