

PEI309: OPTIMAL AND ROBUST CONTROL

L	T	P	Cr
3	1	2	4.5

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

Review of state space analysis, controllability, observability and stability

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

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

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

1. Apply Parametric Optimization
2. Apply Calculus of variations for optimization problems.
3. Apply of Pontryegans Max/min Principle for optimization.
4. Apply Dynamic Programming in Continuous and Discrete Time systems
5. Apply iterative method of optimization
6. 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 Addison 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:

Evaluation Elements	Weightage (%)
MST	30
EST	45
Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	25