ELEC2040

Signals and Systems

Session 1, Special circumstances 2021

School of Engineering

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Lecturer
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appointment via email

Lecturer
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Credit points
10

Prerequisites
MATH1020 or MATH1025 or MATH133 or MATH136

Corequisites

Co-badged status

Unit description
The aim of this unit is to give students a comprehensive introduction to the theory of signal processing and analysis that is used in many areas of electronic and telecommunications engineering including: circuit analysis; amplifiers and electronic systems; analogue and digital communications; audio and image processing; and control systems. The unit covers time and frequency analysis for both continuous-time and discrete-time signals. Topics covered in the unit include: linear time-invariant systems; convolution; Fourier series; Fourier transforms; Laplace Transforms; Discrete Fourier transforms; and Z transforms.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://students.mq.edu.au/important-dates

Learning Outcomes

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

ULO1: solve signal processing problems involving complex numbers

ULO2: demonstrate how signals can be scaled in space, time, flipped in time (time-reversed), delayed (right and left shifted), and to compute other signal properties (mean, energy, power, periodicity).
ULO3: articulate well developed knowledge of the concept of a linear time-invariant system and the concept of the convolution of two signals.
ULO4: articulate the concept of signal domains: how the same signal can be represented in different domains (in time or in frequency) and how to transform from one representation to another.
ULO5: Illustrate the role of sampling and filtering in converting between continuous-time to discrete-time signals, including the Nyquist criterion, and concept of aliasing.
ULO6: use Matlab to solve problems in Signals and Systems

General Assessment Information

Hurdle Quiz: There will be a hurdle quiz in week 2 worth 3%. The quiz will take 30 minutes, and will be available for download from ilearn on Monday March 1, and due on ilearn at a time specified on ilearn (also on Monday March 1). The quiz will be on basic introductory and prerequisite knowledge, which will have been reviewed in the first week of the unit. This quiz is a hurdle requirement for the unit. A grade of 60% or more in this quiz is a condition of passing this unit. If you are given a second opportunity to sit the quiz as a result of failing to meet the minimum mark required, you will be notified of the exact day and time of the second attempt. The second attempt at a hurdle assessment is graded as pass fail. The maximum grade for a second attempt is the hurdle threshold grade.

Tests: There will be four tests during the semester. The Tests have the following condition: If the mark is less than 50%, then the student will be given a second chance to achieve a mark of 50%, by completing extra assessment to a satisfactory standard. The extra assessment will be in the form of a take-home assignment, for which the student will need to achieve a mark of greater than 50%. If the assignment mark is not greater than 50%, then the original Test mark will stand. These tests will be available on ilearn at a specified time, and solutions must be uploaded to ilearn at a specified time.

Projects will be undertaken during each practical session scheduled in weeks 1-13, and will be submitted on-line on ilearn at times stated on the assignment on ilearn. There will be a practical session in week 1. All practical sessions will be run over zoom.

Final exam. The final exam has a hurdle requirement. Students must obtain at least 40% on final exam to pass the unit. The exam will be available on ilearn at a specified time, and solutions must be uploaded to ilearn by a specified time, specified on ilearn. If you are given a second opportunity to sit the final examination as a result of failing to meet the minimum mark required, you will be offered that chance during the supplementary examination period and will be notified of the exact day and time after the publication of final results for the unit. The second attempt at a hurdle assessment is graded as pass fail. The maximum grade for a second attempt is the hurdle threshold grade.

To pass this unit, students must achieve an average grade of 50% and achieve all hurdle requirements.

Assessment Tasks

Name	Weighting	Hurdle	Due
Project work in Practical Sessions	22%	No	Due each week, times given on ilearn
Hurdle Quiz	3%	Yes	Monday March 4
Test 1	5%	No	Week 4
Test 2	5%	No	Week 6
Test 3	5%	No	Week 8
Test 4	5%	No	Week 10
Final Exam	55%	Yes	Final Exam Period

Project work in Practical Sessions

Assessment Type [1]: Project
Indicative Time on Task [2]: 12 hours
Due: **Due each week, times given on ilearn**
Weighting: **22%**

Projects will be undertaken during each practical session scheduled in weeks 1-12 and will be submitted at the end of the practical sessions. There will be a practical session in week 1.

On successful completion you will be able to:

- use Matlab to solve problems in Signals and Systems

Hurdle Quiz

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **Monday March 4**
Weighting: **3%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Quiz on pre-requisite knowledge in complex numbers

On successful completion you will be able to:

- solve signal processing problems involving complex numbers

Test 1

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **Week 4**
Weighting: **5%**

Test on signal operations

On successful completion you will be able to:

- demonstrate how signals can be scaled in space, time, flipped in time (time-reversed), delayed (right and left shifted), and to compute other signal properties (mean, energy, power, periodicity).

Test 2

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **Week 6**
Weighting: **5%**

Test on linear time invariant systems and convolution

On successful completion you will be able to:

- articulate well developed knowledge of the concept of a linear time-invariant system and the concept of the convolution of two signals.

Test 3

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **Week 8**
Weighting: **5%**

Test on Fourier Series and Fourier Transforms

On successful completion you will be able to:

- articulate the concept of signal domains: how the same signal can be represented in different domains (in time or in frequency) and how to transform from one representation to another.

Test 4

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **Week 10**
Weighting: **5%**

Test on Laplace Transforms and Sampling

On successful completion you will be able to:

- Illustrate the role of sampling and filtering in converting between continuous-time to discrete-time signals, including the Nyquist criterion, and concept of aliasing.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 40 hours
Due: **Final Exam Period**
Weighting: **55%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Final Exam

On successful completion you will be able to:

- solve signal processing problems involving complex numbers
- demonstrate how signals can be scaled in space, time, flipped in time (time-reversed), delayed (right and left shifted), and to compute other signal properties (mean, energy, power, periodicity).
- articulate well developed knowledge of the concept of a linear time-invariant system and the concept of the convolution of two signals.
- articulate the concept of signal domains: how the same signal can be represented in different domains (in time or in frequency) and how to transform from one representation to another.
- Illustrate the role of sampling and filtering in converting between continuous-time to discrete-time signals, including the Nyquist criterion, and concept of aliasing.

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment

- the Learning Skills Unit for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Many textbooks provide comprehensive coverage of the material in this unit. We will be referring to the following two books as we progress through the unit:

“Signals and systems”, S. Haykin and B. Van Veen, John Wiley & Sons, second edition. 2003.

“Signals & Systems”, A. V. Oppenheim and A. S. Willsky with S. H. Nawab, Prentice-Hall, second edition, 1997.

These books are on closed reserve in the library.

Other books include:

“Signals, Systems and Transforms” 4th ed, by Phillips, Parr and Riskin. Pearson publishers. 2008.

“Signals and systems”, M. J. Roberts, McGraw-Hill.2004.

“An Introduction to Signals and Systems”, J. A. Stuller, Thomson publishers, 2008.

“Linear Systems and Signals”, 2nd ed, B. P. Lathi, Oxford University Press, 2005.

“Discrete-time signal processing”, A. V. Oppenheim and R. W. Schafer with J. R. Buck, Prentice-Hall, 1999.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.e

du.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Enquiry Service

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

Equity Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.