

Optimal and Robust Control Systems [ORCS]

B.E. Sem. VIII [INST]

(Elective – II)

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

- **Prerequisite**
Partial differentiation, gradient and gradient vector, solving differential equations of multi-order, integral calculus etc.
- 1. Introduction**
The basic concepts of optimal control, formulation of optimal control problem, performance criteria.
 - 2. Parameter Optimization**
Parameter optimization for servo systems (tracking problem), optimal control problem using transfer function approach for continuous and discrete time control system, output regulator problem.
 - 3. Linear Regulators**
Linear quadratic regulator problem, Derivation of Riccati equation for continuous and discrete time systems. State regulator, output regulator and tracking regulator problem for continuous and discrete time control system with examples.
 - 4. Dynamic Programming**
Principles of optimality, derivation of Hamilton – Jacobi - Bellman equation, Application of optimal control via dynamic programming for continuous and discrete time systems.
 - 5. Calculus of Variation**
Minimization of functions, minimization of functionals, fixed end point and variable end point problems, formulation of variational calculus problem using Hamiltonian method.
 - 6. Introduction to Robust Control System**
Robust control system and system sensitivity, analysis of robustness, systems with uncertain parameters. Types of uncertainties: additive and multiplicative with examples. Design of robust control systems using worst case polynomial and Routh-Hurwitz criteria.

Reference Book :

1. Optimal Control – An Introduction (*D. Kirk*) Prentice Hall, Inc., Englewood Cliff, N. J., 1970.
2. Modern Control System Theory (*M. Gopal*) Wiley Eastern, 1982.
3. Linear Optimal Control (*Anderson B. D. O. and J. B. Moore*) Prentice Hall, Englewood Cliff, N. J., 1971.
4. Modern Control Systems (*R.C. Dorf, R.H. Bishop*) 8th Edition, Addison Wesley, 1999.
5. Optimal Control (*Athens and Faib*).
6. Robust Adaptive Control (*Petros A. Joannou and Jing Sun*) Prentice Hall Inc, 1996.

