ECE 615 “Advanced Topics in Power Electronics” – 3 cr. hrs.

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| Catalog Data  2009-2011 | **Prerequisite: ECE 515 or equivalent**  This course covers advanced technologies in power electronics with emphasis on hybrid vehicle and renewable applications. The course will cover topics such as resonant converters, vector control, field oriented control, battery chargers, vehicle to grid management, power factor correction and harmonic control, model predictive control, renewable energy systems (solar, wind and ocean) and their requirement for power converters, electric drive transportation components, silicon carbide power devices. *(Three lecture hours per week)* |
| Textbook | None |
| Coordinators | Prof. C. Mi |
| Prerequisites by Topic | DC-DC converter, rectifiers, inverters |
| Topics | 1. Resonant converters 2. Vector control 3. Field oriented control 4. Battery chargers 5. Vehicle to grid management 6. Power factor correction and harmonic control 7. Model predictive control 8. Renewable energy systems (solar, wind and ocean) and their requirement for power converters 9. Electric drive transportation components 10. Silicon carbide power devices 11. Thermal management of power converters |
| **Laboratory projects** | None |
| Computer Usage | PSPICE, PSIM, Matlab/Simulink, Simplorer |
| Course Objectives | 1. Understanding of resonant converters.  2. Knowledge of the basic concepts of advanced power electronics and motor drive systems, such as field oriented control, vector control.  3. A good understanding of power electronics in EV applications, such as battery chargers, V2G management  4. Knowledge of the application of power electronics in renewable energy applications, such as harmonics control, power factor correction  5. Understanding of advanced semiconductor devices such as silicon carbide devices and GaN devices. |
| Course Outcomes | 1. Ability to analyze resonant converters (Outcome: a).  2. Ability to design controls for motor drives using vector control and field oriented control. (Outcomes: b)  3. Ability to use tools such as PSPICE/PSIM/Matlab to analyze power electronic and motor drive circuits problems. (Outcomes: c)  4. Ability to select new power devices for specific applications (Outcomes: c) |
| Assessment Tools | Assignments, projects, designs, presentations |