

**M.TECH SECOND SEMESTER  
REAL TIME CONTROL OF POWER SYSTEMS**

**17EEPC2T3**

**Lecture: 4 periods/week**

**Credits: 4**

**Internal Assessment: 40 marks  
End Semester Assessment: 60 marks**

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**Course objective:**

This course introduces the need of real time control of power system and various applications carried in real time operation of power systems. It also emphasis on the concept of SCADA, voltage stability, application of PMU techniques in power systems.

**Course Learning Outcomes:** At the end of the course the student will be able to

1. Identify the strategic locations for measurements to analyses the state of the system.
2. Select and identify the most appropriate algorithm for Contingency Evaluation and security analysis.
3. Understand the need of computer control of power system in real time using SCADA system.
4. Analyze voltage stability problems and application of PMU techniques in power systems.

**UNIT-I: STATE ESTIMATION**

State estimation – least square and weighted least square estimation methods for linear and non-linear systems. Static state estimation of power systems. Treatment of bad data – detection, identification and suppression of bad data.

**UNIT-II: SECURITY AND CONTINGENCY EVALUATION**

Security concept, Security Analysis and monitoring, Contingency Analysis for Generator and line outages by DC Model, Fast Decoupled model and network sensitivity methods.

**UNIT-III: COMPUTER CONTROL OF POWER SYSTEMS**

Need for real time and computer control of power systems, operating states of a power system, SCADA - Supervisory control and Data Acquisition systems implementation considerations, energy control centers, software requirements for implementing the above functions.

**UNIT-IV: VOLTAGE STABILITY**

What is voltage stability, voltage collapse and voltage security. Voltage stability analysis, 'PV' curves and 'Q-V' curves, power flow analysis for voltage stability. Applications of PMU in power systems.

**TEXT BOOKS:**

1. Modern Power system Analysis, fourth Edition- I. J. Nagrath and D. P. Kothari, Tata McGraw Hill, 2011
2. Power System Analysis by John J.Grainger and William D.Stevenson , Jr- Tata McGrawHill Edition 2003

**REFERENCE BOOKS:**

1. Power system Generation, Operation and Control by Allen J. Wood and Bruce F. Wollenberg, Wiley India Edition 2010
2. Power systems voltage stability by C.W.Taylor McGraw Hill, 1994
3. Real Time Control of Electric Power Systems by Handschin, E., Elsevier, 1972.