Description: Power Electronics Principles and Applications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Cat-Nbr</th>
<th>Class</th>
<th>Term</th>
<th>Mode</th>
<th>Units</th>
<th>Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELE</td>
<td>3805</td>
<td>25220</td>
<td>2, 2003</td>
<td>EXT</td>
<td>1.00</td>
<td>TW MBA</td>
</tr>
</tbody>
</table>

Academic Group: FOENS
Academic Org: FOES04
HECS Band: 2
ASCED Code: 031301

STAFFING
Examiner: Tony Ahfoc
Moderator: Ron Sharma

PRE-REQUISITES
Pre-requisite: ELE1801 and ELE1502

OTHER-REQUISITES
Pre-requisite: 70230+70326

SYNOPSIS
Power Electronics deals with study of semiconductor devices in the electric energy industry. The power semiconductor devices, such as the diode, thyristor, triac and power transistor, are used in power applications as switching devices. The modern electrical engineer requires a knowledge of these devices and their application in rectification, inversion, frequency conversion, dc and ac machine control, and switch-mode power supplies. Engineers need to be aware of the undesirable effects any power electronic equipment imposes on both the supply system and the load, and how these effects may be minimised.

OBJECTIVES
On completion of this course, students should be able to:

- compare the characteristics of common power semiconductor devices;
- evaluate rms and mean values of waveform Fourier components;
- analyse common power electronic circuits quantitatively;
- select motor torque ratings for particular applications, with the aid of local and international standards;
- analyse DC adjustable speed drive systems quantitatively;
- select AC adjustable speed motor/drive combinations to meet specified requirements;
- design drive circuits for power electronic switches to meet required switching performance;
- evaluate the relative benefits of snubber circuits.

**TOPICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematical tools for power electronic circuit analysis</td>
<td>5.00</td>
</tr>
<tr>
<td>2. Characteristics of power electronic devices</td>
<td>10.00</td>
</tr>
<tr>
<td>3. DC to DC Converters</td>
<td>10.00</td>
</tr>
<tr>
<td>4. Diode Rectifiers</td>
<td>10.00</td>
</tr>
<tr>
<td>5. Line frequency fully controlled converters</td>
<td>10.00</td>
</tr>
<tr>
<td>6. Switch mode inverters</td>
<td>10.00</td>
</tr>
<tr>
<td>7. Switching DC power supplies</td>
<td>10.00</td>
</tr>
<tr>
<td>8. Overview of electrical drives systems</td>
<td>5.00</td>
</tr>
<tr>
<td>9. DC adjustable speed drives</td>
<td>10.00</td>
</tr>
<tr>
<td>10. AC adjustable speed drives</td>
<td>10.00</td>
</tr>
<tr>
<td>11. Drive circuits</td>
<td>5.00</td>
</tr>
<tr>
<td>12. Thermal protection and snubber circuits</td>
<td>5.00</td>
</tr>
</tbody>
</table>

**REFERENCE MATERIALS**

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

IEEE Spectrum.
IEE proceedings.
Electrical World
Australian Standards AS2279 and AS1359.30.
ABB Review.
IEEE Transaction on Power Electronics.
IEEE Transactions on Industry Applications.
STUDENT WORKLOAD REQUIREMENTS

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>30</td>
</tr>
<tr>
<td>Directed Study</td>
<td>87</td>
</tr>
<tr>
<td>Examinations</td>
<td>3</td>
</tr>
<tr>
<td>Private Study</td>
<td>35</td>
</tr>
</tbody>
</table>

ASSESSMENT DETAILS

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks Out of</th>
<th>Wtg(%)</th>
<th>Required</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASSIGNMENT 1</td>
<td>200.00</td>
<td>20.00</td>
<td>Y</td>
<td>01 Sep 2003</td>
</tr>
<tr>
<td>ASSIGNMENT 2</td>
<td>200.00</td>
<td>20.00</td>
<td>Y</td>
<td>27 Oct 2003</td>
</tr>
<tr>
<td>3 HOUR OPEN EXAMINATION</td>
<td>600.00</td>
<td>60.00</td>
<td>Y</td>
<td>END S2</td>
</tr>
</tbody>
</table>

NOTES:

- Student Administration will advise students of the dates of their examinations during the semester.

IMPORTANT ASSESSMENT INFORMATION

1 Attendance requirements:
   There are no attendance requirements for this course. However, it is the students' responsibility to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.

2 Requirements for students to complete each assessment item satisfactorily:
   To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for each assessment item.

3 Penalties for late submission of required work:
   If students submit assignments after the due date without prior approval then a penalty of 20% of the total marks available for the assignment will apply for each working day late.

4 Requirements for student to be awarded a passing grade in the course:
   To be assured of receiving a passing grade a student must submit all of the summative assessment items, achieve at least 50% in the examination and at least 50% of the available weighted marks for the summative assessment items.

5 Method used to combine assessment results to attain final grade:
   The final grades for students will be assigned on the basis of the weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course.

6 Examination information:
In an Open Examination, candidates may have access to any material during the examination except the following: electronic communication devices, bulky materials, devices requiring mains power and material likely to disturb other students.

7 Examination period when Deferred/Supplementary examinations will be held:
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.

8 University Regulations:
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL http://www.usq.edu.au/SECARIAT/calendar/Part5/ or in the printed version of the current USQ Handbook.

ASSESSMENT NOTES

1 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner.

2 Students must retain a copy of each item submitted for assessment. This must be despatched to USQ within 24 hours if required by the Examiner.

3 In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.

4 The Faculty will normally only accept assessments that have been written, typed or printed on paper-based media.

5 The Faculty will NOT accept submission of assignments by facsimile.

6 Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations may be given special consideration. They should contact the examiner of the course to negotiate such special arrangements.

7 In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.

8 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded the temporary grade: IM (Incomplete - Make up). An IM grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non-directed personal study.

9 Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete
Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).

OTHER REQUIREMENTS
1 Students will require access to e-mail and internet access to USQConnect for this course.