University of Jordan
School of Engineering
Department of Electrical Engineering
1st Term – A.Y. 2017-2018

Course: Power System Operation and Economics – 0933789 (3 Cr. Course)

Catalog Data: Power system economics. Electricity market. Optimization. Economic dispatch. Unit commitment. Price elasticity. Market equilibrium. Risk management. Pool, bilateral electricity marketplaces.Forward and spot (balancing) markets. Locational marginal pricing.

Prerequisites by Course: **None**

Textbook: **None**

References:
[1] D. S. Kirschen and G. Strbac, ''Fundamentals of power system economics,'' John Wiley & Sons, 2004.
[2] N. S. Rau, ''Optimization principles: practical applications to the operation and markets of the electric power industry,''John Wiley & Sons, 2003.
[3] H. R. Varian, ''Intermediate Microeconomics: A Modern Approach,'' 2014.

Schedule & Duration: 16 Weeks, 48 lectures, 50 minutes each (including exams).

Course Objectives: This course provides the student with the basic concepts of the optimal operation of power systems and the economic principles of electricity market. This course also provides students with methodologies to assess the security and investments in power systems.

Course Learning Outcomes and Relation to Program Learning Outcomes:

Upon successful completion of this course, the student should be able to:

1. Understand the drivers and risks behind generation and transmission capacity expansion. [i, ii]
2. Understand the concepts of microeconomics and the principles of market-based operation of power systems. [i, ii]
3. Understand different types of electricity markets. [i, ii]
4. Explore different techniques to balance supply and demand in a power system. [i, ii]
5. Explore different optimization techniques that can be applied to the economic operation of power system subject to network constraints. [i, ii, iii]
6. Understand the locational marginal pricing in transmission systems. [i, ii]

Course Topics:

Topic	Description	Contact Hours
1.	Introduction to optimization and optimal economic system operation; economic dispatch and unit commitment.	10
2.	Electricity markets and power system economics: Supply and demand balance over different timeframes, price elasticity and	12

	market equilibrium. Electricity marketplaces: Forward and spot (balancing) markets; power exchanges; generation scheduling; two-settlement system	
3.	Concepts of power system security: ancillary services in a market environment and concept of (N-x) security, Optimal power flow and DC approximation	8
4.	Power system and Generation investments: Drivers for capacity expansion. Costing and pricing of transmission networks.	8
5.	Impacts of high penetration of renewable generation on power system capacity. Opportunities for Demand Side Management (DSM) and storage.	4

Computer Usage: students are encouraged to write/use computer programs for mathematical modelling.

Attendance: Class attendance will be taken and the University policy on absence will be followed.

Assessments: Written assessments and Exams

Grading policy:

Semester work	60 %
Final Exam	40 %
Total	100%

Instructor:

Instructor Name	Office	Ext.	E-mail
Dr. Sereen Althaher	EE	--	s.thaher@ju.edu.jo

Program learning outcomes

- **i** Demonstate a sound, in-depth and up-to-date technical knowledge in the field of specialization.
- **ii** Ability to identify and solve engineering problems in their chosen field of study.
- **iii** Acquir the skills for continued professional development and independent self-study.
- **iv** Demonstrate the ability to communicate technical informatiom effectively and professionally both orally and in writing..

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