

EE533 Power System Operation (3 credits)

College of Engineering

Klipsch School of Electrical and Computer Engineering

New Mexico State University

Date and Time:	Fall 2005
Class	TF 1:10AM-2:25 PM
Room:	CE110
Instructor:	Satish J. Ranade
Office Hours:	T&B112 T-Th 2:30PM-4PM, or by appointment
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Course Description from the Undergraduate Course Catalog –

E E 533. Power System Operation 3 cr.

AGC, economic dispatch, unit commitment, operations planning, power flow analysis and network control, system control centers. Prerequisites: E E 493.

Textbook and other Required Materials:

Glover, J. D., and Sarma, M., "Power System Analysis and Design", 3rd ed., Brooks/Cole, New York, 2001

Mariesa Crow “Computational Methods for Electric Power Systems”, CRC Press, Boca Raton, FL, 2002 ISBN 0-8493-1352-x 9000

Wood, A. J. and Wollenburg, B. F., "Power Generation Operation and Control," John Wiley and Sons, New York, 2nd Ed, 2001.

Reference Texts

1. Bhattacharya, Bollen, Daalder,” Operation of Restructured Power Systems”, Kluwer, 1998
2. Ilic, Galiana, and Fink “ Power System Restructuring—Engineering and Economics”, Kluwer, 1998
3. Shahidepour, Yamin, Li “Market Operations in Electric Power Systems”, IEEE/Wiley Interscience, New York, 2002
4. Current Literature

COURSE OBJECTIVE:

The objective of this class is to provide students with a basic understanding of how a large power system is operated. Problems involved in classical power system operations namely, automatic generation control, economic scheduling, power flow and security analysis, and pricing are studied. The mathematical methods including optimization techniques needed to solve these problems are presented. Most power system operation functions are performed through the energy control center or energy management system. Thus, EMS hardware (SCADA) and application software, are reviewed.

About half of the utility industry in the US has now been ‘restructured’; the fundamental principles of operations and the theory stay the same but the goals, constraints, responsibilities and environment have changed and are still evolving. So we will also discuss generation management and bidding (by Energy Companies) and network management and pricing (by Transmission Operators).

Topical Outline

Week 1: Review of Power System Real-time Operations

We will review the processes and infrastructure necessary to operate power systems in a reliable and economical manner. We will examine the changes necessitated by the deregulated power industry.

Week 2-3: Power System Components and Characteristics Relevant to Operations

Generators: Electrical and Cost Characteristics

Transmission Lines and Transformers

Classical Control Devices

Modern Control Devices (FACTS)

Week 4-8 Basic Processes in Power Operations

Automatic Generation Control

Economic Scheduling

Network Operation-Power Flow and Voltage Control

Deterministic and Probabilistic Costing

Week 9 Deregulated Operation

Motivation and History, Structures

Week 10-11 RTO Operations: Transmission Capacity, Scheduling, Pricing, Ancillary Services, and Congestion Management.

Week 12-14 Generation Portfolio Management and Marketing
Cost , Bidding, Risk Analysis, Commitment and Scheduling,

GRADING: Homework	30%
Tests (2)	40%
Topical Papers/Projects	30%

The tests will most likely be a take-home tests.

A > 90 B > 80 C > 70 D > 60 F < 60

STUDENTS WITH DISABILITIES: If you have (or believe you have) a disability and would benefit from classroom accommodation(s), please contact the Services for Students with Disabilities (SSD)]

Student Responsibilities:

1. Register with SSD and obtain accommodation documents early in the semester;
2. Deliver the completed accommodation and testing form(s) to the instructor(s) within the first two weeks of beginning of classes (or within one week of the date services are to commence);
3. Retrieve the signed form(s) from faculty and return to SSD within (5) days of the receipt from faculty and at least one week before any scheduled exam; and,
4. Contact the SSD Office if the services/accommodations requested are not being provided, not meeting your needs, or if additional accommodations are needed. Do not wait until you receive a failing grade. Retroactive accommodations cannot be considered.

Faculty Responsibilities

1. Sign the *ACCOMMODATION REQUEST FORM* and *TESTING ACCOMMODATION FORM* (when presented), retain a copy, and return the original to the student within five (5) working days of receipt;

2. Contact SSD immediately if there are any questions or disputes regarding accommodation(s), disruptive behavior, etc.; and,
3. Refer the student to SSD for any additional accommodations.

Accommodations: SSD Office, 646-6840 (Corbett Center, room 244)

Discrimination: Office for Institutional Equity, Mr. Paul Gayle-Smith, 646-3635, O'Loughlin House