A- Basic Information

Course Title: Power Electronics (2)  
Code: EP411  
Lecture: 4  Tutorial: 2  Practical:  
Total: 6  
Program on which the course is given: B.Sc. Electrical Engineering (Electrical Power and Machines)  
Major or minor element of program: N.A.  
Department offering the program: Electrical Engineering Department  
Department offering the course: Electrical Engineering Department  
Academic year / level: Fourth Year / First Semester  
Date of specifications approval: 10/5/2006

A. Professional Information

1. Overall aims of course  
   By the end of the course the students will be able to:  
   - Understanding the broad classifications of power electronics converters.  
   - Analyze the AC voltage controller circuits and its applications.  
   - Understand the cycloconverter circuits and its applications.  
   - Understand and analyze the DC/DC converter circuits and its applications.

2. Intended Learning outcomes of Course (ILOs)

a. Knowledge and Understanding:  
a.1) Concepts and theories of mathematics and sciences, appropriate to the discipline.  
a.3) Characteristics of engineering materials related to discipline.  
a.4) Principles of design including elements design, process and/or a system related to specific disciplines.  
a.5) Methodologies of solving engineering problems, data collection interpretation.
b. Intellectual Skills
   b.1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
   b.2) Select appropriate solutions for engineering problems based on analytical thinking.
   b.4) Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
   b.5) Assess and evaluate the characteristics and performance of components, systems and processes.

c. Professional and Practical Skills
   c.1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
   c.7) Apply numerical modeling methods to engineering problems.

d. General and Transferable Skills
   d.1) Collaborate effectively within multidisciplinary team.
   d.3) Communicate effectively.
   d.7) Search for information and engage in life-long self learning discipline

3. Contents

<table>
<thead>
<tr>
<th>No</th>
<th>Topic</th>
<th>No. of hours</th>
<th>ILOs</th>
<th>Teaching / learning methods and strategies</th>
<th>Assessment method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analysis of single-phase AC voltage controllers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2,c1,c7,d1,d3,d7</td>
<td>Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework</td>
<td>Home Assignments, Quizzes, Oral Exam</td>
</tr>
<tr>
<td>2</td>
<td>Analysis of single-phase AC voltage controllers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2,c1,c7,d1,d3,d7</td>
<td>Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework</td>
<td>Home Assignments, Quizzes, Oral Exam</td>
</tr>
<tr>
<td>3</td>
<td>Analysis of three-phase AC voltage controllers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2,c1,c7,d1,d3,d7</td>
<td>Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework</td>
<td>Home Assignments, Quizzes, Oral Exam</td>
</tr>
<tr>
<td>Course Title</td>
<td>Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework</td>
<td>Home Assignments, Quizzes, Oral Exam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4</strong> Analysis of three-phase AC voltage controllers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5</strong> Analysis of three-phase AC voltage controllers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6</strong> Analysis of Cycloconverters</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong> Analysis of Cycloconverters</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8</strong> Mid term exam</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9</strong> DC choppers, step-down choppers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10</strong> Step-up DC choppers</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11</strong> Buck DC regulators</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>12</strong> Boost DC regulators</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13</strong> Buck-Boost DC regulators and non-ideal effects</td>
<td>6</td>
<td>a3,a4,a5,b1,b2, c1,c7,d1,d3,d7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Course Specifications (2011-2012)

**Faculty of Engineering**

<table>
<thead>
<tr>
<th>Study</th>
<th>Assignments / homework</th>
<th>Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework</th>
<th>Home Assignments, Quizzes, Oral Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>DC chopper circuits: design and applications</td>
<td>6 a4,d1,d3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Final exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 4. Teaching and Learning Methods
- Lectures
- Practical training / laboratory
- Class activity
- Case study
- Assignments / homework

#### 5. Student Assessment Methods
- Assignments to assess knowledge and intellectual skills and professional and practical skills.
- Quiz to assess knowledge, intellectual and professional skills and practical skills.
- Mid-term exam to assess knowledge, intellectual skills and professional and practical skills.
- Final exam to assess knowledge, intellectual skills and professional and practical skills.

#### 6. Assessment Schedule
- Assessment 1 on weeks 2, 5, 9, 11, 13
- Assessment 2 Quizzes on weeks 4, 6, 10, 12
- Assessment 3 Mid-term exam on week 8
- Assessment 4 Oral Exam on week 14
- Assessment 5 Final exam on week 15

#### 7. Weighting of Assessments
- Home assignments 10%
Quizzes 10%
Mid-term examination 20%
Final-term examination 60%
Total 100%

8. List of References

8.1 Course Notes
- Handouts prepared by the instructors.

8.2 Essential Books (Text Books)

8.3 Recommended Books

8.4 Web sites
- Interactive Power Electronics Seminar by Swiss Federal Institute of Technology Zurich: http://www.ipes.ethz.ch/ipes/e_index.html
- Interactive Power Electronics online text by University of Technology Sydney, Australia http://services.eng.uts.edu.au/~venkat/pe_html/contents.htm
- Interactive Power Electronics Online Course by Power Designers, USA http://www.powerdesigners.com/InfoWeb/resources/pe_html/contents.htm

9. Facilities Required for Teaching and learning
Presentation board
Computer and data show
Laboratory setups

Course coordinator: Prof. Dr. Hamed Galal Hamed
Course instructors: (1) Prof. Dr. Hamed Galal Hamed
(2) Assoc. Prof. Hassan Abd El-aziz Mansour

Head of department: Prof. Dr. Mousa Abd-Allah

Date: 8/12/2011