EE481-Special Topics in Communications (Elective Course)

Code and Name: EE481 Special Topics in Communications.
Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:
- Renewable and Efficient Electric Power Systems, Gilbert M. Masters, Wiley Interscience, John Wiley & Sons, Inc, 2004
Other References:
-None

Course Description:
Photovoltaic Materials and Electrical Characteristics, The Equivalent Circuit for a Photovoltaic Cell, The PV I –V Curve Under Standard Test Conditions (STC), Impacts of Temperature and Insolation on I –V Curves, Shading impacts on I–V curves, Bypass Diodes for Shade Mitigation, Photovoltaic Systems, Current–Voltage Curves for different Loads, Maximum Power Point Trackers, Grid-Connected Systems, Interfacing with the Utility, The "Peak-Hours" Approach to Estimating PV Performance, Grid-Connected System Sizing, Stand-Alone PV Systems, Estimating the Load, The Inverter and the System Voltage, Batteries, and Battery Storage Capacity, Coulomb Efficiency Instead of Energy Efficiency, Battery Sizing, Blocking Diodes, Sizing the PV Array, Hybrid PV Systems, Stand-Alone System Design

Pre-requisites: EE222
Co-requisites: None

Course Learning Outcomes:
With relation to ABET Student Outcomes (SOs: 1-7)
1. Solve electrical engineering problems related to photovoltaic cells. (1)
2. Recall main methods to analyze and explain the performance of PV cells and describe their specs and their meanings and be able to summarize their characteristics. (2)
3. Calculate the efficiency of photovoltaic arrays and converters. Design solar system array meeting a required demand. (1)
4. Evaluate the energy demands per year of electric appliances and electronic equipment. (1)
5. Apply information related to solar insolation and peak hours in design problems. (1)
6. Calculate battery size needed for stand-alone systems. (1)

Topics to be covered:
- Photovoltaic Materials and Electrical Characteristics: Introduction; Basic Semiconductor Physics; A Generic Photovoltaic Cell; The Equivalent Circuit for a Photovoltaic Cell From Cells to Modules to Arrays.
- The PV I –V Curve Under Standard Test Conditions (STC), Impacts of Temperature and ---Insolation on I –V Curves.
- Shading impacts on I–V curves, Physics of Shading, Bypass Diodes for Shade Mitigation, Blocking Diodes.
- Photovoltaic Systems: Introduction to the Major Photovoltaic System Types, Current–Voltage Curves for Loads.
- Maximum Power Point Trackers.
- Grid-Connected Systems, Interfacing with the Utility.
- The "Peak-Hours" Approach to Estimating PV Performance.
- Grid-Connected System Sizing.
- Stand-Alone PV Systems, Estimating the Load, The Inverter and the System Voltage, Batteries, Battery Sizing, Blocking Diodes.
- Sizing the PV Array, Hybrid PV Systems, Stand-Alone System Design Summary.

Grading Policy:
The grading for the course are 60% coursework and 40% Final Exam. The coursework consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, and projects for the remaining 20% that is modified by the course instructor.