The Hong Kong University of Science and Technology

UG Course Syllabus

Signals and Systems
ELEC2100
Credits: 4
Pre-requisite: MATH2011 or MATH2023 or MATH2111 or MATH2350 or MATH2351 or MAT2352

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Course Description

This is a foundation course introducing signals and systems for modelling and analysis of a variety of engineering systems. The course covers continuous- and discrete-time Fourier analysis, Laplace Transform, interactions between signals and linear time invariant (LTI) systems, sampling theorem, differential and difference equations as LTI systems, and application examples in communications, control, and multimedia. MATLAB is introduced as an integral part of this course.

Intended Learning Outcomes (ILOs)

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

ILO1 - Describe Basic Continuous-Time and Discrete-Time signals and different ways to make use of and manipulate them.

ILO2 - List the Properties of LTI systems and determine the output of an LTI system using the impulse response and the convolution sum/integral, and the frequency response and transform.

ILO3 - Correctly apply the appropriate transform (FS, DTFS, FT, DTFT) to produce a Frequency domain representation for continuous-time/discrete-time and periodic/aperiodic signals, and relate basic operations in the time and frequency domains.

ILO4 - State and prove the sampling theorem.

ILO5 - Analyze differential and difference equations as causal LTI systems and to realize them in different block diagram forms.

ILO6 - Apply theories learnt to the analysis of communication systems including Amplitude Modulation and Frequency Division Multiplexing, the communication channel, mechanical systems, and new problems.

ILO7 - Use the Software Tools MATLAB to manipulate, process, analyze and plot signals.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Homework	**18%**	
HW1	6%	Week5
HW2	6%	Week9
HW3	6%	Week13
Laboratory exercises	**12%**	
Lab1	3%	Week4
Lab2	3%	Week7
Lab3	3%	Week9
Lab4	3%	Week12
Online Quiz	**5%**	
Quiz1	1%	Week4
Quiz2	1%	Week7
Quiz3	1%	Week9
Quiz4	1%	Week11
Quiz5	1%	Week13
Mid-term Examination	**25%**	Week9
Final Examination	**40%**	Fall Term Examinations

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6	Assesses ability to solve problems involving signal manipulation, LTI systems, Fourier transforms, sampling theorem, difference equations, and modulation.
Laboratory	ILO1, ILO2, ILO3, ILO7	Assesses ability to use MATLAB to generate signals, perform convolution, compute Fourier transforms, and simulate AM/FDM systems.
Quiz	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6	Assesses rapid recall and application of core concepts from all six ILOs in a short-answer format.
Mid-term Exam	ILO1, ILO2, ILO3	Assesses foundational skills: signal operations, LTI convolution, and Fourier analysis (FS/FT/DTFT).
Final Exam	ILO1, ILO2, ILO3, ILO4, ILO5, ILO6	Assesses comprehensive understanding including sampling theorem, difference equations, block diagrams, and communication system applications.

Grading Rubrics

Detailed rubrics for each assignment will be provided. These rubrics clearly outline the criteria used for evaluation. Students can refer to these rubrics to understand how their work will be assessed.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Mastery of signals, LTI systems, Fourier transforms, sampling, difference equations, and MATLAB. Solves complex and novel problems correctly and creatively.
B	Good Performance	Solid understanding of core topics. Solves most problems correctly with minor errors. Good MATLAB skills.
C	Satisfactory Performance	Adequate knowledge of basics. Solves familiar problems but struggles with complexity. Basic MATLAB proficiency.
D	Marginal Pass	Threshold knowledge of core topics. Can attempt simple problems. Minimal MATLAB ability. Meets minimum requirements.
F	Fail	Insufficient understanding. Cannot solve basic problems. No MATLAB competency. Does not meet passing threshold.

Course AI Policy

AI tools are permitted with proper acknowledgement.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Required Texts and Materials

Reference book: Alan V. Oppenheim, Alan S. Wilsky and S.H. Nawab, Signals and Systems, Prentice-Hall Internal Editions, 2nd Edition

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism