The University of Newcastle, Australia
School of Electrical Engineering and Computer Science
ELEC 3540: Analog and Digital Communications (10 units)
Course Outline
Semester 1, 2011

Course coordinator	Professor Minyue Fu
Office	EAG20 in Engineering Building EA
Phone	49217730
E-Mail	minyue.fu@newcastle.edu.au
Student consultation hours	Wednesday 10:00 – 12:00 (or by appointment)
Additional lecturer	Damián Marelli (damian.marelli@newcastle.edu.au)
Lab tutor	Eduardo Rohr (eduardo.rohr@studentmail.newcastle.edu.au)
Course website	blackboard.newcastle.edu.au
Contact hours	
Lectures	Tuesday, 15:00 – 16:00, in EAG01 Wednesday, 14:00 – 16:00, in ES204
Tutorials	Tuesday, 14:00 – 15:00, in ES209 (every week except Week 1)
Labs	Tuesday, 12:00-14:00 or 16:00 – 18:00 (weeks 3,5,7,9,11, location to be arranged)

Assessment items	
5 laboratory reports	5 x 4 % = 20 %
2 Assignments	2 x 7.5 % = 15 %
Mid-term quiz (90 mins)	15 % (in lieu of regular lecture on Wednesday, 14 April)
Final examination (3 hrs)	50 %

Assumed knowledge	ELEC2400 Signals and Systems MATH2420 Engineering Mathematics II (Probability)

The mid-term quiz will be held in lieu of the regular lecture in Week 7, Wednesday, 13 April 2011 in ES204. Both the mid-term quiz and final exam are closed book. No calculators or cheat sheets of any kind are permitted in the mid-term quiz or final exam.

Course description

This course provides a thorough introduction to the basic principles and techniques used in analog and digital communications. The course will introduce analog and digital modulation techniques, communication receiver and transmitter design, baseband and bandpass communication techniques, line coding techniques, noise analysis and multiplexing techniques. The course also introduces analytical techniques to evaluate the performance of communication systems.

Course Objectives

This course provides students with a very good understanding of basic communication engineering techniques and principles related to transmission of information over wired and wireless communication channels. The course starts with a review of the Fourier transform and information signal properties. The course then focuses on developing an understanding of the principles and techniques of analogue modulation. Communication transmitter and receiver design techniques are discussed for different transmission conditions. Noise analysis techniques are also introduced. The course then covers a range of digital modulation techniques which are frequently used in modern communication systems. The course also introduces a range of baseband and bandpass communication techniques including different line coding techniques. Optimal digital receiver design techniques are briefly discussed. Multiplexing techniques are also discussed in the course. After completing the course students will develop good understanding of basic communication techniques and have the ability to analyse the performance of communication systems.

Course content

1. Review of complex analysis, Fourier transform, random variables, and random signals.
2. Basic elements of communications systems.
3. Baseband signal properties, spectral properties and analysis.
4. Amplitude, frequency and phase modulation and demodulation techniques: AM, DSB, SSB, FM and. PM.
5. Communication transmitter and receiver design; superheterodyne principle, carrier recovery, coherent and non-coherent demodulation techniques.
6. Noise analysis technique and effects of noise on baseband transmission.
7. Digital modulation and demodulation techniques: ASK, FSK, PSK, BPSK, QPSK, QAM.
8. Digital transmitter and receivers, detection and optimum receiver.
9. Bandpass communication techniques, line coding techniques.
10. Multiplexing techniques: FDM, TDM and CDM.

Tutorials

Tutorials run every week except Week 1. Tutorial attendance is strongly recommended but not mandatory. You should try to solve the tutorial questions before you attend the tutorials in order to maximize your learning experience. The tutorial questions are available for download on the Blackboard course web site.

Texts and lecture notes

The nominated text for this course is

Martin S. Roden, Analog and Digital Communication Systems, 5ed, 2003. ISBN 9780964696976.

Copies of the book are available from the University Co-op Bookshop. Students are required to have constant access to the book. Additional lecture notes on digital communications are available for download on the Blackboard course web site. . The following text is also highly recommended as a reference book:

Simon Haykin, *Communication Systems*, 4th ed.,Wiley, ISBN: 0-471-17869-1

Please note that these textbooks and lecture notes cannot substitute active participation in lectures. For your success in this course, it is essential that you attend all lectures and actively take notes.

Laboratories

There are five laboratories in this course. Each lab consists of two 2-hour sessions. **Attendance is mandatory. If you fail to attend a laboratory session you will receive zero marks for that lab. Requests for special consideration will only be granted in exceptional circumstances beyond your control.** You will be organized in lab groups of two. Each group is required to hand in **one** lab report for each of the five laboratories. **Both group members are expected to contribute equally to this report.** Laboratory reports must be posted in the assignment box for this course in the foyer of the EA building. Please observe the due date for each lab report. You must use assignment cover sheets, available from the Electrical and Computer Engineering main office (EAG08). **Both group members must sign the cover sheet.** Late submissions will not be accepted. **Laboratory reports that are submitted after the deadline will receive zero marks**. In addition to the lab report, you must also hand in **precise and meaningful** answers to the pre-lab questions **at the beginning of the first session** of each laboratory. **Both group members must hand in their own individual answers.** The pre-lab questions contribute 25% and the lab report contributes 75% toward the mark of each laboratory.

Assignments

There are two assignments. Please observe the due date for each assignment. Assignments must be posted in the assignment box for this course in the foyer of the EA building. You must use assignment cover sheets as well.

Timetable (Tentative)

Week	Lecture Content	Tute	Lab	Assessment
1. 28/2-4/3	Review of Fourier transform and linear systems; Probability and random variables; (Appendices A, B, C)	No		Assignment 1 out
2. 7/3-11/3	Analog baseband transmission (Ch 2)	Yes		
3. 14/3-18/3	Analog amplitude modulation (Ch 3)	Yes	Lab1	
4. 21/3-25/3	Probability and random analysis (Appendix C)	Yes		**Lab 1 Report due** (Tues)
5. 28/3-31/3	Amplitude modulation (Ch 3); Analog frequency modulation (Ch 4)	Yes	Lab2	
6. 4/4-8/4	Analog frequency modulation (Ch 4)	Yes		**Lab 2 Report due** (Tues) **Assignment 1 due** (Wed)
7. 11/4-15/4	Review(Tues); **QUIZ** (Wed)	Yes	Lab3	Assignment 2 out
8. 18/4-22/4	Baseband digital transmission (Ch2)	Yes		**Lab 3 Report due** (Tues)
RECESS (22/4-29/4)				

9. 2/5-6/5	Baseband digital transmission (Ch2)	Yes	Lab4	
10. 9/5-13/5	Digital frequency modulation (Ch4)	Yes		**Lab 4 Report due** (Tues)
11. 16/5-20/5	Digital phase modulation (Ch5)	Yes	Lab5	
12. 16/5-20/5	Multiplexing techniques: FDM, TDM and CDM (Notes)	Yes		**Lab 5 Report due** (Tues) **Assignment 2 due** (Wed)
13. StuVac		No		
Exam Period: 6/6 – 24/6				

Academic Integrity

Academic integrity, honesty, and a respect for knowledge, truth and ethical practices are fundamental to the business of the University. These principles are at the core of all academic endeavours in teaching, learning and research. Dishonest practices contravene academic values, compromise the integrity of research and devalue the quality of learning. To preserve the quality of learning for the individual and others, the University may impose severe sanctions on activities that undermine academic integrity. There are two major categories of academic dishonesty:

Academic fraud is a form of academic dishonesty that involves making a false representation to gain an unjust advantage. Without limiting the generality of this definition, it can include:

1. falsification of data;
2. using a substitute person to undertake, in full or part, an examination or other assessment item;
3. reusing one's own work, or part thereof, that has been submitted previously and counted towards another course (without permission);
4. making contact or colluding with another person, contrary to instructions, during an examination or other assessment item;
5. bringing material or device(s) into an examination or other assessment item other than such as may be specified for that assessment item; and
6. making use of computer software or other material and device(s) during an examination or other assessment item other than such as may be specified for that assessment item;
7. contract cheating or having another writer compete for tender to produce an essay or assignment and then submitting the work as one's own.

Plagiarism is the presentation of the thoughts or works of another as one's own. University policy prohibits students plagiarising any material under any circumstances. Without limiting the generality of this definition, it may include:

1. copying or paraphrasing material from any source without due acknowledgment;
2. using another person's ideas without due acknowledgment;
3. collusion or working with others without permission, and presenting the resulting work as though it were completed independently.

Turnitin is an electronic text matching system. During assessing any assessment item the University may

- Reproduce this assessment item and provide a copy to another member of the University; and/or
- Communicate a copy of this assessment item to a text matching service (which may then retain a copy of the item on its database for the purpose of future checking);
- Submit the assessment item to other forms of plagiarism checking.

Re-marks and moderations
Students can access the University's policy at:
http://www.newcastle.edu.au/policylibrary/000769.html
All marks and grades released during term are indicative only until formally approved by the Head of School.

Extension of time for assessment items, deferred assessment and special consideration for assessment items or formal written examinations.

Requests for extensions of time must be lodged no later than the due date of the item. This applies to students:

- applying for an extension of time for submission of an assessment item on the basis of medical, compassionate, hardship/trauma or unavoidable commitment; or
- whose attendance at or performance in an assessment item or formal written examination has been or will be affected by medical, compassionate, hardship/trauma or unavoidable commitment.

Students must report the circumstances, with supporting documentation, as outlined in the Special Circumstances Affecting Assessment Items Procedure at:
http://www.newcastle.edu.au/policylibrary/000641.html
Students should be aware of the following important deadlines:

- Special Consideration Requests must be lodged no later than 3 working days after the due date of submission or examination.
- Rescheduling Exam requests must be received no later than 10 working days prior the first date of the examination period.

Late applications may not be accepted.

In case you are granted special consideration because you were prevented from taking the midterm and/or final exam, an **oral** makeup examination will be given.

Changing your enrollment
Students enrolled after the HECS Census Date of 31 March are liable for the full cost of their student contribution or fees for that term. Students may withdraw from a course without academic penalty on or before the last day of term. Any withdrawal from a course after the last day of term will result in a fail grade. Students cannot enrol in a new course after the second week of term, except under exceptional circumstances. Any application to add a course after the second week of term must be on the appropriate form, and should be discussed with staff in the Student Hubs. To check or change your enrolment online go to myHub:
https://myhub.newcastle.edu.au

Students with a disability or chronic illness

The University is committed to providing a range of support services for students with a disability or chronic illness. If you have a disability or chronic illness which you feel may impact on your studies, please feel free to discuss your support needs with your lecturer or course coordinator. Disability Support may also be provided by the Student Support Service (Disability). Students must be registered to receive this type of support. To register, contact the Disability Liaison Officer on 492-15766 or student-disability@newcastle.edu.au. As some forms of support can take a few weeks to implement it is extremely important that you discuss your needs with your lecturer, course coordinator or Student Support Service staff at the beginning of each semester. For more information on confidentiality and documentation visit the Student Support Service (Disability) website:

www.newcastle.edu.au/services/disability

Student Information and Contacts

Various services are offered by the Student Support Unit:

www.newcastle.edu.au/service/studentsupport

The Student Hubs are a one-stop shop for the delivery of student related services and are the first point of contact for students studying in Australia. Student Hubs on the Callaghan Campus are located at Level 3, Shortland Building and Level 2, Student Services Centre.

Other contact information

Rules Governing Undergraduate Academic Awards

www.newcastle.edu.au/policylibrary/000311.html

Rules Governing Postgraduate Academic Awards

www.newcastle.edu.au/policylibrary/000306.html

General enquiries:
Phone: 02 4921 5000
Email: EnquiryCentre@newcastle.edu.au
The Dean of Students Resolution Precinct
Phone: 02 4921 5806
Fax: 02 4921 7151
Email: resolutionprecinct@newcastle.edu.au