



Prescription

This 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.

Course learning objectives

Students who pass this course should be able to:

1. describe various analogue and digital modulation techniques, including their relative merits (BE graduate attribute 3(a))
2. design receivers to mitigate the effects of noise and interference of bandlimited channels (BE graduate attributes 3(a),3(c))
3. describe wireless propagation channels models and simulate them using Matlab (BE graduate attributes 3(a),3(c))
4. design Monte Carlo Matlab simulations to evaluate the performance of wireless systems (BE graduate attributes 3(d),3(f))

Course content

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

Communication System Overview

Amplitude Modulation

Frequency Modulation

Sampling, Quantisation and Pulse Code Modulation

Digital Modulation and Noise Performance (Matched Filter Receiver, BER, Signal Constellations)

Basics of Wireless Channel Characteristics

OFDM, Equalisation

Diversity Combining and basics of MIMO

Withdrawal from Course

Withdrawal dates and process:

<https://www.wgtn.ac.nz/students/study/course-additions-withdrawals>

Lecturers

Pawel Dmochowski (Coordinator)

Teaching Format

This course will be offered in-person and online. For students in Wellington, there will be a combination of in-person components and web/internet based resources. It will also be possible to take the course entirely online for those who cannot attend on campus, with all the components provided in-person also made available online.

During the trimester there will be three lectures tutorials will be held in selected lectures slot.

Student feedback

Student feedback on University courses may be found at:

www.cad.vuw.ac.nz/feedback/feedback_display.php

Dates (trimester, teaching & break dates)

- Teaching: 13 July 2020 - 18 October 2020
- Break: 17 August 2020 - 30 August 2020
- Exam period: 19 October 2020 - 25 October 2020

Class Times and Room Numbers

13 July 2020 - 16 August 2020

- **Tuesday** 09:00 - 09:50 – 301, Old Kirk, Kelburn
- **Thursday** 09:00 - 09:50 – 118, Easterfield, Kelburn
- **Friday** 09:00 - 09:50 – 118, Easterfield, Kelburn

31 August 2020 - 18 October 2020

- **Tuesday** 09:00 - 09:50 – 301, Old Kirk, Kelburn
- **Thursday** 09:00 - 09:50 – 118, Easterfield, Kelburn
- **Friday** 09:00 - 09:50 – 118, Easterfield, Kelburn

Set Texts and Recommended Readings

Required

There are no required texts for this offering.

Recommended

There are a large number of textbooks covering the principles of communications systems. Examples include

- Proakis and Salehi, *Fundamentals of Communication Systems*, 2ed, 2014, Pearson (International Edition or otherwise)
- 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
- Lathi and Ding, *Modern Digital and Analog Communication Systems*, 4ed, 2010, Oxford

Mandatory Course Requirements

In addition to achieving an overall pass mark of at least 50%, students must:

- achieve an average grade of at least 40% on 2 of the 3 tests

If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.

Assessment

This course will be assessed through matlab labs, and 3 tests

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
3 Tests (25% each)		CLO: 1,2,3,4	75%
2 Labs		CLO: 3,4	25%

Penalties

Work submitted after the due date will incur a penalty of 10% of the full mark per working day. Late work will not be marked after the model solutions have been made available or if more than one week late.

Extensions

Individual extensions will only be granted in exceptional personal circumstances, and should be negotiated with the course coordinator before the deadline whenever possible. Documentation (eg, medical certificate) may be required.

Submission & Return

The assessment items will be submitted using the ECS online submission system. It will be returned during class time.

Marking Criteria

Labs will be assessed on the submitted Matlab source code and the generated output. No formal reports will be required.

Workload

The total workload for ECEN 310 is 150 hours. In order to maintain satisfactory progress in ECEN 310, you should spend on average 10 hours per week on this course.

Teaching Plan

See https://ecs.wgtn.ac.nz/Courses/ECEN310_2020T2/LectureSchedule

Communication of Additional Information

The main means of communication outside of lectures will be the ECEN 310 web area at https://ecs.wgtn.ac.nz/Courses/ECEN310_2020T2/

Links to General Course Information

- Academic Integrity and Plagiarism: <https://www.wgtn.ac.nz/students/study/exams/integrity-plagiarism>
- Academic Progress: <https://www.wgtn.ac.nz/students/study/progress/academic-progress> (including restrictions and non-engagement)
- Dates and deadlines: <https://www.wgtn.ac.nz/students/study/dates>
- Grades: <https://www.wgtn.ac.nz/students/study/progress/grades>
- Special passes: Refer to the Assessment Handbook, at <https://www.wgtn.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf>
- Statutes and policies, e.g. Student Conduct Statute: <https://www.wgtn.ac.nz/about/governance/strategy>
- Student support: <https://www.wgtn.ac.nz/students/support>
- Students with disabilities: https://www.wgtn.ac.nz/st_services/disability/
- Student Charter: <https://www.wgtn.ac.nz/learning-teaching/learning-partnerships/student-charter>
- Terms and Conditions: <https://www.wgtn.ac.nz/study/apply-enrol/terms-conditions/student-contract>
- Turnitin: <http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin>
- University structure: <https://www.wgtn.ac.nz/about/governance/structure>
- VUWSA: <http://www.vuwsa.org.nz>

Offering CRN: [18515](#)

Points: 15

Prerequisites: ECEN 220;

Restrictions: CSEN 303

Duration: 13 July 2020 - 25 October 2020

Starts: Trimester 2

Campus: Kelburn