

# Communication Engineering - Course Outline

## ECEN 310: 2012 Trimester 2

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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

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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 and a brief introduction to advanced techniques such as MIMO, OFDM and CDMA.

### Prerequisites

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Prerequisites: ECEN 220 (or ENGR 201)

Restrictions: CSEN 303

### Objectives

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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. Monte Carlo simulations of system error rate performance

Objectives 1-5 are assessed primarily by written assignments and the examination. Objective 6 is assessed during laboratory sessions.

### Textbook

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The textbook for the course is

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

**note: the students are expected to complete the reading assignments given in the course schedule**

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

- 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

### Lectures, Tutorials, Laboratories, and Practical work

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- Lectures: Tuesday 10-11 and Wednesday 15-16, both in AM104
- Tutorial: Friday 10-11, AM104
- Laboratories: Friday 11-2, CO249-250

Laboratory experiments will begin in Week 2 and will be held in weeks specified by the course schedule.

## Assignments and Project

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There will be short weekly assignments handed out on Tuesdays in weeks 2-8. They will be due the following Tuesday at the start of the lectures and handed back in Friday's tutorial. Late submissions **will not** be considered due to the rapid feedback

Three laboratory experiments will be held, including both hardware and Matlab-based. Each will span 2 weeks.

In addition, each student will carry out an individual research project on a special topic selected from a list. The deliverable will be a 20 minute oral presentation followed by a question period, both of which will determine the grade assigned for this component.

## Practical Work

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The course includes several laboratory experiments. In addition, assignments may 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.

## Workload

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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

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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
- Basics of Wireless Channel Characteristics
- Equalisation
- Brief preview of advanced topics, such as MIMO, OFDM, CDMA, Cognitive Radio...

## School of Engineering and Computer Science

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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

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The course coordinator and lecturer for ECEN 310 is [Dr Pawel Dmochowski](#)

Contact details are:

- [Pawel Dmochowski](#)
- [AM227](#)
- 463 5948
- [pawel.dmochowski@vuw.ac.nz](mailto:pawel.dmochowski@vuw.ac.nz)
  
- Lab demonstrator and marker is [Ramoni Adeogun](#)
  
- Class Rep: Harsh Tataria

## Announcements and Communication

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The main means of communication outside of lectures will be the ECEN 310 web area at [http://ecs.victoria.ac.nz/Courses/ECEN310\\_2012T2/](http://ecs.victoria.ac.nz/Courses/ECEN310_2012T2/). There you will find, among other things, this document, the [lecture schedule](#) and [assignment handouts](#).

## Assessment

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

Item	Weight
Assignments (approx 7)	15%
Test	20%
Labs	10%
Research Project Presentation	15%
Final Exam	40%

## Tests and Exams

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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 examination period for trimester 2 is 26 Oct - 17 Nov.

## Plagiarism

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### 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

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

1. does not submit at least 5 of the 8 assignments.
2. does not achieve at least a **D** grade for the final exam.

## Passing ECEN 310

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

## Withdrawal

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The last date for withdrawal from ECEN 310 with entitlement to a refund of tuition fees is Friday 27 July 2012. The last date for withdrawal without being regarded as having failed the course is Friday 28 Sept 2012 -- though later withdrawals may be approved by the Dean in special circumstances.

## Rules & Policies

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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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