Description: Communication Systems

Subject         Cat-nbr  Class  Term  Mode  Units  Campus
                       4606  44506  2, 2005  ONC  1.00  Toowoomba

Academic group:                  FOENS
Academic org:                     FOES04
Student contribution band:        2
ASCED code:                      031307

STAFFING
Examiner: Jim Ball
Moderator: David Parsons

REQUISITES
Pre-requisite: ELE2504 and ELE2601

OTHER-REQUISITES
Recommended prior or concurrent study: ELE3506 and ELE4605

SYNOPSIS
The purpose of this course is to provide an introduction to the specialised techniques and
components which are common to both analog and digital communication systems. Topics
studied include phase locked loops, noise, modulation methods, electromagnetic propagation,
antennas and optical fibre communication. The relevance of these topics is illustrated by reference
to existing communication systems such as the telephone network, TV, cellular mobile and
microwave radio, radar, radio navigation aids, and satellite communication systems. The course
is intended for final year electrical degree students, and assumes a knowledge of electromagnetic
fields and Maxwell's equations.

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

1. demonstrate an awareness of standards such as CCIR and CCITT recommendations;
2. calculate the performance of simple communications circuits;
3. calculate the propagation characteristics of electromagnetic waves in free space and in
   the troposphere;
4. analyse the performance of simple aerials and aerial arrays.
## TOPICS

<table>
<thead>
<tr>
<th>Weighting (%)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.00</td>
<td>COMMUNICATION ELECTRONICS Transmitter and receiver architecture, frequency synthesis techniques, mixers, modulators and demodulators.</td>
</tr>
<tr>
<td>7.00</td>
<td>DIGITAL BASEBAND TRANSMISSION Line codes, spectra, filtering, pulse shaping, eye patterns, PCM.</td>
</tr>
<tr>
<td>8.00</td>
<td>DIGITAL MODULATION METHODS FSK, PSK, QPSK etc.</td>
</tr>
<tr>
<td>8.00</td>
<td>NOISE Origins, Noise Figure and Temperature, passive networks, and cascaded networks, low noise devices.</td>
</tr>
<tr>
<td>23.00</td>
<td>ANTENNAS Simple wire antennas, arrays of identical elements, aperture antennas, Antenna parameters, gain, effective area, aperture taper, spillover, efficiency, polarisation etc.</td>
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<tr>
<td>8.00</td>
<td>PROPAGATION In free space, the ionosphere, the troposphere, refraction, reflection, diffraction, polarisation.</td>
</tr>
<tr>
<td>24.00</td>
<td>EXISTING COMMUNICATION SYSTEMS Television, cellular mobile radio, radar and satellite communication.</td>
</tr>
<tr>
<td>7.00</td>
<td>OPTICAL COMMUNICATION Types of fibre, propagation, dispersion and loss, light emitting diodes, semi conductor lasers, pin and avalanche detectors, bandwidth. Losses, power budgets and link design.</td>
</tr>
</tbody>
</table>

## 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).

*ELE4606 Communication Systems External Study Package*, USQ Publication,
(International Edition. Also text for ELE4605 Fields and Waves and ELE4608 High Frequency Engineering.)

## 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.

Haykin, S. 2001, *Digital Communications*, John Wiley,
STUDENT WORKLOAD REQUIREMENTS

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
</tr>
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<tbody>
<tr>
<td>Examinations</td>
<td>3.00</td>
</tr>
<tr>
<td>Lectures</td>
<td>39.00</td>
</tr>
<tr>
<td>Private Study</td>
<td>54.00</td>
</tr>
<tr>
<td>Project Work</td>
<td>26.00</td>
</tr>
<tr>
<td>Report Writing</td>
<td>20.00</td>
</tr>
<tr>
<td>Tutorials</td>
<td>13.00</td>
</tr>
</tbody>
</table>

ASSESSMENT DETAILS

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks out of</th>
<th>Wtg(%)</th>
<th>Due date</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST 1 (2 HOUR OPEN)</td>
<td>70.00</td>
<td>7.00</td>
<td>15 Aug 2005</td>
</tr>
<tr>
<td>COMPUTING ASSIGNMENT</td>
<td>200.00</td>
<td>20.00</td>
<td>05 Sep 2005</td>
</tr>
<tr>
<td>TEST 2 (2 HOUR OPEN)</td>
<td>80.00</td>
<td>8.00</td>
<td>10 Oct 2005</td>
</tr>
<tr>
<td>3 HOUR CLOSED EXAMINATION</td>
<td>650.00</td>
<td>65.00</td>
<td>END S2 (see note 1)</td>
</tr>
</tbody>
</table>

NOTES

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

IMPORTANT ASSESSMENT INFORMATION

1. Attendance requirements:
   It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and 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 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 a passing grade, students must demonstrate, via the summative assessment items, that they have achieved the required minimum standards in relation to the objectives of the course by satisfactorily completing all summative assessment items (the examination and assignments), as stated in 2 above. Students who do not qualify for a Passing grade may, at the discretion of the Examiner, be assigned additional work to demonstrate to the Examiner that they have achieved the required standard.
is expected that such students will have gained at least 45% of the total marks available for all 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).