EE-4227
Power Electronics

Curricular Designation:  EE: elective  CpE: elective

Catalog Description:
EE 4227 – Power Electronics  Fundamentals of circuits for electrical energy processing. Covers switching converter principles for dc-dc, ac-dc, and dc-ac, power conversion. Other topics include, harmonics, pulse width modulation, feedback control, magnetic components and power semiconductor switching devices.

Credits: 3.0  Lec-Rec-Lab: (3-0-0)  Semesters Offered: Fall  Pre-requisites: EE 3120

Textbooks(s) and/or Other Required Materials:

Prerequisites by Topic:
Overview of the generation and utilization of electrical energy. Covers three-phase circuits, transformers, photovoltaics, batteries, electromechanical energy conversion, and an overview of electric power systems, including economic issues.

Course Objectives:
1. To develop all major power electronics concepts, from both systems and components perspectives.
2. To present major design considerations for switching power conversion, including operation and control choices, harmonics and filtering, circuit models of real sources and devices, magnetics design, and passive and active component behavior.

Topics Covered:
1. Energy Conversion and the Future
2. Switch Circuit Analysis
3. Measures of Quality
4. DC-DC Converters
5. Advanced DC-DC Converters
6. Rectifiers and Inverters
7. Real Sources, loads and Passive Components
8. Discontinuous Modes
9. AC-AC Conversion
10. Control of Converters
Relationship of the Course Content to Program Outcomes:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Topics and Level of Coverage</th>
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<tbody>
<tr>
<td>a</td>
<td>an ability to apply knowledge of mathematics, science and engineering</td>
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<tr>
<td>b</td>
<td>an ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<tr>
<td>c</td>
<td>the ability to design a system, component, or process to meet desired needs within realistic constraints such as...</td>
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<td>d</td>
<td>an ability to function on multi-disciplinary teams</td>
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<td>e</td>
<td>an ability to identify, formulate and solve engineering problems</td>
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<td>f</td>
<td>an understanding of professional and ethical responsibility</td>
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<td>g</td>
<td>an ability to communicate effectively</td>
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<td>h</td>
<td>the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context</td>
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<tr>
<td>i</td>
<td>a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>j</td>
<td>a knowledge of contemporary issues</td>
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<td>k</td>
<td>the ability to use the techniques, skills, and modern engineering tools necessary for the practice of electrical engineering</td>
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Contribution of Course to Meeting Degree Requirements:
3 Credit Hours – Engineering Topics

Class/Laboratory Schedule (note: 1 hour = 50 minutes):
Lecture: 42 hours = 3 hours/week for 14 weeks

Prepared by:
Wayne Weaver, Assistant Professor, March 5, 2010