COURSE INTRODUCTION — Session 2, 2010

Course Staff
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Laboratory Coordinator: Qim Lee {{}}, room ??
Blackboard Assistant: Jiong An, Jiongan@ee.unsw.edu.au

Course details

Credits
The course is a 6 UoC course; expected workload is 10-12 hours per week throughout the 13 week session.

Contact hours
The course consists of 3 hours of lectures, a 1-hour tutorial every fortnight and a 3-hour laboratory session each fortnight.

Lectures: Tuesday, 12pm-2pm, room EE224
Thursday, 12pm–1pm, room EE418

Tutorials: Tuesday, 3pm-4pm, room MAT308

Consultations: Thursday- 3pm-4pm

Course Information

Context and aims

One of the most high profile areas of electrical engineering is that of the provision of communication systems, including radio & television, mobile telephones & satellite communications. The broad purpose of this course is to provide an introduction to the technology behind these communication systems.

In this course, the basic components of a communication system which are the transmitter, channel and the receiver are explained. The advantages of digital communication together with some digital modulation techniques are discussed and the importance of transmitted signal power and channel bandwidth in the design of a communication system is explained.

Relation to other courses
The minimum pre-requisite for the course is ELEC3104 and MATH2099. This course builds the ground for the courses like TELE4652, TELE4653.

**Assumed knowledge:** It is essential that the students have a good computer literacy, and they are strongly advised to revise previous ELEC3104 and MATH2099 courses materials.

**Learning outcomes**

1. Review of frequency domain analysis of continuous time signal via Fourier transforms.
2. Review of the study of the response of linear continuous time systems via the idea of impulse responses and transfer functions.
4. Introduction to Amplitude Modulation, both large carrier and suppressed carrier, together with a treatment of demodulation schemes.
5. Introduction to angle modulation schemes and in particular, frequency modulation methods, both narrowband and wideband. Again demodulation schemes are treated, and this involves discussion of phase locked loops.
6. Introduction to pulse code modulation schemes together with treatment of multiplexing methods.
7. Pulse Code Modulation schemes, Quantization and Companding.

The course delivery methods and course content address a number of core UNSW graduate attributes; these include:

a. The capacity for analytical and critical thinking and for creative problem-solving, which is addressed by the tutorial exercises and laboratory work.

b. The ability to engage in independent and reflective learning, which is addressed by tutorial exercises together with self-directed study.

c. The skills of effective communication, which are addressed by the viva-style verbal assessment in the laboratory.

Please refer to [http://www.ltu.unsw.edu.au/content/userDocs/GradAttrEng.pdf](http://www.ltu.unsw.edu.au/content/userDocs/GradAttrEng.pdf) for more information about graduate attributes.

**Teaching strategies**

The course consists of the following elements: lectures, tutorials, and laboratory work.

**Lectures**

The lectures provide the students with the explanation of the core material in the course.
Tutorials

The tutorials enable students to apply various methods to quantitatively analyze the fundamentals of communication systems. Students are expected to attend the tutorials and attempt to solve given tutorial questions before attending the tutorial.

Laboratory work

Starting in week 2, the laboratories provide the student with hands-on experience to design, analyze and test the communication systems. The laboratory experiments are concerned with modeling various signals on the one hand, and with carrying out different operations upon signals (e.g. filtering, sampling, demodulating) on the other. This approach is intended to provide insights into the properties of, and relationships between, many signals which are fundamental to communications engineering.

Midterm examination: There will be a midterm exam conducted in week 8.

Final examination: The exam in this course is a standard closed-book 3 hours written examination, comprising five compulsory questions. University approved calculators are allowed. The examination tests analytical and critical thinking and general understanding of the course material in a controlled fashion. Questions may be drawn from any aspect of the course, unless specifically indicated otherwise by the lecture staff.

Assessment

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Laboratory work</td>
<td>20%</td>
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<tr>
<td>Midterm exam</td>
<td>20%</td>
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<tr>
<td>Final examination</td>
<td>60%</td>
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Course Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Reference (Chapters)</th>
<th>Tutorials</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>History of telecommunication and fundamentals of signals and systems</td>
<td>1,2</td>
<td>-</td>
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<tr>
<td>2</td>
<td>Amplitude modulation DSB-SC, DSB-WC</td>
<td>3</td>
<td>1</td>
<td>Introduction to TIMS and MATLAB, Amplitude Modulation</td>
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<tr>
<td>3</td>
<td>Amplitude modulation SSB, VSB</td>
<td>3</td>
<td>1</td>
<td>Introduction to TIMS and MATLAB, Amplitude Modulation</td>
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<tr>
<td>4</td>
<td>Angle modulation Narrowband, wideband FM</td>
<td>4</td>
<td>2</td>
<td>Double and Single Sideband Modulation</td>
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<tr>
<td>Week</td>
<td>Topic</td>
<td>Lecturer</td>
<td>Tutorials</td>
<td>Notes</td>
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<td>5</td>
<td>Angle modulation&lt;br&gt;FM transmission, PLL</td>
<td>4</td>
<td>2</td>
<td>Double and Single Sideband Modulation</td>
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<tr>
<td>6</td>
<td>Sampling and Quantization Multiplexing</td>
<td>5</td>
<td>3</td>
<td>Frequency Modulation</td>
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<tr>
<td>7</td>
<td>Pulse Modulation&lt;br&gt;PCM, DPCM and Delta modulation</td>
<td>5</td>
<td>3</td>
<td>Frequency Modulation</td>
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<tr>
<td>8</td>
<td>Band-pass modulation technique&lt;br&gt;M-ary</td>
<td>7</td>
<td>4</td>
<td>Sampling and Time Division Multiplexing</td>
</tr>
<tr>
<td>9</td>
<td>Fundamentals of probability and statistics.</td>
<td>8</td>
<td>4</td>
<td>Sampling and Time Division Multiplexing</td>
</tr>
<tr>
<td>10</td>
<td>Noise&lt;br&gt;Baseband transmission,</td>
<td>8,6</td>
<td>5</td>
<td>Digital Signals: Eye Patterns and Line Codes</td>
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<tr>
<td>11</td>
<td>Detection theory&lt;br&gt;Optimal detection theory and Matched filter</td>
<td>10</td>
<td>5</td>
<td>Digital Signals: Eye Patterns and Line Codes</td>
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<tr>
<td>12</td>
<td>Review</td>
<td>-</td>
<td>6</td>
<td>Communication Systems and Performance</td>
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<tr>
<td>13</td>
<td></td>
<td></td>
<td>6</td>
<td>Communication Systems and Performance</td>
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**Resources**

**Textbooks**

**Prescribed textbook**

The following textbook is prescribed for the course:  

**Reference texts**

“Communication systems, An introduction to signal and noise in electrical communication”, by A. Bruce Carlson, Paul B Crilly, Mc Graw Hill, 2010, 5th edition,

**On-line resources**

Some additional on-line resources relevant to the course:  
Course blackboard site  
http://lms-blackboard.telt.unsw.edu.au/webapps/portal/frameset.jsp  
Library resources  
http://info.library.unsw.edu.au/web/services/teaching.html
Other Matters

Academic Honesty and Plagiarism
Plagiarism is the unacknowledged use of other peoples work, including the copying of laboratory results from other students. Plagiarism is considered a serious offence by the University and severe penalties may apply. For more information about plagiarism, please refer to http://www.lc.unsw.edu.au/plagiarism

Continual Course Improvement
The course is under constant revision in order to improve the learning outcomes of its students. Please forward any feedback (positive or negative) on the course to the course convener or via the Course and Teaching Evaluation and Improvement Process (surveys at the end of the course).

Administrative Matters
On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School policies, see http://scoff.ee.unsw.edu.au/.