IC6002 SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL

DETAILED SYLLABUS

OBJECTIVES:

- To introduce Non parametric methods
- To impart knowledge on parameter estimation methods
- To impart knowledge on Recursive identification methods
- To impart knowledge on Adaptive control schemes
- To introduce stability, Robustness and Applications of adaptive control method

UNIT I NON-PARAMETRIC METHODS

Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis.

UNIT II PARAMETER ESTIMATION METHODS

Least square estimation – best linear unbiased estimation under linear constraints – updating the parameter estimates for linear regression models–prediction error methods: description of prediction methods – optimal prediction – relation between prediction error methods and other identification methods – theoretical analysis - Instrumental variable methods: Description of instrumental variable methods – Input signal design for identification.

UNIT III RECURSIVE IDENTIFICATION METHODS

The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identifiability considerations – direct identification – indirect identification.

UNIT IV ADAPTIVE CONTROL SCHEMES

Introduction – Types of adaptive control–Gain scheduling controller–Model reference adaptive control schemes–Self tuning controller–MRAC and STC: Approaches–The Gradient approach – Lyapunov functions – Passivity theory – pole placement method – Minimum variance control – Predictive control.

UNIT V ISSUES INADAPTIVE CONTROL AND APPLICATIONS

Stability – Convergence – Robustness –Applications of adaptive control.

TEXT BOOKS:

1. Soder Storm T and Peter Stoica, System Identification, Prentice Hall International,1989.

2. Astrom. K.J. and Wittenmark. B, “Adaptive Control”, Pearson Education, 2nd Edition, 2001.

3. Sastry, S. and Bodson. M, “Adaptive Control– Stability, Convergence and Robustness”, Prentice Hall inc, New Jersey, 1989.

REFERENCES:

1. Ljung L, System Identification: Theory for the user, Prentice Hall, Engle wood Cliffs,1987.

2. Bela. G. Liptak., “Process Control and Optimization”., Instrument Engineers’ Handbook., volume2, CRC press and ISA, 2005.

3. William S. Levine, “Control Systems Advanced Methods, the Control Handbook, CRC Press, 2011.