# Communication Engineering - Course Outline

## ECEN 310: 2010 Trimester 2

This document sets out the workload and assessment requirements for ECEN 310. It also provides contact information for staff involved in the course. If the contents of this document are altered during the course, you will be advised of the change by an announcement in lectures and/or on the course web site. A printed copy of this document is held in the School Office.

## Course Description

The course provides the student with an introduction to communication systems focusing on the physical layer of the OSI model. It covers both analog and digital modulation techniques, including baseband and passband signaling. Topics include matched filter receivers for additive noise channels and associated error rate performance, intersymbol interference and Nyquist pulse shaping. Also covered are fundamentals of wireless fading channels, an overview of synchronization and a brief introduction to advanced techniques such as MIMO, OFDM and CDMA.

## Prerequisites

Prerequisites: ECEN 220 (or ENGR 201)

Restrictions: CSEN 303

## Objectives

Upon completion of the course, the students should be able to demonstrate the understanding of:

1. analogue and digital modulation techniques, including trade-offs and relative merits 3(a) .
2. effects of bandlimited channels and the transmitter design techniques to avoid intersymbol interference 3(a) 3(c) .
3. effects of additive noise on the system performance and receiver design technique to mitigate its effects 3(a) 3(c) .
4. the basics of wireless channel characteristics and modeling 3(a) 3(c)
5. basic concepts behind advanced communications methods, including multicarrier, spread spectrum and spatial diversity systems 3(a)
6. practical synchronisation requirements of analogue and digital receivers 3(a) 3(e)
7. the operation and configuration of a Software Defined Radio 3(f)

Objectives 1-5 are assessed primarily by written assignments and the examination. Objectives 6 and 7 are assessed primarily by the project.

## Textbook

There main textbook for the course is

- Lathi and Ding, Modern Digital and Analog Communication Systems, 4ed, 2010, Oxford

In addition there are a large number of textbooks covering the principles of communications systems.

- Haykin and Moher, Introduction to analogue and digital communications, 2ed, 2007, Wiley
- Ziemer and Tranter, Principles of Communications - Systems Modulation and Noise, 6ed, 2009, Wiley
- Couch, Digital and Analog Communication Systems, 7ed, 2006, Prentice Hall
- Rappaport, Wireless Communications, Principles & Practice, 1ed, 1996, Prentice Hall
- Proakis and Salehi, Digital Communications, 5ed, 2008, McGraw Hill

Haykin/Moher and Ziemer/Tranter are availabe at the library on closed reserve (2hr issue), with additional copies available on 3-day loans.

## Lectures, Tutorials, Laboratories, and Practical work

- Lectures: Monday 12-1 AM105, Tuesday 2-3, AM101
- Tutorial: Friday 3-4 AM101
- Laboratories: Wednesdays 9-12 in CO249

Laboratory experiments will begin in Week 2 (19 July).

## Assignments

There will be three assignments which will be due at the start of the Monday lecture in weeks 5, 8 and 12. Late submissions will be penalised at the rate of 10% for every day that the assignment is late. The lecturers may refuse to mark work that has been handed in over a week late, and will also refuse if the assignment has been marked and returned to the class. In such instances a zero grade for that assignment shall result.

## Practical Work

The course includes several laboratory experiments. In addition, assignments will include Matlab-based components. Students are expected to work individually on these, although informal collaboration is encouraged. Submission of laboratory assignments for assessment will be done via the electronic submission system where possible. Late submissions will be penalised at a rate of 10% per day.

In addition, there will be a Software Defined Radio project, which will culminate with a brief oral presentation and a written report both due in week 12.

## Tests and Exams

As indicated by the assessment breakdown, in addition to the final examination an in-class test will be held during the trimester. It is tentatively scheduled for the tutorial slot in week 7. If you are unable to attend this test, please notify the instructor *as soon as possible* so that alternate arrangements can be made.

The timetable for final examinations will be available from the University web site and will be posted on a notice board outside the faculty office. The final examination will be three hours long. No computers, electronic calculators or similar device will be allowed in the final examination. Paper non-English to English dictionaries will be permitted. The study and examination period for trimester T2 is 23 October - 14 November

## Workload

To maintain satisfactory progress in ECEN 310, you should spend on average at least *10* hours per week on this course. A plausible and approximate weekly breakdown for these hours would be:

- Lectures and tutorials: 3 hours
- Laboratory sessions and project work: 3 hours
- Assignments: 2 hours
- Preparatory reading and problem solving: 3 hours.

## Course Content

The following is a preliminary outline of the topics covered in the lectures.

- Communication System Overview
- Review of Signals and Random Variables
- Amplitude Modulation
- Frequency Modulation
- Analogue to Digital Conversion
- Baseband Communications: ISI, Nyquist Pulse Design Criterion
- Carrier Modulated Systems: ASK, PSK, FSK
- Noise, Matched Filter Receivers
- Error Rate Performance of MF Receivers
- Overview of Synchronisation
- Basics of Wireless Channel Characteristics
- Brief overview of MIMO, OFDM, CDMA systems

## School of Engineering and Computer Science

The School office is located on level three of the Cotton Building (Cotton 358).

The notice board for ECEN 310 is located on the second floor of the Cotton Building.

## Staff

The course organiser and lecturer for ECEN 310 is Pawel Dmochowski

Contact details are:

- Pawel Dmochowski
- AM227

- 463 5948
- pawel.dmochowski@vuw.ac.nz

## Announcements and Communication

The main means of communication outside of lecture will be the Blackboard site and the ECEN 310 Forum. The forum is a web-based bulletin board system. Questions and comments can be posted to the forum, and staff will read these posts and frequently respond to them.

# Assessment

Your grade for ECEN 310 will be determined based on the following assessment weightings:

| Item | Weight |
|---|---|
| Assignments (3) | 15% |
| In class test | 15% |
| Labs | 10% |
| Project | 15% |
| Final Examination | 45% |

## Plagiarism

Working Together and Plagiarism

We encourage you to discuss the principles of the course and assignments with other students, to help and seek help with programming details, problems involving the lab machines. However, any work you hand in must be your own work.

The School policy on Plagiarism (claiming other people's work as your own) is available from the course home page. Please read it. We will penalise anyone we find plagiarising, whether from students currently doing the course, or from other sources. Students who knowingly allow other students to copy their work may also be penalised. If you have had help from someone else (other than a tutor), it is always safe to state the help that you got. For example, if you had help from someone else in writing a component of your code, it is not plagiarism as long as you state (eg, as a comment in the code) who helped you in writing the method.

## Mandatory Requirements

It is expected that all work will be completed and submitted for assessment. An incomplete or fail grade will be issued to any student who satisfies *any* of the following conditions:

1. does not sit the test.
2. does not submit at least two (of the three) assignments.
3. is caught cheating in any form (this includes laboratory work).

## Passing ECEN 310

To pass ECEN 310, a student must satisfy mandatory requirements and gain at least a **C** grade overall.

## Withdrawal

The last date for withdrawal from ECEN 310 with entitlement to a refund of tuition fees is Friday *date* 2010. The last date for withdrawal without being regarded as having failed the course is Friday, *date* 2010 -- though later withdrawals may be approved by the Dean in special circumstances.

## Rules & Policies

Find key dates, explanations of grades and other useful information at http://www.victoria.ac.nz/home/study.

Find out about academic progress and restricted enrolment at http://www.victoria.ac.nz/home/study/academic-progress.

The University's statutes and policies are available at http://www.victoria.ac.nz/home/about/policy, except qualification statutes, which are available via the Calendar webpage at http://www.victoria.ac.nz/home/study/calendar (See Section C).

Further information about the University's academic processes can be found on the website of the Assistant Vice-Chancellor (Academic) at http://www.victoria.ac.nz/home/about/avcacademic

All students are expected to be familiar with the following regulations and policies, which are available from the school web site:

Grievances
Student and Staff Conduct
Meeting the Needs of Students with Disabilities
Student Support
Academic Integrity and Plagiarism
Dates and Deadlines including Withdrawal dates
School Laboratory Hours and Rules
Printing Allocations
Expectations of Students in ECS courses

The School of Engineering and Computer Science strives to anticipate all problems associated with its courses, laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning experience.

If you think we have overlooked something or would like to make a suggestion feel free to talk to your course organiser or lecturer.

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