The Hong Kong University of Science and Technology

UG Course Syllabus

A System View of Communications: from Signals to Packets

ELEC1200

4 Credits

Co-requisites: (COMP 1021 OR COMP 1022P (prior to 2025-26) OR COMP 1023) AND (MATH 1003 OR MATH 1014 OR MATH 1020 OR MATH 1024)

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Course Description

Have you ever wondered what technologies go into your mobile phone or a WiFi hotspot? Through hands on work with a simple but fully functional wireless communication system, you will understand the basic engineering tools used and tradeoffs encountered in the design of these systems. This course is centered on weekly laboratories, each designed to introduce an important concept in the design of these systems. The lab sessions are supported by two one-hour lectures and a tutorial that introduce the concepts for the next laboratory, as well as reviewing and expanding the concepts learned in the previous laboratory.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Examine a voice communication system to identify the practical context of key theoretical concepts in ECE.
2. Identify typical problems and tradeoffs encountered in electronic and computer engineering systems.
3. Analyze simple approaches to address a range of problems and tradeoffs.
4. Use software tools, such as MATLAB, to investigate potential solutions to problems and tradeoffs in order to validate an analysis, and to handle cases not amenable to simple analysis.
5. Work in a cooperative setting on real hardware or by simulations where the simplifying assumptions used in theoretical analysis may be violated, and assess the benefits and limitations of such analysis.

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:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Mid-Term	25%	Week 8 *
Homework	10%	Week 7/ 11/13*
Laboratory	25%	Week 2 to Week 12 *
Final examination	40%	7-19 December 2026

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Mid-Term	ILO1, ILO2, ILO3	The task assesses foundational knowledge of voice communication systems through HW1 topics (ILO1), such as examining binary sequence transmission and LTI channel responses. It also evaluates the identification of tradeoffs in signal transmission and noise (ILO2), and the analysis of approaches like step response calculation and equalizer design (ILO3), using theoretical and problem-solving questions.
Homework	ILO2, ILO3. ILO4	This task evaluates students' ability to identify tradeoffs in communication systems, channel coding tradeoffs, and ALOHA efficiency (ILO2), analyze approaches to solve problems like equalizer design, Fourier analysis, or routing (ILO3), and use MATLAB to validate solutions such as waveform plotting, and Fourier expansion (ILO4).
Laboratory	ILO1, ILO4, ILO5	Weekly laboratory experiments include learning MATLAB basics, ILO4, followed by examining practical systems like IR channels, Frequency Division Multiplexing (FDM), ILO1; using MATLAB for validation, e.g., channel equalization, time-frequency analysis, ILO4; and cooperating on hardware/simulations, protocol analysis, FDM, ILO5 to assess theoretical limitations and practical applications.
Final Examination	ILO1, ILO2, ILO3, ILO4, ILO5	This task is comprehensive, testing a full understanding of communication systems from signals to packets (ILO1), including LTI systems, modulation, and networking. It assesses identifying and analyzing problems and tradeoffs (ILO2, ILO3), and applying cooperative

		lab learning (ILO5) through theoretical and conceptual questions.

Grading Rubrics

Detailed rubrics for homework assignments will be provided on Gradescope. All assessments in this course are carefully evaluated to provide clear and constructive feedback.

Final Grade Descriptors:

[As appropriate to the course and aligned with university standards]

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of communication systems from signals to coding/modulation and networking, with exceptional problem-solving. Excels in MATLAB use in labs and homework, and in collaborative lab work, showing strong teamwork and personal mastery. Exceeds expectations in analyzing tradeoffs and applying lab-derived concepts theoretically in the final exam.
B	Good Performance	Shows good understanding of signals, coding/modulation, and networking, with competent analysis of tradeoffs. Performs well in MATLAB use in labs and homework, and in collaborative lab work, demonstrating good teamwork and solid individual understanding. Applies lab-derived concepts effectively in the final exam, with consistent effort.
C	Satisfactory Performance	Possesses adequate knowledge of communication systems, with basic understanding of signals, coding, and networking, and functional MATLAB skills in labs and homework. Completes collaborative lab work with some effort, showing minimal teamwork and basic individual understanding. Applies lab-derived concepts minimally in the final exam, meeting core requirements.
D	Marginal Pass	Has threshold understanding of signals and basic networking principles, with limited tradeoff analysis. Shows basic MATLAB use in labs and homework, completes minimal collaborative lab work, with little teamwork and weak individual understanding. Applies lab-derived concepts poorly in the final exam, meeting minimum requirements with gaps.
F	Fail	Demonstrates insufficient understanding of communication systems, failing to grasp signals, coding, or networking, with no effective tradeoff analysis. Lacks effective MATLAB use in labs and homework, shows minimal effort in collaborative lab work, and fails to apply lab-derived concepts in the final exam, failing to meet course standards.

Course AI Policy

Students are allowed to use generative artificial intelligence (AI) tools to assist with learning. However, proper credit for any use of generative AI should be provided.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on homework assignments will include detailed marking that indicates which parts are incorrect, along with common mistakes. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Late submissions of any assessed tasks are not allowed in this course.

Required Texts and Materials

No textbooks are required for this course.

Reference Books:

Frenzel Louis E, "Principles of electronic communication systems" 5th Edition, McGraw-Hill, 2023 (ebook)

Alan V. Oppenheim, Alan S. Willsky and S. H. Nawab, Signals and Systems, 2nd Ed., Prentice Hall, 1997

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.