Course Number and Name

BEE003 & Advanced Control System

Credits and Contact Hours

3 & 45

Course Coordinator's Name

Dr.V.Jayalakshmi

Text Books and References

Text Books:

1. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.
2. G. J. Thaler, " Automatic Control Systems", Jaico Publishing House, 1993.
3. M.Gopal, "Modern Control System Theory", New Age International Publishers, 2002.

References:

1. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Tayler and Francies Group, 2nd edition, 2011.
2. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
3. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
4. T. Glad and L. Ljung,"Control Theory –Multivariable and Non-Linear Methods", Taylor& Francis, 2002.
5. D.S.Naidu, "Optimal Control Systems" First Indian Reprint, CRC Press, 2009.
6. http://nptel.ac.in/courses/101108047

Course Description

To provide knowledge on design in state variable form and in phase plane analysis

Prerequisites	Co-requisites
Control System	Nil

required, elective, or selected elective (as per Table 5-1)

Required

Course Outcomes (COs)

CO1:To develop mathematical models and understand the mathematical relationships between the sensitivity functions and how they govern the fundamentals in control systems.
CO2:To understand the phase plane analysis.
CO3:To give basic knowledge in describing function analysis.
CO4:To study the design of optimal controller.
CO5: To design of optimal estimator including Kalman Filter

Student Outcomes (SOs) from Criterion 3 covered by this Course

COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
CO1	H	M	M	H	H		L		H	L	L	M
CO2	H	M	M	H	H		L		H	L	L	M

CO3	H	M		H	H		L		H	L	L	M
CO4	H	M		H	H		L		H	L	L	M
CO5	H	M	M	H	H		L		H	L	L	M

List of Topics Covered

UNIT I STATE VARIABLE DESIGN 9

Introduction to state Model- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle- servo design: -State Feedback with integral control.

UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearization Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts, derivation of describing functions for common non-linearities –Describing function analysis of non-linear systems – limit cycles – Stability of oscillations.

UNIT IV OPTIMAL CONTROL 9

Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti's equation – Application examples.

UNIT V OPTIMAL ESTIMATION 9

Optimal estimation – KalmanBucy Filter-Solution by duality principle-Discrete systems-Kalman Filter- Application examples..