



University of Kurdistan  
Department of Electrical Engineering

# Microgrids

(Spring 2020)

Instructors: [Q. Shafiee](#) & [H. Bevrani](#)

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## Course Description

Microgrid is an ideal way to intelligently integrate renewable resources, enable customer participation in the electricity enterprise, add reliability, bring diversification of energy sources, and reduce carbon emissions and costs. The microgrids form the building blocks of the modern, smart power grid. This course provides both theoretical knowledge and practical foundation for understanding of Microgrids. Different aspects of these small-scale power systems, current challenges and research directions will be examined in detail.

## Topics Covered

1. Introduction
2. Power Electronics for Renewable Energy Sources and DGs
3. Microgrids: Concept, Structure, Types and Operation Modes
4. Microgrid Demonstration Projects
  1. Microgrid Planning and Operation
  2. Microgrid Control
  3. Interconnected Microgrids: Modeling and Control
  4. Power Quality in Microgrids
  5. DC Microgrids
  6. Grid Connected RESs and Ancillary Services
  7. Microgrids: Dynamics and Modeling
  8. Virtual Inertia
  9. Dynamic Impact on Power Systems
  10. Energy Management in Microgrids
  11. Special Issues in Microgrids

## Grading

The course grade will be determined using the following:

- Homework and Activities: 20%

- Final Exam: 40%
- Final Project: 40%

## References

- [1] H. Bevrani, B. Francois, T. Ise, *Microgrid Dynamics and Control*, Wiley Press, July 2017.
- [2] Q. Shafiee, H. Bevrani, *Course Lecture Notes*, Spring 2020.
- [3] SMGRC recent published documents.

## Homework Assignments

The homework assignments will be performed along the semester. Main homework (mini project) will be arisen from Chapter 2.

Note: Students may discuss the problems with other students, but are not allowed to share solutions (MATLAB m-files, etc.).

## Final Project

During the last 1/2 of this course you will work on a special project of your choice. This will give you a chance to deepen your knowledge in your area of interest. You will provide a detailed written report and simulation files.