# ECE 3211 Power Electronics

Credits and contact hours: 4 Credits (Two 75-minute class periods, one two-hour laboratory period)

Instructor: Prof. Ali Bazzi
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- Office Hours: Wednesday 10:30 a.m. to 12:30 p.m. in ITE 331, or by appointment.

Specific Course Information:
- *Catalog Description*: Power converters for power processing, regulation, and control as applied to computer and telecommunication systems, transportation systems, industrial drives, and renewable power conversion systems. Power semiconductor device characteristics, transformers, and dc/dc converters including design projects.
- *Prerequisite*: ECE 3201. This course and ECE 3610W may not both be taken for credit.
- *Required, elective, or selected elective:* Selected elective (EE)

Textbook
- *Required:* P.T. Krein, *Elements of Power Electronics*, 2nd ed., Oxford University Press, New York, NY, 2015.
- *Required:* Ali M. Bazzi, *ECE 3211 Power Electronics - Laboratory Manual*, V. 1.3, Available at the Co-op.
- *Optional:* N. Mohan, T. Undeland, and W. Robins, *Power Electronics Converters, Applications, and Design*, 3rd edition, John Wiley and Sons, Honoken, NJ, 2002.

Specific Goals for the Course:

*Specific Outcomes of Instruction*: Students will be able to identify different power semiconductor devices, identify and design power converter types including dc/dc, dc/ac, and ac/dc, understand the control and operation of such converters, analyze their behavior, and mathematically model their circuits.

- *EAC Criterion 3 Student Outcomes addressed by the course*:

1. **an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics**

   Students learn to identify different power semiconductor devices, identify and design power converter types including dc/dc, dc/ac, and ac/dc, understand the control and operation of such converters, analyze their behavior, and mathematically model their circuits.

2. **an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors**

   n/a

3. **an ability to communicate effectively with a range of audiences**

   Students write a technical report on a specific project topic that is related to power electronics, and present their project findings to their peers.

4. **an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts**

n/a

5. **an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives**

   Students build leadership and collaborative team work by doing team-based laboratory activities and establish goals, plan tasks, and meet objectives by doing a final team project.

6. **an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions**

   Students learn to conduct experiments by following step-by-step given lab sessions. Students learn to analyze and interpret data by comparing the experimental results and theoretical derived results.

7. **an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.**

   Students learn to use MATLAB/Simulink.

Topics covered

- Switching devices
- AC/DC rectifiers
- DC/DC converters
- DC/AC inverters
- Converter modeling and control
- Teamwork
- Project reports and oral presentations
- Electrical/Computer design and modeling
- Prototyping and system evaluation