

## ABOUT MULTIVERSITY

Texas A&M University at Qatar is a leader for Qatar Foundation's vision for multiversity to enrich learning and success of students across Qatar Foundation's partner universities. The multiversity vision aligns with Texas A&M's own purpose of developing leaders dedicated to serving the greater good, and we understand that graduates will be better equipped as engineering leaders through diverse experiences that cultivate holistic learning and multidimensional skills beyond the traditional classroom. To achieve this vision, Texas A&M University at Qatar is offering a multiversity course with Hamad Bin Khalifa University on smart grid.



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**TEXAS A&M**  
UNIVERSITY *at* QATAR



# ECEN489

## SPECIAL TOPICS IN SMART GRID



elective undergraduate course for  
TAMUQ and HBKU students

## SPECIAL TOPICS IN SMART GRID

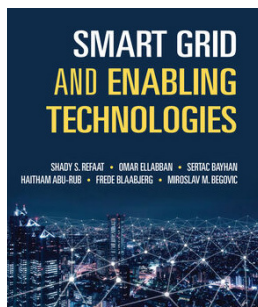
Is an undergraduate course offered jointly by Texas A&M University at Qatar and Hamad Bin Khalifa University to enrich learning and success of students across Qatar Foundation's partner universities. Smart Grid is bound to give aspiring electrical engineering and computer science students the best academic path for building and developing the core areas of smart grid - microgrids, renewable energy, electric vehicle integration, and communication.

### TEXTBOOK

*Smart Grid and Enabling Technologies*, Shady S. Refaat, Omar Ellabban, Sertac Bayhan, Haitham Abu-Rub, Frede Blaabjerg, Miroslav M. Begovic, Wiley, 2021.

### PREREQUISITES

ECEN214 - Principles of Electrical Engineering or equivalent.



### Instructors

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### Important Dates

Class Starts:  
July 31, 2022

Enrollment Deadline:  
August 4, 2022

## COURSE LEARNING OUTCOMES

The student is expected to attain basic knowledge of the following aspects:

1. Understand the smart grid concepts and terminology.
2. Know the renewable energy integration and microgrid technology.
3. Know about energy storage issues in smart grid.
4. Know the communication technologies, advanced metering infrastructure, and information security standards in smart grids.
5. Investigate the demand response, demand side management and economy of the smart grids.

## ABOUT

The course presents the smart grid basics, its enabling technologies, current state, and the future perspectives. The taught material contains an overview of the smart grid architectural, renewable energy integration opportunities and challenges, power electronics as enabling technology of the smart grid, micro grids structure and control, energy storage, demand response, advanced metering infrastructure, communication and networks in smart grids, information security for smart grids, data management, and economy of the smart grids.

The smart grid encompasses a wide array of technology that has the potential to dramatically improve the reliability, security, and efficiency of the electric grid, offering economic and environmental benefits. The smart grid has been described as the convergence of electric system and information technologies to provide utility customers the enhanced information, services and reliability that are so critical for the coming future.

The objective of this course is to equip the students with an overview of smart grid elements and fundamentals.

### COURSE OUTLINE

1. Smart grid architectural overview.
2. Renewable energy integration: opportunities and challenges.
3. Power electronics as enabling technology of the smart grid.
4. Microgrids: structure and control.
5. Energy storage for smart grid balancing.
6. Smart transportations
7. Demand response and demand side management.
8. Advanced metering infrastructure.
9. Communication and networks in smart grids.
10. Simulation tools for the smart grid

