MONASH University

Unit Guide

ECE2111
Signals and systems

Semester 2, 2017

Table of contents

Unit handbook information

Synopsis

This unit provides foundations for the electrical engineering areas of control, signal processing and communications. The unit introduces concepts of continuous-time and discrete-time signals, their sampling and aliasing issues. Complex numbers, in particular, complex exponentials are introduced along with their representation as phasors, leading to periodic waveforms, Fourier series and the signal frequency spectrum. Modification of spectra will be described using FIR filters, discrete-time systems, the unit-sample response, discrete convolution, linear time-invariant systems, convolution integrals, the continuous-time Fourier transform, windowing, DFT, FFT, time-frequency spectrum analysis, spectrogram, and Laplace Transform. Connecting frequency response and time response completes the unit.

Mode of delivery

Clayton (Day)
Malaysia (Day)

Workload requirements

3 hours lectures, 3 hours laboratories/tutorials and 6 hours of private study per week.

Unit relationships

Prerequisites

ENG1060 and (ENG1091 or ENG1005)

Prohibitions

ECE2011

Co-requisites

None

Chief Examiner(s)

Professor Manos Varvarigos

Unit Coordinator(s)

Name: Dr James Saunderson
Email: James.Saunderson@monash.edu

Clayton/Malaysia staff contact details

Clayton campus	
Campus Coordinator	Name: Dr James Saunderson Email: James.Saunderson@monash.edu Building: 72, Room: 222 Consultation hours: 10-11am Wednesday, or by appointment via email
Lecturer(s)	Name: Dr James Saunderson Email: James.Saunderson@monash.edu Building: 72, Room: 222 Name: Dr Faezeh Marzbanrad Email: Faezeh.Marzbanrad@monash.edu Building: , Room:

Malaysia campus	
Campus Coordinator	Name: Dr Maxine Tan Email: Maxine.Tan@monash.edu Building: 2, Room: 2-4-39C Consultation hours: Monday/Wednesday: 1400-1500 appointment via email
Lecturer(s)	Name: Dr Maxine Tan Email: Maxine.Tan@monash.edu Building: 2, Room: 2-4-39C Consultation hours: Monday/Wednesday: 1400-1500 appointment via email

Section A: For Clayton students

Academic Overview

Engineers Australia Stage 1 competencies

The Engineers Australia Policy on Accreditation of Professional Engineering Programs requires that all programs ensure that their engineering graduates develop to a substantial degree the stage 1 competencies. Listed below are the activities in this unit that will help you to achieve these competencies.

Note: that not all stage 1 competencies are relevant to each unit.

Element of competency	Indicators of attainment	Learning outcomes
1 Knowledge and skill base		
1.1 Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of complex problems and broader aspects of engineering practice.	**a)** Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of complex problems and broader aspects of engineering practice.	1,2,3,4,5
1.2 Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.	**a)** Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.	1,2,3,4,5
1.3 In-depth understanding of specialist bodies of		1,2,3,4,5

knowledge within the engineering discipline.	**a)** Proficiently applies advanced technical knowledge and skills in at least one specialist practice domain of the engineering discipline.	
2. Engineering application ability		
2.1 Application of established engineering methods to complex engineering problem solving.	**a)** Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions.	1,2,3,4,5
	b) Ensures that all aspects of an engineering activity are soundly based on fundamental principles - by diagnosing, and taking appropriate action with data, calculations, results, proposals, processes, practices, and documented information that may be ill-founded, illogical, erroneous, unreliable or unrealistic.	1,2,3,4,5
	e) Partitions problems, processes or systems into manageable elements for the purposes of analysis,modelling or design and then re-combines to form a whole, with the integrity and performance of the overall system as the paramount consideration.	1,2,3,4,5
	f) Conceptualises alternative engineering approaches and evaluates potential outcomes against appropriate criteria to justify an optimal solution choice.	1,2,3,4,5
2.2 Fluent application of engineering techniques, tools and resources.	**b)** Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions.	1,2,3,4,5
	d) Applies a wide range of engineering tools for analysis, simulation, visualisation, synthesis and design, including assessing the accuracy and limitations of such tools, and validation of their results.	1,2,3,4,5
	g) Analyses sources of error in applied models and experiments; eliminates, minimises or compensates for such errors; quantifies significance of errors to any conclusions drawn.	1,2,3,4,5

3. Professional and personal attributes		
3.2 Effective oral and written communication in professional and lay domains.	**b)** Prepares high quality engineering documents such as progress and project reports, reports of investigations and feasibility studies, proposals, specifications, design records, drawings, technical descriptions and presentations pertinent to the engineering discipline.	1,2,3,4,5

Teaching and learning method

The unit uses the following teaching approaches:

- Lectures
- Tutorials/problem classes
- Laboratory-based classes

The lectures are intended to present key aspects of the material in the unit, including motivating and introducing theory, working through examples, discussing applications of the ideas presented in engineering applications. Lectures will incorporate active learning strategies. Tutorials provide students with an opportunity to work on problems, and gain feedback on their progress in solving those problems. The aim of the problems is to help students improve and reinforce their understanding of the unit material, and practice demonstrating the unit outcomes. The laboratory classes are aimed to help students connect the theory with more practical problems, and develop skills in programming, and using simulation tools.

Learning outcomes

On successful completion of this unit, students will be able to:

1. Analyse and manipulate continuous-time and discrete-time signals using appropriate techniques.
2. Evaluate and analyse signals in frequency and time domains.
3. Analyse engineering systems by applying linear time invariant system concepts.
4. Apply the Fourier transform, Laplace Transform, and the discrete Fourier transforms to signals and system problems.
5. Recognise sampling errors and aliasing phenomena.

Your feedback to us

One of the formal ways students have to provide feedback on teaching and their learning experience is through the Student Evaluation of Teaching and Units (SETU) survey. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied with and areas for improvement.

Previous student evaluations of this unit

In response to previous SETU results of this unit, the following changes have been made:

Not Applicable. This is a new unit.

Student feedback has highlighted the following strength(s) in this unit:

Not Applicable. This is a new unit.

If you wish to view how previous students rated this unit, please go to:
https://unitevaluations.connect.monash.edu.au/unitevaluations/index.jsp

Unit schedule - Clayton campus

Week	Lecture topic	Tutorial	Lab	Assessment
1	Signal models and properties	Problems reviewing complex numbers	No lab	
2	System models and properties	Problems on signals and their properties	Intro to signals and systems in MATLAB (part 1)	
3	Discrete time LTI systems in time domain	Problems on systems and their properties	Intro to signals and systems in MATLAB (part 2)	Lab 1 due
4	Continuous time LTI systems in time domain	Problems on discrete-time LTI systems in time domain	Discrete-time convolution (part 1)	
5	Periodic signals in frequency domain/ mid-semester test 1 feedback	Problems on continuous-time LTI systems in time domain	Discrete-time convolution (part 2) + Mid-semester test 1	Lab 2 due Mid-semester test 1
6	Periodic signals in frequency domain/ Frequency response of LTI systems	Problems on periodic signals in frequency domain	DTMF signalling (part 1)	
7	Response of LTI systems to periodic inputs/ frequency selective filtering	Problems on frequency response of LTI systems	DTMF signalling (part 2)	Lab 3 due
8	Fourier transforms/ response of LTI systems to aperiodic inputs	Problems on response of LTI systems to periodic inputs and filtering	Frequency-selective filtering (part 1)	

Week	Lecture topic	Tutorial	Lab	Assessment
9	Properties of Fourier transforms/ Mid semester test 2	Problems on Fourier transforms	Frequency-selective filtering (part 2)	Lab 4 due Mid-semester test 2
10	Sampling and reconstruction	Mid-semester test 2 feedback/ properties of Fourier transforms	Sampling and aliasing (part 1)	
11	Laplace transforms and signal and system properties	Problems on sampling and reconstruction	Sampling and aliasing (part 2)	Lab 5 due
12	Computing LTI system response using Laplace transform methods	Problems on Laplace transforms	Assignment demonstrations	Assignment due

Assessment requirements

Assessment summary

Continuous assessment: 40%
Examination (2 hours): 60%
Students are required to achieve at least 45% in the total continuous assessment component (assignments, tests, mid-semester exams, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment task	Value	Due date
Laboratory experiments	10% of the total mark for the unit (2% for each laboratory)	Weeks 3, 5, 7, 9, 11
Mid-semester test 1	10% of the total mark for the unit	Week 5
Mid-semester test 2	10% of the total mark for the unit	Week 9
Assignment	10% of the total mark for the unit	Week 12
Final Examination	60% of the total mark for the unit	To be advised

Hurdle requirements

Students are required to achieve at least 45% in the total continuous assessment component

(assignment, mid-semester tests, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment tasks

Assessment title: Laboratory experiments
Mode of delivery: Laboratory (using MATLAB)
Details of task: Students will complete 5 laboratory exercises involving programming in MATLAB.

Each laboratory will span two timetabled sessions (lab 1 spans weeks 2 and 3, lab 2 spans weeks 4 and 5, lab 3 spans weeks 6 and 7, lab 4 spans weeks 8 and 9, lab 5 spans weeks 10 and 11). Each timetabled session is of two hours duration. This means that each student has four hours of class time allocated to each lab.

Release dates (where applicable): Not Applicable
Word limit (where applicable): Not Applicable
Due date: Weeks 3, 5, 7, 9, 11
Value: 10% of the total mark for the unit (2% for each laboratory)
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Students are required to complete and submit prelab exercises before the lab, attend and actively participate in the lab sessions, demonstrate their working solutions to the lab demonstrators, and submit documentation of their laboratory work (including code, figures, answers to questions). Marks will be assigned based on all of these, with specific mark breakdowns for each lab detailed in the lab instructions.
Additional remarks: Not Applicable

Assessment title: Mid-semester test 1
Mode of delivery: Moodle (in laboratory)
Details of task: Students will complete a test covering material introduced in the first four weeks of the unit.
Release dates (where applicable): Week 5
Word limit (where applicable): Not Applicable
Due date: Week 5
Value: 10% of the total mark for the unit
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Number of correct answers
Additional remarks: Not Applicable

Assessment title: Mid-semester test 2
Mode of delivery: Written (during lecture)
Details of task: Students will complete a written test covering material introduced in weeks 5-8 of the unit.
Release dates (where applicable): Week 9

Word limit (where applicable): Not Applicable
Due date: Week 9
Value: 10% of the total mark for the unit
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Number of correct answers. Partial marks may be given if student responses demonstrate understanding.
Additional remarks: Not Applicable

Assessment title: Assignment
Mode of delivery: The assignment will be posted on Moodle and reports will be submitted via Moodle. Designs will be demonstrated in the laboratory session in week 12.
Details of task: Students will solve a practical signal processing problem using techniques from the lectures and laboratories. The assignment will involve programming in MATLAB, demonstrating their solution, and submitting a report describing their approach.
Release dates (where applicable): Week 10
Word limit (where applicable): Not Applicable
Due date: Week 12
Value: 10% of the total mark for the unit
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Marking will be based on

- Quality of the solution to the design problem
- Soundness of reasoning behind the student's design
- Clarity of explanation of that reasoning in the report.

Additional remarks: Not Applicable

Examination(s)

Exam title: Final Examination
Weighting: 60% of the total mark for the unit
Length: 2 hours writing time
Type (Open/closed book): closed book
Hurdle requirements (where applicable): 45%
Electronic devices allowed: Faculty approved calculator
Remarks (where applicable): The final examination will be held after the completion of the unit, and constitutes 60% of the overall assessment of this unit.

Calculators
A list of the Faculty of Engineering approved calculators and the process for obtaining a sticker is available online at:

http://www.eng.monash.edu.au/current-students/calculators.html

IMPORTANT: Only these listed calculators with the **authorised Monash University-Science or Monash University-Engineering STICKER** will be allowed into the examination by the invigilators.

Section B: For Malaysia students

Academic Overview

Program Education Objectives
The Electrical and Computer Systems engineering discipline expects to produce graduates, who are:
1. competent in Electrical and Computer Systems engineering
2. responsible and effective global citizens
3. leaders in their chosen profession or society at large.

Program Outcomes
The Electrical and Computer Systems engineering discipline has developed a set of Program Outcomes (POs) for all of its graduates based on the competencies required by the Malaysian Engineering Accreditation Council.

Program Outcomes (POs)	Activities used in this unit to develop POs, achievement of Bloom's domains and complex problem solving
PO1 **Electrical and Computer Systems Engineering Knowledge:** Apply knowledge of mathematics, natural science, engineering fundamentals and specialisation in Electrical and Computer Systems engineering to the solution of complex engineering problems	Cognitive: Theoretical lecture material, prescribed texts and recommended readings. Laboratory experiments, tutorial problem solving, major assignment(s).
PO2 **Problem Analysis:** Identify, formulate, survey research literature and analyse complex Electrical and Computer Systems engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences	Cognitive: Not applicable
PO3 **Design/Development of Solutions:** Design solutions for complex Electrical and Computer Systems engineering problems and design systems, components or processes that meet specified needs.	Cognitive: Not applicable Psychomotor: Not applicable
PO4 **Research-based Investigation:** Conduct investigations of complex Electrical and Computer Systems engineering problems using research-based knowledge and research methods including design of experiments, (analysis and interpretation of data, and synthesis of information to provide valid conclusions.	Cognitive: Not applicable
PO5 **Modern Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex Electrical and Computer Systems engineering problems, with an understanding of the limitations	Cognitive: Not applicable Psychomotor: Not applicable
	Affective: Not applicable

Program Outcomes (POs)	Activities used in this unit to develop POs, achievement of Bloom's domains and complex problem solving
PO6 **Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex Electrical and Computer Systems engineering problems	
PO7 **Environment and Sustainability:** Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex Electrical and Computer Systems engineering problems in environmental contexts.	Cognitive: Not applicable Affective: Not applicable
PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	Affective: Not applicable
PO9 **Communication:** Communicate effectively on complex Electrical and Computer Systems engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	Affective: Not applicable
PO10 **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings	Affective: Not applicable
PO11 **Lifelong Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	Affective: Not applicable
PO12 **Project Management and Finance:** Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to manage projects	Cognitive: Not applicable Affective: Not applicable

Teaching and learning method

Laboratory-based classes

This Unit is of fundamental nature and requires the students to understand the abstract notion of signals and systems with the aid of the mathematical tools.

The teaching approach is classic: lectures illustrating the theoretical material, tutorials to practice problem solving and hands-on labs with practical examples.

Self-evaluation is available with online quizzes and/or assessments/tests.

All lecture slides, tutorials and lab materials are available on Moodle.

Learning outcomes

On successful completion of this unit, students will be able to:

1. Analyse and manipulate continuous-time and discrete-time signals using appropriate techniques.
2. Evaluate and analyse signals in frequency and time domains.
3. Analyse engineering systems by applying linear time invariant system concepts.
4. Apply the Fourier transform, Laplace Transform, and the discrete Fourier transforms to signals and system problems.
5. Recognise sampling errors and aliasing phenomena.

OBE requirements to learning outcomes (LOs)

Learning Outcomes (LOs) for Outcome Based Education (OBE) requirements	Handbook Learning Outcomes
LO1 - Apply linear system framework to analyse, design and evaluate suitable digital /continuous time filters	Analyse and manipulate continuous-time and discrete-time signals using appropriate techniques.
	Evaluate and analyse signals in frequency and time domains.
	Analyse engineering systems by applying linear time invariant system concepts.
	Apply the Fourier transform, Laplace Transform, and the discrete Fourier transforms to signals and system problems.
	Recognise sampling errors and aliasing phenomena.

Relationship between unit learning outcomes and program outcomes

No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

LO1	√	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Key

	No emphasis

√	Emphasized and assessed in the unit

Your feedback to us

One of the formal ways students have to provide feedback on teaching and their learning experience is through the Student Evaluation of Teaching and Units (SETU) survey. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied with and areas for improvement.

Previous student evaluations of this unit

In response to previous SETU results of this unit, the following changes have been made:

- More examples will be given in the class

Student feedback has highlighted the following strength(s) in this unit:

- Labs and tutorials have attracted good interest

If you wish to view how previous students rated this unit, please go to:
https://emuapps.monash.edu.au/unitevaluations/index.jsp

Unit schedule - Malaysia campus

Week	Lecture topic	Tutorial	Lab	Assessment
1	Signal models and properties	Problems reviewing complex numbers	No lab	
2	System models and properties	Problems on signals and their properties	Intro to signals and systems in MATLAB (part 1)	
3	Discrete time LTI systems in time domain	Problems on systems and their properties	Intro to signals and systems in MATLAB (part 2)	Lab 1 due
4	Continuous time LTI systems in time domain	Problems on discrete-time LTI systems in time domain	Discrete-time convolution (part 1)	
5	Periodic signals in frequency domain/ mid-semester test 1 feedback	Problems on continuous-time LTI systems in time domain	Discrete-time convolution (part 2) + Mid-semester test 1	Lab 2 due Mid-semester test 1
6	Periodic signals in frequency domain/ Frequency response of LTI systems	Problems on periodic signals in frequency domain	DTMF signalling (part 1)	
7	Response of LTI systems to periodic inputs/ frequency selective filtering	Problems on frequency response of LTI systems	DTMF signalling (part 2)	Lab 3 due
8	Fourier transforms/ response of LTI systems to aperiodic inputs	Problems on response of LTI systems to periodic inputs and filtering	Frequency-selective filtering (part 1)	
9	Properties of Fourier transforms/ Mid semester test 2	Problems on Fourier transforms	Frequency-selective filtering (part 2)	Lab 4 due Mid-semester test 2
10	Sampling and reconstruction	Mid-semester test 2 feedback/ properties of Fourier transforms	Sampling and aliasing (part 1)	
11		Problems on sampling and reconstruction	Sampling and aliasing (part 2)	Lab 5 due

Week	Lecture topic	Tutorial	Lab	Assessment
	Laplace transforms and signal and system properties			
12	Computing LTI system response using Laplace transform methods	Problems on Laplace transforms	Assignment demonstrations	Assignment due

Assessment Summary

Continuous assessment: 40%
Examination (2 hours): 60%
Students are required to achieve at least 45% in the total continuous assessment component (assignments, tests, mid-semester exams, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Assessment task	Value	Due date
Laboratory experiments	10%	Please consult the unit schedule
Mid-semester test 1	10%	Week 5
Mid-semester test 2	10%	Week 9
Assignment	10%	Week 12
Examination	60%	N/A

Hurdle requirements

Students are required to achieve at least 45% in the total continuous assessment component (assignment, mid-semester tests, laboratory reports) and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

Bloom's Taxonomy:
Three domains of educational activities have been identified under the general taxonomy known as Bloom's.

- **Cognitive**: mental skills (*Head*)
- **Affective**: growth in feelings or emotional areas (*Heart*)
- **Psychomotor**: manual or physical skills (*Hand*)

The *cognitive* domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills.

The *affective* domain includes the attitudes with which someone deals with things emotionally, such as feelings, values, appreciation, enthusiasms and motivations.

The *psychomotor* domain includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.

Key for the LO-assessment relationship table above:

Cognitive

C1	C2	C3	C4	C5	C6
Knowledge: Remembers previously learned material	**Comprehension:** Grasps the meaning of material (lowest level of understanding)	**Application:** Uses learning in new and concrete situations (higher level of understanding)	**Analysis:** Understands both the content and structure of material	**Synthesis:** Formulates new structures from existing knowledge and skills	**Evaluation:** Judges the value of material for a given purpose

Psychomotor

P1	P2	P3	P4	P5	P6	P7
Perception: Senses cues that guide motor activity	**Set:** Is mentally, emotionally and physically ready to act	**Guided Response:** Imitates and practices skills, often in discrete steps	**Mechanism:** Performs acts with increasing efficiency, confidence and proficiency	**Complete Overt Response:** Performs automatically	**Adaption:** Adapts skill sets to meet a problem situation	**Organisation:** Creates new patterns for specific situations

Affective

A1	A2	A3	A4	A5
Receiving: Selectively attends to stimuli	**Responding:** Responds to stimuli	**Valuing:** Attaches value or worth to something	**Organisation:** Conceptualises the value and resolves conflict between it and other values	**Internalising:** Integrates the value into a value system that controls behaviour

Relationship between Assessments and OBE Learning Outcomes (LOs)

No.	Learning Objective	Assessment				
		Lab	Mid-semester test 1	Mid-semester test 2	Assignment	Examination
1	Apply linear system framework to analyse, design and evaluate suitable digital /continuous time filters	C4	C4	C4	C6	C5

Relationship between Assessments and Complex Problems /Activities

	Assessment	Complex Problems							Complex Activities				
		DoK	RoR	DoA	FI	EoC	SI	I	RoR	LoI	I	CSE	F
1	Lab	X	X					X					X
2	Mid-semester test 1	X	X					X					
3	Mid-semester test 2	X	X					X					
4	Assignment	X	X					X			X		
5	Examination	X	X					X					

Complex Problems (CP)

Attribute Code	Attribute Description	Complex Engineering Problems have characteristic WP1 and some or all of WP2 to WP7:
WP1	Depth of Knowledge Required (DoK)	Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5, WK6 or WK8 which allows a fundamentals-based, first principles analytical approach
WP2	Range of conflicting requirements (RoR)	Involve wide-ranging or conflicting technical, engineering and other issues
WP3	Depth of analysis required (DoA)	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
WP4	Familiarity of issues (FI)	Involve infrequently encountered issues

WP5	Extent of applicable codes (EoC)	Are outside problems encompassed by standards and codes of practice for professional engineering
WP6	Extent of stakeholder involvement and conflicting requirements (SI)	Involve diverse groups of stakeholders with widely varying needs
WP7	Interdependence (I)	Are high level problems including many component parts or sub-problems

Complex Activities (CA)

Attribute	Attribute Description	Complex Activities
Preamble		**Complex activities means (engineering) activities or projects that have some or all of the following characteristics:**
EA1	Range of resources (RoR)	Involve the use of diverse resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)
EA2	Level of interactions (LoI)	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
EA3	Innovation (I)	Involve creative use of engineering principles and research-based knowledge in novel ways
EA4	Consequences to society and the environment (CSE)	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
EA5	Familiarity (F)	Can extend beyond previous experiences by applying principles-based approaches

Assessment requirements

Assessment tasks

Assessment title: Laboratory experiments
Mode of delivery: Laboratory (using MATLAB)
Details of task: Students will complete 5 laboratory exercises involving programming in MATLAB.

Each laboratory will span two timetabled sessions (lab 1 spans weeks 2 and 3, lab 2 spans weeks 4 and 5, lab 3 spans weeks 6 and 7, lab 4 spans weeks 8 and 9, lab 5 spans weeks 10 and 11). Each timetabled session is of two hours duration. This means that each student has four hours of class time allocated to each lab.

Release dates (where applicable): Not Applicable
Word limit (where applicable): Not Applicable
Due date: Weeks 3, 5, 7, 9, 11
Value: 10% of the total mark for the unit (2% for each laboratory)
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Students are required to complete and submit prelab exercises before the lab, attend and actively participate in the lab sessions, demonstrate their working solutions to the lab demonstrators, and submit documentation of their laboratory work (including code, figures, answers to questions). Marks will be assigned based on all of these, with specific mark breakdowns for each lab detailed in the lab instructions.
Additional remarks: Not Applicable

Assessment title: Mid-semester test 1
Mode of delivery: Moodle (in laboratory)
Details of task: Students will complete a test covering material introduced in the first four weeks of the unit.
Release dates (where applicable): Week 5
Word limit (where applicable): Not Applicable
Due date: Week 5
Value: 10% of the total mark for the unit
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Number of correct answers
Additional remarks: Not Applicable

Assessment title: Mid-semester test 2
Mode of delivery: Written (during lecture)
Details of task: Students will complete a written test covering material introduced in weeks 5-8 of the unit.
Release dates (where applicable): Week 9
Word limit (where applicable): Not Applicable
Due date: Week 9
Value: 10% of the total mark for the unit
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable

Criteria for marking: Number of correct answers. Partial marks may be given if student responses demonstrate understanding.
Additional remarks: Not Applicable

Assessment title: Assignment
Mode of delivery: The assignment will be posted on Moodle and reports will be submitted via Moodle. Designs will be demonstrated in the laboratory session in week 12.
Details of task: Students will solve a practical signal processing problem using techniques from the lectures and laboratories. The assignment will involve programming in MATLAB, demonstrating their solution, and submitting a report describing their approach.
Release dates (where applicable): Week 10
Word limit (where applicable): Not Applicable
Due date: Week 12
Value: 10% of the total mark for the unit
Presentation requirements: Not Applicable
Hurdle requirements (where applicable): 45% hurdle for the total continuous assessment component (laboratory experiments, mid semester tests, and assignment).
Individual assessment in group tasks (where applicable): Not Applicable
Criteria for marking: Marking will be based on

- Quality of the solution to the design problem
- Soundness of reasoning behind the student's design
- Clarity of explanation of that reasoning in the report.

Additional remarks: Not Applicable

Examination(s)

Exam title: Final Examination
Weighting: 60% of the total mark for the unit
Length: 2 hours writing time
Type (Open/closed book): closed book
Hurdle requirements (where applicable): 45%
Electronic devices allowed: Faculty approved calculator
Remarks (where applicable): The final examination will be held after the completion of the unit, and constitutes 60% of the overall assessment of this unit.

Calculators

A list of the Faculty of Engineering approved calculators and the process for obtaining a sticker is available online at:
http://www.eng.monash.edu.au/current-students/calculators.html

IMPORTANT: Only these listed calculators with the **authorised Monash University-Science or Monash University-Engineering STICKER** will be allowed into the examination by the invigilators.

You must bring your calculator with you to the Faculty office at any time during the semester to receive a sticker. We recommend you do this well in advance of the exam.

Section C: All students

Plagiarism and collusion

Intentional plagiarism or collusion amounts to cheating under Part 7 of the Monash University (Council) Regulations.

Plagiarism: Plagiarism means taking and using another person's ideas or manner of expressing them and passing them off as one's own. For example, by failing to give appropriate acknowledgement. The material used can be from any source (staff, students or the internet, published and unpublished works).

Collusion: Collusion means unauthorised collaboration with another person on assessable written, oral or practical work and includes paying another person to complete all or part of the work. Where there are reasonable grounds for believing that intentional plagiarism or collusion has occurred, this will be reported to the Associate Dean (Education) or delegate,

Referencing requirements

Not Applicable

To build your skills in citing and referencing, and using different referencing styles, see the online tutorial Academic Integrity: Demystifying Citing and Referencing at http://www.lib.monash.edu.au/tutorials/citing/

Assignment submission

Hard Copy Submission:

Not Applicable

Online Submission: If Electronic Submission has been approved for your unit, please submit your work via the Moodle site or other; as directed by your demonstator for this unit.
Please keep a copy of tasks completed for your records.

Feedback to you

Feedback to students will take the form of

- Verbal comments
- Feedback to the whole class
- Feedback to tutorial groups

Learning resources

Recommended textbooks

- Edward A. Lee, Pravin Varaiya, "Structure and Interpretation of Signals and Systems", Second Edition, LeeVaraiya.org, ISBN 978-0-578-07719-2, 2011.
- Alan V. Oppenheim, Alan S. Willsky, "Signals and Systems" 2nd Edition, Prentice-Hall, 1997

Monash Library Unit Reading List (if applicable to the unit):
http://readinglists.lib.monash.edu/index.html

Required resources

Students generally must be able to complete the requirements of their course without the imposition of fees that are additional to the student contribution amount or tuition fees. However, students may be charged certain incidental fees or be expected to make certain purchases to support their study. For more information about this, go to Administrative Information for Higher Education Providers: Student Support, Chapter 21, Incidental Fees at: http://www.innovation.gov.au/HigherEducation/TertiaryEducation/ResourcesAndPublications/Pages/default.aspx

Technological requirements

- Students must regularly check Moodle for announcements.
- MATLAB is required (and provided) to complete the lab experiments and the assignment.

Other information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:
http://www.policy.monash.edu/policy-bank/academic/education/index.html

Graduate Attributes Policy

http://www.monash.edu/policy-bank/academic/education/course-governance-and-design/course-design-policy

Student Charter

http://www.monash.edu/students/policies/student-charter.html

Student Services

The University provides many different kinds of services to help you gain the most from your studies. Contact your tutor if you need advice and see the range of services available at http://www.monash.edu/students.

Malaysia students go to: http://www.monash.edu.my/Student-services/.

Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research.
Go to http://www.monash.edu/library or the library tab in http://my.monash.edu.au portal for more information.

For Malaysia students the Library and Learning Commons, Monash University Malaysia Campus, provides a range of services and resources that enable you to save time and be more effective in your learning and research.
Go to http://www.lib.monash.edu.my or the library tab in my.monash portal for more information.

Disability Support Services

Students who have a disability, ongoing medical or mental health condition are welcome to contact Disability Support Services.

Disability Support Services also support students who are carers of a person who is aged and frail or has a disability, medical condition or mental health condition.

Disability Advisers visit all Victorian campuses on a regular basis.

- Website: monash.edu/disability
- Telephone: 03 9905 5704 to book an appointment with an Adviser;
- Email: disabilitysupportservices@monash.edu
- Drop In: Level 1, Western Annexe, 21 Chancellors Walk (Campus Centre) Clayton Campus

At Malaysia campus, for information and referral, telephone: Student Adviser, Student Community Services at 03 55146018 or, drop in at Student Community Services Department, Level 2 Building 2, Monash University Malaysia Campus.