

Special Topics ECE 8803-A

Smart Electricity Grids



2019, Prof. Santiago Grijalva

Description: This course provides a comprehensive introduction to smart electricity grids covering smart devices and controls, the cyber layer (communication, information, and computation), system level control, and market applications. The course has an emphasis on grid control and management architectures, software systems, and data analytics.

Pre-requisites: ECE4320 or ECE4330
ECE6320 desirable

Time: 9:05 am – 9:55 am MWF
Location: Van Leer C341
Office Hours: W 10-11am, Van Leer 284

Textbook: Instructor will provide lecture presentations in pdf format through Canvas
References: Instructor will provide list of references for various topics.
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Grading: Homework (20%)
Mini-Project (15%)
Midterm (15%)
Semester Project (25%)
Final Exam (25%)

CONTENTS

1. Introduction to Smart Grids

Device Layer

2. Distribution Systems

Local Control Layer

3. Smart Meters and Sensors
4. Substation IEDs and PMU
5. Smart Grid Data Analytics
6. Smart Power Electronic Devices and Controls

Cyber Layer

7. Smart Grid Communications
8. Advanced Metering Infrastructures
9. Internet of Things and Embedded Computing
10. Cyber-Security
11. Smart Grid Cyber-Physical Security
12. Information Systems
13. Computation Systems

System Control and Market Layer Applications

14. Distribution Automation
15. Demand Response
16. Distributed Energy Resources
17. Energy Storage and Electric Vehicles
18. Home Energy Management Systems
19. Microgrids
20. Smart Bulk Power Applications
21. Future Grids