



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Power Systems - Analysis and Operation

## ECE 5043

**Credit Hours:**

3.00

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**Course Levels:**

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

Power systems analysis and operations, including steady-state analysis, state estimation, and economic operation.

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**Prerequisites and Co-requisites:**

Prereq: 3040, Sr standing, and ECE major; or Sr standing and ISE major; and Math 2568; or Grad standing in engineering or biological sciences or math and physical sciences.

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**Course Goals / Objectives:**

- Students learn how power systems operate in steady-state (solving systems of nonlinear equations).
  - Students learn how to estimate the state of a power system (solving unconstrained optimization problems).
  - Students learn how to perform a security analysis of a power system (solving a large number of interrelated systems of linear equations).
  - Students learn how electricity markets operate (solving linear optimization problems).
  - Students learn how generating units are scheduled for production (solving mixed-integer linear optimization problems).
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**Course Topics:**

- Introduction: Power systems and how they work
  - Power system steady-state analysis: power flow equations, Newton solution, DC power flow
  - Power system state estimation: observability, estimation, bad data detection and identification
  - Power system security: contingency analysis, optimal power flow, security-constrained optimal power flow
  - Power system economic operation: market clearing, unit commitment
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**Designation:**

Elective