The Hong Kong University of Science and Technology

UG Course Syllabus

Introduction to Microelectronics and Integrated Circuits

ELEC 1300

4 Credits

Co-requisites: MATH 1014 AND (PHYS 1114 OR PHYS 1314)

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Office Hours: By appointment

Course Description

This course introduces the foundations and applications of microelectronics and integrated circuits (ICs). Topics are divided into five categories, covering (i) historical perspectives of microelectronics devices and ICs; (ii) electronic materials (from atoms to solids, semiconductors, crystal growth); (iii) solid-state devices (diodes, photo-active devices, bipolar junction transistors, field effect transistors); (iv) classifications and applications of ICs (digital/logic, analog, memory); (v) modern technologies (artificial intelligence, quantum, etc.).

Intended Learning Outcomes (ILOs)

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

1. Explore the historical perspectives and future trends of the microelectronics and integrated circuits industry.
2. Analyze the electronic and transport properties of crystalline solids.
3. Describe the operating principles and functionalities of common solid-state electronic devices.
4. Understand the classifications and applications of various types of integrated circuits.
5. Describe the key techniques and considerations behind the fabrication of modern electronic devices and integrated circuits.

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
Homework assignments	10%	Weeks 3 to 13
Laboratory experiments	40%	Weeks 3, 5, 7, 10, 12
Midterm	20%	Week 9
Final examination	30%	Exam Period (TBD)

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework assignments	ILO1, ILO2, ILO3, ILO4, ILO5	This task assesses students' ability to apply theoretical knowledge discussed in the lectures to synthesize well-argued solutions for practical problems.
Laboratory experiments	ILO3, ILO4, ILO5	This task enriches students' understanding in the properties and fabrication of microelectronic devices and integrated circuits through hands-on electrical measurements, data analysis, and laboratory visit.
Midterm	ILO1, ILO2, ILO3	This task assesses the students' understanding of the lecture and laboratory contents, including their ability to explain fundamental concepts.
Final examination	ILO1, ILO2, ILO3, ILO4, ILO5	This task provides a comprehensive assessment of the students' mastery of the core subject materials discussed throughout the course.

Grading Rubrics

Detailed solutions and marking schemes for all assessment tasks will be outlined. Students can refer to these rubrics to understand the criteria used for grading.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates mastery of the subject matter and exceptional creativity or critical thinking in developing solutions to unfamiliar problems.
B	Good Performance	Demonstrates solid understanding of the subject matter and competency in problem solving.
C	Satisfactory Performance	Demonstrates adequate understanding of the subject matter and satisfactory problem-solving skills.
D	Marginal Pass	Shows limited understanding of the subject matter and basic ability to analyze problems.
F	Fail	Shows insufficient understanding of the subject matter and a lack of the necessary problem-solving capability.

Course AI Policy

The use of generative AI in completing the assessment tasks is permitted with proper acknowledgement.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two to three weeks of submission.

Late Submission Policy

Late submissions will not be accepted without prior consent of the instructor.

Required Text

S. O. Kasap, *Principles of Electronic Materials and Devices, 4th edition*, McGraw-Hill Education.

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.