



FACULTY OF ENGINEERING
SCHOOL OF ELECTRICAL ENGINEERING &
TELECOMMUNICATIONS

TELE3113

Analogue & Digital Communications

SESSION 1, 2009

Course staff

- Lecturer: Dr. Wei Zhang
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- Consultation Time: Thursday, 2pm-4pm
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Course details

- 6 Units of Credit (UoC) value for the course
- 5 hours of expected workload per week

Course aims

- TELE3113 is the first course in telecommunication systems, introducing the fundamental concepts in both analogue and digital communications. It comprises fundamentals of telecommunications, analogue modulation (AM, DSB, SSB, VSB, QAM, FM and PM) and demodulation techniques, digital baseband modulation (PAM, PWM, PPM, PCM, DM and line coding) and passband modulation (M -ary signal, ASK, PSK, FSK, QPSK, QAM) techniques, multiplexing techniques, and error and noise analysis.
- The course aims to assist students to be familiar with fundamentals of telecommunications, develop understanding of analogue and digital communications, and deduce and analyse the behaviour of a telecommunication system.

Relation to other courses

- TELE3113 is a pre-requisite for all professional electives offered in the Telecommunication option. It assumes basic competency in the second year electronics and systems courses, and requires a mathematical ability of at least up to second year.
- TELE3113 is the minimum pre-requisite for TELE4651 Wireless Communication Technologies, TELE4652 Mobile and Satellite Communication Systems, and TELE4653 Digital Modulation and Coding.

Assumed knowledge

- It is assumed that the student has a background in calculus, electronics, signals and systems, and probability theory.
- It is assumed that the student has basic knowledge of programming language such as MATLAB or C.

Student learning outcomes

Upon completing of the course, students should

- be familiar with both time and frequency domain representations of signals;
- be familiar with analogue modulation and demodulation techniques;

- be familiar with digital modulation and demodulation techniques;
- be able to perform noise and error analysis of an analogue or digital telecommunication system.

Students are strongly recommended to read UNSW Graduate Attributes (Engineering) <http://www.ltu.unsw.edu.au/content/userDocs/GradAttrEng.pdf>

Teaching strategies

The course consists of lecture, tutorial and laboratory work.

During the lecture, theories and other relevant information will be expounded by the lecturer. Core materials of the course will be elaborated with a variety of practical examples of analogue and digital communications. As the course emphasizes interactive learning, students are encouraged to ask questions and express the feedback during the lectures.

The tutorial provides students in-depth quantitative understanding of analogue and digital modulation/demodulation techniques. Students will practise their problem-solving skills in the form of discussion and class exercises.

The laboratory work offers students handy experience in generating and detecting wireless data signals in various modulation formats, and thus helps students understand the core materials of the course.

Assessment

- | | |
|-----------------------|----------------------------|
| • laboratory work | 25% (5 labs, 5 marks each) |
| • Midterm Examination | 30% |
| • Final Examination | 45% |

How do you pass the course:

Student will pass the course if he/she must achieve

1. No less than 50 marks in total, AND
2. No less than 15 marks in lab work, AND
3. No less than 10 marks in Midterm Exam, AND
4. No less than 15 marks in Final Exam.

Assessment Details

- **Laboratory Work (25 marks):** Five assessable labs (i.e., Lab 1, 2, 3, 4, 5) start in week 3 and end in week 11. The labs help students understand the principles of analogue and digital communications. It requires students to complete labs in slotted time and be marked by a supervisor before the end of each lab session.
- **Midterm Examination (30 marks):** The midterm exam is a closed-book 2-hour written examination, held in class on Tuesday of week 6, i.e., **21 April 2009**. It comprises three to five compulsory questions. The midterm exam aims to test students' understanding of the course materials and their problem-solving abilities. Assessment is a graded mark according the correct fraction of the answers to the exam questions.

- **Final Examination (45 marks):** The final examination is a standard closed-book 3-hour written examination, held after week 12, comprising not more than six compulsory questions. The final examination will test students' understanding of the course material and analytical skills. Assessment is a graded mark according to the correct fraction of the answers to the exam questions.

Course schedule

1. Lecture

Lecture Schedule TELE3113 S1, 2009	Tue 9-11 am (ElecEng224); Thu 9 am (OMB 145)	Topics	Reference [1]
Week 0	2 Mar - 6 Mar	No lecture	
Week 1	9 Mar – 13 Mar	Introduction to signals & communications, Review of probability theory, random process and Fourier transform	Chapter 1, 11, and 8
Week 2	16 Mar – 20 Mar	Amplitude Modulation (1)	Chapter 2
Week 3	23 Mar – 27 Mar	Amplitude Modulation (2)	Chapter 3
Week 4	30 Mar – 3 Apr	Angle Modulation (1)	Chapter 3
Week 5	6 Apr – 10 Apr	Angle Modulation (2)	Chapter 4
	13 Apr – 17 Apr	Mid-Semester Break	
Week 6	20 Apr – 24 Apr	<i>Tuesday: <u>Midterm Examination</u></i> <i>Thursday: Noise in Analogue Communication</i>	Chapter 9
Week 7	27 Apr – 1 May	Pulse Modulation	Chapter 5
Week 8	4 May – 8 May	Baseband Data Transmission	Chapter 6
Week 9	11 May – 15 May	Band-pass Data Transmission (1)	Chapter 7
Week 10	18 May – 22 May	Band-pass Data Transmission (2)	Chapter 7
Week 11	25 May – 29 May	Noise in Digital Communication	Chapter 10
Week 12	1 Jun – 5 Jun	Case Studies	

Note:

1. Lectures start in week 1 and end in week 12.

2. Lecture notes/handouts will be distributed, or else available on course website.
3. All students must attend the lectures on both Tuesday 09-11 and Thursday 09 every week.
4. Midterm examination will be held at ElecEng224 in the Tuesday lecture of week 6, i.e., 9-11 am, 21 April 2009.

2. Laboratory work

Lab Schedule TELE3113 S1, 2009	Location: ElecEng302 Time: Tue 11-14 Thu 15-18	Topics	Reference
Week 1		<u>Lab 0</u> : Introduction to TIMS & Matlab	Lab manual
Week 3		<u>Lab 1</u> : Amplitude Modulation	Lab manual
Week 5		<u>Lab 2</u> : DSB and SSB	Lab manual
Week 7		<u>Lab 3</u> : Frequency Modulation	Lab manual
Week 9		<u>Lab 4</u> : Sampling and TDM	Lab manual
Week 11		<u>Lab 5</u> : Digital Signals: Line codes	Lab manual

Note:

1. The lab manual is available from the school office as a bound volume, for a nominal fee. Also available on the course website.
2. Some lab slots may be closed due to low enrolments. Lab allocations will be finalised in Week 1.
3. Please come to the lab time you are enrolled in. Should you need to alter your lab time, please contact your supervisor.
4. The labs are open in week 1 for **all** students, i.e., those enrolled in even or odd weeks, to undertake Lab 0. This is an introduction to the TIMS equipment, and to the MATLAB functions that will be used throughout the laboratory course. While Lab 0 is not assessed, it is strongly advised that students do attend, as familiarity with TIMS and MATLAB is essential to being able to complete the labs in allotted time.
5. The assessable labs start in week 3 and end in week 11, and must be attended **every second week**.

3. Tutorial

Tutorial Schedule	Location: CivEng G6	Contents
TELE3113 S1, 2009	Time: Thu 10	
Week 1	March 12	Tutorial 1
Week 3	March 26	Tutorial 2
Week 5	April 9	Tutorial 3
Week 7	April 30	Tutorial 4
Week 9	May 14	Tutorial 5
Week 11	May 28	Tutorial 6

Note:

1. Tutorials begin in week 1.
2. A tutorial must be attended **every second week**. Please come to your enrolled tutorial, as room sizes are restricted.
3. The tutorial sheets will be distributed by the tutor, or else are available on the course website.

Resources for students

- Prescribed textbooks
 1. Simon Haykin and Michael Moher, *Introduction to Analog & Digital Communications*, 2nd Ed, John Wiley & Sons, 2006.
- Reference books
 2. Simon Haykin, *Communication Systems*, 4th Ed, John Wiley & Sons, 2000.
 3. Nevio Benvenuto, Roberto Corvaja, Tomaso Erseghe, and Nicola Laurenti, *Communication Systems: Fundamentals and Design methods*, John Wiley & Sons, 2006.

Course evaluation and development

- Any feedback on the course to improve the quality of learning and teaching is appreciated. Please feel free to talk to your lecture staff about it.
- Students' feedback is gathered periodically on-class and such feedback will be considered carefully with a view to acting on it constructively wherever possible.
- Note that feedback is gathered using various means, including the Course and Teaching Evaluation and Improvement (CATEI) Process

Academic honesty and plagiarism

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.