Communications Systems (ELEC3302)

6 points Semester 1 2009

Outcomes
Students gain an understanding of the fundamental aspects of both analogue and digital communications systems. They gain practical experience in communications systems problem solving and gain experience in reporting laboratory experiments.

Course Contents
This unit covers the following topics:

Analogue Communications (AC) - review of signal representations; random processes and noise; modulation and demodulation techniques (AM, FM); noise performance of AM; pulse modulation; Pulse Code Modulation.

Digital Communications (DC) - baseband digital transmission; intersymbol interference; Nyquist criteria; line coding; signal space analysis; passband digital transmission (ASK, PSK, FSK, QAM); bit error rate; bandwidth efficiency; and information theory and coding - entropy; mutual information; binary channels (BSC, BEC); channel capacity; source coding (Huffman codes); fundamentals of channel coding (Hamming distance); Shannon's coding theorems.

Personnel
Lecturer Professor. Victor Sreeram  Rm 3.16, EE&C x3069 sreeram@ee.uwa.edu.au
Lab Demonstrator (AC and DC) Mr. Lu Jin  Lab 2.01, EE&C x3391 jinlu0602@gmail.com
Lab Demonstrator (AC and DC) Mr. Tarik-Ul Islam Khandoker  Lab 2.01, EE&C x3391 khandt01@student.uwa.edu.au

Prerequisites: Elec2305 Signals and Systems 2 (formerly 620.228 Signals and Systems 228/ENGT2305 Signals and Systems 2)
Advisable Prior Study: Math2040 Engineering Mathematics (formerly 530.218 Mathematics 218/MATH2218 Mathematics E2B) or Math2213 Algebra A

Textbook
**Contact Hours**

**Lectures** (Three sessions per week, totally 18 AC sessions and 18 DC sessions)
- AC Component  Weeks 9-15  (7 weeks, 18 sessions, No class between April 13 and April 17)
- DC Component  Weeks 17-22 (6 weeks, 18 sessions)

**Lab** (One AC lab and one DC lab)
- AC Component  Weeks 14-15  (Mar. 30 - Apr 10, total 5 duplicate sessions)
- DC Component  Weeks 20-21  (May 11 - May 22, total 5 duplicate sessions)

Location: Environmental Systems Engineering: (2.03) Project Laboratory

Note: Students must be allocated to one of the 5 repeat laboratory sessions to be guaranteed a place using the OLCR system.

**Office hours**
- **Professor Victor Sreeram** (Rm. 3.16)
  Email anytime to ask questions or to make an appointment

**Assessment**
This is based on a final examination, a submitted assignment, a written take-home test and two written laboratory reports. The assignment, test and examination test students’ understanding of the fundamentals and their ability to solve problems in communications systems. The laboratory reports demonstrate students’ ability to interpret laboratory experiments and communicate the results in a written form.

- AC Class Test 10%  1pm-2pm, **Thursday, April 23, 2009, Week 17**
- AC Lab 1 Report* 10%  Due at **11am, Thursday, May 7, 2009, Week 19**
- DC Class Test 10%  **1pm-2pm, Thursday, May 28, 2009, Week 22**
- DC Lab 2 Report* 10%  Due at **11am, Thursday, June 11, 2009, Week 24**
- **Final Exam (3 hrs) 30% (AC) 30% (DC)**

* The lab report will each constitute 5% of the final mark, lab attendance 3%, and pre-lab preparation 2%.
All class test and assignment work submitted must be the individual student's own work (unless otherwise specified).

Students must receive a combined mark of at least 50% to pass the unit. All assessment in this unit is subject to the **Faculty Policy on Assessment Practices and Procedures**.
Bound, printed lecture material for sale
Printed lecture notes and Laboratory Manuals (with the AC assignment attached) can be purchased from the General Office.

The Unit URL is as follows:
http://student.ee.uwa.edu.au/units/elec3302

Notification of Important Unit Events
Please check all emails with "ELEC3302: " in the Subject heading.

Late Penalties
Assignments and Lab Reports will be subject to a late penalty as indicated on the assignment/lab sheet. A correctly completed and signed assignment cover sheet is required with all assignment work and the take-home test.

Final exam Approved Calculators
The final exam will be subject to the Faculty policy on approved calculators (http://www.ecm.uwa.edu.au/for/students/calculators).

Important Policy and Regulatory Information
- Unit marks may be scaled in line with the Faculty's Policy on Assessment Practices and Procedures (see http://www.ecm.uwa.edu.au/for/students/assess)
- **No supplementary examinations will be available for the unit.**
- Please be sure you are familiar with the University Guidelines on Academic Misconduct (see http://www.ecm.uwa.edu.au/for/students/plagiarism)
- Please be sure you are familiar with the Faculty Policy for Appeals (see http://www.ecm.uwa.edu.au/for/students/exams)
- Did you know about the Charter of Student Rights (see http://www.secretariat.uwa.edu.au/home/policies/charter)?
- **IMPORTANT:** The university policy on special consideration has been altered so that from now on application for consideration, deferral of tests or exams or extensions of time for assignments on medical, personal or other grounds must be lodged with the faculty office no later than three working days after the due date for the assessment in question. This rule will apply to all students except in exceptional circumstances ('exceptional' does not mean 'exceptional', not 'just didn't have to time to get around to it').
## ELEC3302 Lecture Schedule

### Analogue Communications

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<th>Textbook</th>
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<td>Week 10</td>
<td>Introduction</td>
<td>Lecture 1</td>
<td>pp. 1-10, 15-23, 26-29</td>
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<td>Weeks 10-11</td>
<td>Review of Signals &amp; Systems</td>
<td>Lectures 2,3</td>
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<td>Weeks 11-12</td>
<td>Linear Modulation</td>
<td>Lectures 4-6</td>
<td>pp. 88-93, pp. 166-168 (questions 2.2, 2.3 and 2.5), pp. 94-100, pp. 169 (questions 2.9, and 2.10), pp. 100-107, 128-129</td>
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<td>Weeks 12-13</td>
<td>Angle Modulation</td>
<td>Lectures 7-9</td>
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<td>Week 16-17</td>
<td>Pulse Modulation, Sampling, Quantization and PCM</td>
<td>Lectures 14, 15</td>
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### Digital Communications

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<tr>
<td>1-3</td>
<td>Analysis of Digital Communications Systems</td>
<td>Chapter 1</td>
<td>Chapter 5</td>
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<td>4-6</td>
<td>Baseband Digital Communication</td>
<td>Chapter 2</td>
<td>Sections 4.4, 4.5, 4.7, 4.11</td>
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<td>7-10</td>
<td>Passband Digital Communication</td>
<td>Chapter 3</td>
<td>Sections 6.1 to 6.5 (exc. pgs. 373-380 and 387-399)</td>
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<td>11-12</td>
<td>Information Theory and Sources</td>
<td>Sections 4.1 to 4.3</td>
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<td>12-14</td>
<td>Mutual Information and Channels</td>
<td>Sections 4.4 to 4.13</td>
<td>Sections 9.5 to 9.7, 9.9, 9.10</td>
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<td>14-15</td>
<td>Source Coding</td>
<td>Sections 4.14 to 4.20</td>
<td>Sections 9.3, 9.4</td>
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<td>16-17</td>
<td>Channel Coding</td>
<td>Sections 4.21 to 4.25</td>
<td>Section 9.8</td>
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**TEXTBOOK**