

# GUJARAT TECHNOLOGICAL UNIVERSITY

## B.E. SEMESTER : VIII

### ELECTRICAL ENGINEERING

Subject Name: **ADVANCED POWER SYSTEM II**

Sr. No.	Course Contents	Total Hrs
1.	<b>An Introduction to State Estimation of Power Systems:</b> Introduction, Least Square Estimation: The Basic Solution, Static State Estimation of Power systems, Tracking State Estimation of Power systems, Some Computational Considerations, External System Equivalence, Treatment of Bad Data, Application of Power System State Estimation.	12
2.	<b>Power System Security:</b> Introduction, System State Classification, Security Analysis, Contingency Analysis, Sensitivity Factors	08
3.	<b>Reactive Power Control and Voltage Stability:</b> Introduction, Power Flow in a Two-bus system, Voltage Regulation in a Transmission system and its Relation with Reactive Power, Uncompensated Transmission Line Review of Basic Concepts, Uncompensated Radial Transmission Line on Open Circuit, Uncompensated Radial Transmission Line under Heavy Loading Condition, Expression of Midpoint Voltage in a Line Terms of Real Power Flow and Line Length, Reactive Power Requirement of an Uncompensated Line, Reactive Power and Voltage Collapse, Changes in Power System Contributing to Voltage Collapse, Concepts of Stability of Transmission System, Definition and Classification of Voltage Stability, Mechanism of Voltage Collapse, Analytical Concept of Voltage stability for a Two-bus System, Expression for Critical Receiving End Voltage and Critical Power Angle at Voltage Stability Limit for a Two-bus Power System, Relation of Voltage Stability and Rotor Angle Stability, Factors Affecting Voltage Stability, Role of Transformer on Voltage Control of a Power System, Reactive Compensation Methods for Heavily Loaded and Voltage Stressed Power Systems to Enhance Voltage Stability	10
4.	<b>Load Forecasting Techniques:</b> Introduction, Forecasting Methodology, Estimation of Average and Trend Terms, Estimation of Periodic Components, Estimation of $y_s(k)$ : Time series Approach, Long Term Load Predictions Using Econometric Models, Reactive Forecast.	08
5.	<b>Preventive, Emergency and Restorative Control:</b> Introduction, Normal and Alert State in a Power System, Emergency Control, Emergency Control An Example, A Blackout, Power System Restoration	06
6.	<b>Power System Structures:</b> A vertically integrated utility, Structure of a Deregulated Industry, Indian Scenario, Concluding Notes	04

#### Reference Books/Resource:

- 1) **Modern Power System Analysis** by D.P. Kothari, I.J. Nagrath, TMH Pub., 4<sup>th</sup> Edition.  
Topics [1, 2, 4]
- 2) **Power System Analysis Operation and Control** by Abhijit Chakrabarti, Sunita Halder, PHI Publication, 3<sup>rd</sup> Edition : [Topic 3]
- 3) Web Course: Power System Operation and Control by Prof A. M. Kulkarni, NPTEL. Available at : <http://nptel.iitm.ac.in>, Topics : [5-6]
- 4) **Power Generation Operation and Control** by A. J. Wood, B.F. Wollenberg, John Wiley

- 5) **Power System Analysis** by T.K. Nagsarkar, M.S. Sukhija, Oxford Pub.
- 6) **Power System Analysis** by J.J. Grainger, W.D. Stevenson Jr., TMH Edition
- 7) **Power System Analysis and Design** by Glover D., Sarma M., Thomson Publishers

**Suggested Laboratory Work:**

- 1) Simple Problem on State Estimation using any programming language.
- 2) Problem solving of Load Fo
- 3) Recasting using any programming language.
- 4) Study of Electric Market Restructuring.
- 5) Study of PV, QV curves, Voltage Stability Using POWERWORLD Simulator (Demo Version).

The visits to Load Dispatch Center, 400 kV substation and Generating stations are suggested. The purpose of these visits is to give all students the exposure to operation and control of power system.