

## **OIC552 STATE VARIABLE ANALYSIS AND DESIGN**

### DETAILED SYLLABUS

#### **OBJECTIVES:**

- To provide knowledge on design in state variable form
- To study the design of optimal controller.
- To study the design of optimal estimator including Kalman Filter

#### **UNIT I STATE FORMULATION**

Formulation of state variable model, non-uniqueness, controllability, observability, stability.

#### **UNIT II STATE VARIABLE DESIGN**

Modes, controllability of modes -effect of state and output Feedback- pole placement Design

#### **UNIT III STATE ESTIMATION**

Need for state estimation- design of state Observers- full and reduced order – disturbance estimation-separation principle.

#### **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.

#### **OUTCOMES:**

- Ability to apply advanced control theory to practical engineering problems.

#### **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.

SSLC, HSE, DIPLOMA, B.E/B.TECH, M.E/M.TECH, MBA, MCA

*Notes*

*Syllabus*

*Question Papers*

*Results and Many more...*

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**REFERENCES:**

1. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Taylerand Francies Group, 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.