

**The University of Jordan**  
**School of Engineering**  
**Electrical Engineering Department**  
2nd Semester – A.Y. 2023/2024

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**Course:** **Power System Operations & Economics – 933583 (3 Cr. – Required Course)**

**Instructor:**

Dr. Sereen Althaher

Office: E306, Telephone: 06/5355000 ext 22857, Email: s.thaher@ju.edu.jo

Office Hours: Will be posted soon

**Platform:**

(<https://elearning.ju.edu.jo/>)

**Catalog**

**description:**

Overview of electric power system; generation, transmission and distribution. Power system operation; load characteristics, demand forecasting, economic dispatch, and unit commitment. Security of power system; optimization, DC optimal power flow and security-constrained economic dispatch. Power system economics; cost of electricity generation, locational marginal pricing, and network charges. Power sector restructuring and Electricity market; price elasticity, market structure and deregulation, wholesale and retail electricity markets, market mechanisms and equilibrium, pool and bilateral electricity market, forward and spot (balancing) markets and ancillary services markets.

**Prerequisites  
by course:**

**EE 903481** Power system analysis (pre- or co-requisite)

**Prerequisites  
by topic:**

Students are assumed to have a background in the following topics:

- Power system analysis techniques

**Textbook:**

**N/A**

**References:**

1. D. S. Kirschen and G. Strbac, "Fundamentals of power system economics," John Wiley & Sons, 2018.
2. A. Conejo, and L. Baringo. "Power system operations", New York: Springer, 2018.
3. M. Shahidehpour, and M. Alomoush, "Restructured electrical power systems: Operation: Trading, and volatility". CRC Press, 2017.
4. •F. Denny, and D. Dismukes. "Power system operations and electricity markets", CRC press, 2017.

**Schedule:**

**On Campus** [16 Weeks, 42 lectures (50 minutes each) including exams]

**Course goals:**

This course provides the student with the basic concepts of the optimal operation of

**Course learning outcomes (CLO) and relation to ABET student outcomes (SO):**

Upon successful completion of this course, a student will:

**[SO]**

1. Understand the principles of power system operation including the security of supply and economics considerations.

**[1,2]**

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

**Course topics:**

		<b>Hrs</b>
1.	Overview of electric power system; generation, transmission and distribution. Power system operation; load characteristics and demand forecasting.	<b>8</b>
2.	Introduction to optimization and optimal economic system operation; economic dispatch, and unit commitment. Security of power system; optimal power flow and DC approximation and security-constrained economic dispatch.	<b>12</b>
3.	Power system economics; generation investments, capacity expansion, cost of electricity generation, costing and pricing of transmission networks, locational marginal pricing, and network charges	<b>10</b>
4.	Power sector restructuring; price elasticity, deregulation, wholesale and retail electricity markets, market mechanisms and equilibrium.	<b>8</b>
5.	Electricity market; power exchange, pool and bilateral electricity market, forward and spot (balancing) markets and ancillary services markets.	<b>4</b>

**Ground rules:** Attendance is required and highly encouraged. To that end, attendance will be taken

**Assessment & grading policy:**

First Exam		Assignments	10%
Midterm Exam	30%	Projects	15%
Final Exam	40%	Lab Reports	0%
Quizzes	0%	Presentation	5%
<b>Total</b>			<b>100%</b>

**Last Revised:** Feb 2024