Description: Electricity Supply Systems

<table>
<thead>
<tr>
<th>Subject</th>
<th>Cat-nbr</th>
<th>Class</th>
<th>Term</th>
<th>Mode</th>
<th>Units</th>
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<td>2704</td>
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<td>2, 2004</td>
<td>EXT</td>
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Academic group: FOENS
Academic org: FOES04
Student contribution band: 2
ASCED code: 031301

STAFFING
Examiner: Gordon Hampson
Moderator: Ron Sharma

REQUISITES
Pre-requisite: ELE2702

SYNOPSIS
This course introduces the principles and practical aspects of generation, transmission distribution and control of electrical energy. On successful completion of this course, the student should be able to discuss the technical, environmental and economic considerations of planning and operating different types of electrical plant (generators, transformers, circuit breakers, cables, insulators and transmission lines), as well as principles of substation layout, control, instrumentation and protection. The student should also be aware of the theoretical principles of system stability, load flow, and fault analysis of power systems using computing software tools.

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

1. justify the typical structure of modern electricity supply systems on the basis of economics, reliability, safety and technical constraints;
2. compare underground cables against overhead lines on the basis of cost, environmental impact, technical performance and supply reliability;
3. analyse three-phase electrical networks under abnormal conditions;
4. determine, by qualitative analysis, the performance requirements of practical switchgear;
5. analyse the impact of transformer tap-change on the voltage profile of radial feeders;
6. compare the relative strengths and weaknesses of typical protection schemes.
### TOPICS

<table>
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<tr>
<td>1. Power systems: environment and planning, economics</td>
<td>10.00</td>
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<tr>
<td>2. Generation, transmission and distribution systems</td>
<td>10.00</td>
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<td>3. Lines, cables and distributors</td>
<td>10.00</td>
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<td>4. Transformers</td>
<td>5.00</td>
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<tr>
<td>5. Surges, insulation coordination</td>
<td>5.00</td>
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<tr>
<td>6. Loads, scheduling and voltage control</td>
<td>5.00</td>
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<tr>
<td>7. HV Testing, commissioning</td>
<td>5.00</td>
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<td>8. Substations: layout, reliability, safety</td>
<td>10.00</td>
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<tr>
<td>9. High voltage switchgear</td>
<td>10.00</td>
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<td>10. Protection relays: protection schemes</td>
<td>10.00</td>
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<tr>
<td>11. Fault calculations and symmetrical components</td>
<td>15.00</td>
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<tr>
<td>12. Supervisory Control and Communications Coordination.</td>
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### TEXT and MATERIALS required to be PURCHASED or ACCESSED:

All textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at http://bookshop.usq.edu.au click 'Semester', then enter your 'Course Code' (no spaces).

- **Mathcad 11**, MathSoft Inc, Cambridge MA, USA.
  (Student version or earlier available from Hearn Scientific Software: http://www.mathcad.com)

### 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.

- **Journal of ASEA Brown Boveri in Australia**, 
  (No longer held at the USQ Library, but freely available on the internet at: http://www.abb.com/abbreview)
- **Electrical World**, 
- **IEE Proceedings on Generation Transmission and Distribution**, 


IEEE Transactions on Industry Applications,
(No longer held at the USQ Library.)

IEEE Transaction on Energy Conversion,

IEEE Transactions on Power Systems,

Gonen, T 1988, Modern Power System Analysis, J Wiley,
(International Edition)

Nasar, SA 1990, Theory and Problems of Electric Power Systems - Schaum's Outline Series,

Nasar, SA 1999, Electric Power Systems, CRC Press,
(USQ Library Call No. 621.31Nas)

Standards Australia 2000, SAA HB13 Electrical Equipment for Hazardous Areas, 2nd edn,

(USQ Library Call No. 621.3191Wee)

(USQ Library Call No. 621.31913Whi)

(International Edition)

STUDENT WORKLOAD REQUIREMENTS:

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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<tbody>
<tr>
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<tr>
<td>Directed Study</td>
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<td>Examinations</td>
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<td>Private Study</td>
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ASSESSMENT DETAILS

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<tr>
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<tr>
<td>ASSIGNMENT 1</td>
<td>200.00</td>
<td>20.00</td>
<td>13 Sep 2004</td>
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<td>ASSIGNMENT 2</td>
<td>200.00</td>
<td>20.00</td>
<td>15 Oct 2004</td>
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<td>3 HOUR CLOSED EXAMINATION</td>
<td>600.00</td>
<td>60.00</td>
<td>END S2</td>
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NOTES:

1. 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:
(i) To complete each of the assignments satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for each assignment. (ii) To complete the examination satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for the examination.

3 Penalties for late submission of required work:
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student 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 attempt all of the summative assessment items, achieve at least 50% in the examination, achieve an aggregated mark of at least 40% in the total marks allocated for the assignments, 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 a Closed Examination, candidates are allowed to bring only writing and drawing instruments into the examination.

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/corporateservices/calendar/part5.htm or in 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 one of the temporary grades: IM (Incomplete - Make up), IS (Incomplete - Supplementary Examination) or ISM (Incomplete -Supplementary Examination and Make up). A temporary 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).