ELCT 572
Power Electronics

CREDITS/CONTACT HOURS:  Credits: 3, Contact Hours:  42

COORDINATOR:  Dr. Enrico Santi

TEXTBOOKS AND OTHER REQUIRED MATERIAL:

SUPPLEMENTAL MATERIALS:
Handouts will be provided on transformers and on design of power inductors and transformers

CATALOG DATA:
(Prerequisite: ELCT331, ELCT371). Basic analysis and design of solid-state power electronic devices and circuitry.

REQUIRED/ELECTIVE:
Elective

TOPICS COVERED:
- Introduction to power electronics (3 hour)
- Steady-state operation of switching converters: inductor volt-second balance, on capacitor charge balance and small-ripple approximation (4 hours)
- Steady-state equivalent circuit modeling, losses and efficiency (5 hours)
- Switch realization (2 hours)
- A brief survey of power semiconductor devices (4 hours)
- Switching losses in switching converters (2 hours)
- Discontinuous conduction mode of operation (3 hours)
- Converter topologies (2 hours)
- High-frequency transformer isolation in switching converters (5 hours)
- Basic magnetic theory (3 hours)
- Inductor and transformer design: area product and core geometry approach (6 hours)
- AC equivalent circuit modeling (4 hours)
- Review of Bode plots (2 hours)
- Small-signal switching converter transfer functions (5 hours)
- Negative feedback, controller design (4 hours)
- Demo of switching power converter operation (2 hours)

COURSE OUTCOMES:
1. Demonstrate the ability to analyze switching power converters in steady state using circuit averaging and determine DC voltages and currents
2. Be able to sketch current and voltage waveforms in a converter in steady state
3. Demonstrate the ability to size passive filtering components in a converters such as inductors and capacitors to obtain a desired ripple performance
4. Demonstrate the ability to derive small-signal linearized models for switching converters
5. Demonstrate an understanding of the effects of negative feedback on converter operation
6. Demonstrate the ability to simulate switching converter using both switching models and averaged models

Relation of course outcomes to program outcomes
H = major importance, M = moderate importance, L = minor importance, blank indicates no relation

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>an ability to apply knowledge of math, science and eng. (a)</td>
<td>1  2  3  4  5  6</td>
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<td>an ability to design and conduct experiments; analyze and interpret data (b)</td>
<td>H  M  H  M</td>
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<td>design a system, component, or process to meet desired needs (c)</td>
<td>L  M  M</td>
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<td>identify, formulate, and solve engineering problems (e)</td>
<td>H  M  L  M</td>
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<td>an ability to use the techniques, skills, and modern eng. tool necessary (k)</td>
<td>L  H</td>
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ASSESSMENT METHODS:
1. Tests
2. Homework
3. Project