

ELEC3540: Analog and Digital Communications

Singapore PSB

Trimester 1 - 2024 (Singapore)



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	This course introduces you to the basic principles and techniques used in analog and digital communications. You will learn analog and digital modulation techniques, communication receiver and transmitter design, baseband and bandpass communication techniques, line coding techniques, and noise analysis in various transmission environments. After completing the course, you will be able to use analytical techniques to evaluate the performance of analog and digital communication systems.
Academic Progress Requirements	Nil
Assumed Knowledge	ELEC2430, STAT2110
Contact Hours	Singapore PSB Laboratory Face to Face On Campus 2 hour(s) per week(s) for 5 week(s) Lecture Face to Face On Campus 3 hour(s) per week(s) for 13 week(s) starting Week 1 Tutorial Face to Face On Campus 1 hour(s) per week(s) for 12 week(s) starting Week 2
Unit Weighting	10
Workload	Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator	Singapore PSB A/Pr Duy Ngo Duy.Ngo@newcastle.edu.au +61 2 4921 8947 Consultation: By Email
Teaching Staff	Other teaching staff will be advised on the course Canvas site.
School Office	School of Engineering (Callaghan) SENG-ADMIN@newcastle.edu.au +61 2 4921 5798

SYLLABUS

Course Content	<ol style="list-style-type: none">1. Basic elements of a communication system2. Deterministic signal characterisation and analysis3. Review of probability theory, random variables and random processes4. Analog modulation and demodulation techniques: AM, FM5. Sampling and quantisation6. Optimum receiver for binary data transmission7. Baseband data transmission and line coding techniques8. Basic digital passband modulation and demodulation techniques: BASK, BPSK, BFSK, QPSK, OQPSK, MSK9. M-ary signalling techniques10. Signalling over bandlimited channels11. Synchronisation
Course Learning Outcomes	<p>On successful completion of this course, students will be able to:</p> <ol style="list-style-type: none">1. Identify the basic elements of a communication system2. Analyse baseband signals in time domain and in frequency domain3. Compare and contrast various analog and digital modulation and demodulation techniques4. Evaluate the performance of modulation and demodulation techniques in various transmission environments5. Explain the importance of synchronisation in communication systems
Course Materials	<p>Lecture Materials:</p> <ul style="list-style-type: none">- Lecture notes, Tutorial problems, Lab handouts, Assignments: Will be posted on the course Canvas site.- Please note that the textbook and lecture notes cannot substitute active participation in lectures and tutorials. For your success in this course, it is essential that you attend all lectures and tutorials and actively take notes. <p>Required Text:</p> <ul style="list-style-type: none">- Ha H. Nguyen and Ed Shwedyk. <i>A First Course in Digital Communications</i>. 1st edition. Cambridge: Cambridge University Press, 2009 (ISBN: 9780521876131).

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Laboratory Exercises and Written Assignments	Will be announced on the course Canvas site.	Individual	35%	1, 2, 3, 4
2	Examination: Formal	During the formal examination period.	Individual	50%	1, 2, 3, 4, 5
3	Quiz - Class	Time and location will be announced on the course Canvas site.	Individual	15%	1, 2, 3

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Laboratory Exercises and Written Assignments

Assessment Type Description

Tutorial / Laboratory Exercises

There are 5 lab exercises, the schedule of which will be announced on the course Canvas site. Attendance is mandatory. If you fail to attend the scheduled laboratory session, you will receive zero marks for that laboratory exercise. Requests for special consideration will only be granted in exceptional circumstances beyond your control. You will be organised in lab groups. Each group is required to submit one lab report for each of the five laboratory exercises. All group members are expected to contribute equally to this report. Each lab report is due in the week following the scheduled lab session. You must use assignment cover sheets. All group members must sign the cover sheet. The lab reports contribute 20% (4% each) to your final mark.

Weighting

There are 2 written assignments. Please observe the due date for each assignment. The assignments contribute 15% (7.5% each) to your final mark.

Due Date

35%

Submission Method

Will be announced on the course Canvas site.

Assessment Criteria

Online

Return Method

Will be uploaded to Canvas.

Feedback Provided

Online

Returned Work

Assessment 2 - Examination: Formal

Assessment Type

Formal Examination

Description

There is one final examination. More details will be provided by the course instructor.

Weighting

50%

Length

2 hours

Due Date

During the formal examination period.

Submission Method

Formal Exam

Assessment Criteria

Correct answers.

Return Method

Not Returned

Feedback Provided

No Feedback

Assessment 3 - Quiz - Class

Assessment Type

Quiz

Description

There is one mid-term quiz. More details will be provided by the course instructor.

Weighting

15%

Due Date

Time and location will be announced on the course Canvas site.

Submission Method

In Class

Online

Assessment Criteria

Will be uploaded to Canvas.

Return Method	In Class Online
Feedback Provided	Returned Work

ADDITIONAL INFORMATION

Grading Scheme This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Attendance Attendance/participation will be recorded in the following components:

- Laboratory (Method of recording: Lab attendance sheet)

Communication Methods Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas) As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

**Adverse
Circumstances**

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>.

**Important Policy
Information**

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at

<https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

UON Att.	University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1,2
13	3.3. Creative, innovative and pro-active demeanour.				
14	3.4. Professional use and management of information.				
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1,2
8	2.2. Fluent application of engineering techniques, tools and resources.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1,2
9	2.3. Application of systematic engineering synthesis and design processes.				
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1,2
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		1,2
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1,2
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1,2
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				

This course outline was approved by the Head of School on 28th November 2023. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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