PEI309: OPTIMAL AND ROBUST CONTROL

L	T	P	Cr
3	1	0	3.5

Course Objectives: To understand the concepts of optimal and robust control, to enable to analyze and design a robust Control System

Introduction and Parametric Optimization: Introduction to optimal control problems, Classification of optimal control problems, performance indices for optimal control and their Selection.

Calculus of variations: Lagrange multiplier, Euler Lagrange's equation for different conditions, Transversality conditions, Dynamic optimization with equality and inequality constraints, Fractional order controllers.

Pontryegans Max/min Principle: Optimization using Pontryegans maximum (minimum) principles with special emphasis on Bang-Bang type system

Dynamic Programming in Continuous and Discrete Time: Developments of Hamilton Jacobi equation, Matrix Riccati equation, Optimal control based on quadratic performance indices, Linear regulator and servomechanism problem, Dynamic programming multi stage decision processes in continuous time. Principle of causality, invariant imbedding and optimality

Iterative Method of Optimization: Optimization using gradient methods and interactive techniques (steepest descent), Newton Raphson and Fletcher Powell. Introduction to multivariable system and decoupling, advance numerical techniques for optimal control, Introduction to Optimal Filters (Kalman Filter)

Robust Control System: Introduction, Robust Control System and System sensitivity, Analysis of Robustness, system with uncertain parameters, the design of robust control system, PID controllers, design of robust PID controlled systems, design examples

Minor Project : Nil

Course learning outcome (CLO): After the completion of the course the students will be able to

1. Use Parametric Optimization

Use Calculus of variations for optimization problems.

Use of Pontryegans Max/min Principle for optimization.

Apply Dynamic Programming in Continuous and Discrete Time systems

Apply iterative method of optimization

Analyze and design a robust Control System

Recommended Books:

1. *M Gopal, Modern Control System Theory, Wiley Eastern*
2. *C Drof and R H Bishop, Modern Control Systems, Richard Addision Wesley*
3. *Kirk, Optimal control theory: An introduction, PHI*
4. *Andrew P Sage and C C White, Optimum Systems Control, PHI*
5. *B D O Anderson and B Moree, Optimum System Control, PHI*

Evaluation Scheme:

S.No.	Evaluation Elements	Weightage (%)
1.	MST	30
	EST	45
	Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	25