

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



**Course code:** EE- 0933789  
**Course title:** Power System Operation and Economics  
**Credit hours:** 3

**Instructor** Dr. Sereen Althaher  
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Office Hours: Will be posted soon

**Course website:** <http://elearning.ju.edu.jo/>

**Catalog Data:** **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:** None

**Textbook:** None

**References:**

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

**Schedule & Duration:** 16 Weeks, 16 Lectures (150 minutes each) plus 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 (CLO) and relation to ABET student outcomes (SO):****Upon successful completion of this course, a student will:**

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

**Course topics:**

	<b>[hr]</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 mandatory** and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered **cumulative**. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

**Assessments and Grading policy:**

Mid-term exam	<b>30 %</b>
Project and Term-paper	<b>30%</b>
Final Exam	<b>40 %</b>
Total	<b>100%</b>

**Last Updated:      October 10, 2023**