

## **RO8005 ADVANCED CONTROL SYSTEMS**

### DETAILED SYLLABUS

#### **OBJECTIVES**

- To provide knowledge on design in state variable form
- To provide knowledge in phase plane analysis.
- To give basic knowledge in describing function analysis.
- To study the design of optimal controller.
- To study the design of optimal estimator including Kalman Filter

#### **UNIT I STATE VARIABLE DESIGN**

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**

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**

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**

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

#### **UNIT V OPTIMAL ESTIMATION**

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

#### **TEXT BOOKS**

1. Mohandas K. P., "Modern Control Engineering", Sanguine Technical Publishers, 2006
2. Thaler G.J., "Automatic Control Systems", Jaico Publishing House, 1993
3. Gopal, M. 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 2011.
2. Ashish Tewari, „Modern control Design with Matlab and Simulink, John Wiley, New Delhi, 2002.

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*Notes*  
*Syllabus*  
*Question Papers*  
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Available @

[www.AllAbtEngg.com](http://www.AllAbtEngg.com)

3. Ogata K., „Modern Control Engineering“, 4th edition, PHI, New Delhi, 2002.
4. Glad T. and Ljung L. “Control theory –Multivariable and Non-linear methods”, Taylor & Francis, 2002
5. Naidu D.S., “Optimal Control Systems” First Indian Reprint, CRC Press, 2009.