

The Hong Kong University of Science and Technology
UG Course Syllabus (Fall 2026)

[Course Title] Design and Analysis of Computer Architectures

[Course Code] COMP 4611

[No. of Credits] 3 credits

[Any pre-/co-requisites] Prerequisite(s): COMP 2611 OR ELEC 2350

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Course Description

Analysis, synthesis and evaluation of different computer architectures. Emphasis on computer design with respect to price/performance and its relation to architectural choices. Introducing the basic knowledge on modern GPU architecture.

Key concepts covered: ISA, pipelining, hazard handling, branch prediction, out-of-order instruction execution, SIMD processing, memory hierarchy, caches, multiprocessors, memory and cache coherence, and modern GPU architecture, etc.

Intended Learning Outcomes (ILOs)

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

1. Assess the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance, cost and power consumption.
2. Analyze various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.
3. Critically evaluate computer architectures and systems.
4. Select and apply various performance evaluation techniques and tools.

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.

Assessment Task	Contribution to Overall Course grade (%)
Written assignments x 2 (7.5% each)	15%
Project assignment x 1	10%
Midterm exam	25%
Final exam	50%

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Written assignment 1	7.5%	Week 5
Written assignment 2	7.5%	Week 9
Project assignment	10%	Week 13
Midterm exam	25%	Around Week 8-9
Final exam	50%	During the University Exam Period

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Written assignment 1	ILO1	This task assesses students' ability to apply basic performance evaluation concepts and cost concepts to analyze the performance and costs in designing a computer architecture (ILO 1).
Written assignment 2	ILO2	This task assesses students' ability to apply more advanced techniques to improve different aspect of a computer so as to improve the overall performance. (ILO 2).
Project assignment	ILO3, ILO4	This task assesses students' ability to apply learned concepts and select various techniques to evaluate the computer system performance. (ILO 3)
Midterm exam	ILO1, ILO2	This task assesses the students' ability for ILO1 and ILO2
Final exam	ILO1, ILO2, ILO3, ILO4	This task assesses all the ILOs the students have learned.

Grading Rubrics

Course Learning Outcome	A	B	C	D	F
Assess the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance, cost and power consumption.	Demonstrates a comprehensive grasp of assessing the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance,	Demonstrates a good grasp of assessing the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance, cost and	Demonstrates an adequate grasp of assessing the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance, cost and	Demonstrates a preliminary grasp of assessing the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance, cost and	Demonstrates an insufficient grasp of assessing the intricate nuances of designing computer architectures with the aim of improving performance, balancing performance, cost and

	cost and power consumption.	power consumption.	power consumption.	power consumption.	power consumption.
Analyze various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.	Demonstrates a comprehensive grasp of analyzing various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.	Demonstrates a good grasp of analyzing various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.	Demonstrates an adequate grasp of analyzing various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.	Demonstrates a preliminary grasp of analyzing various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.	Demonstrates an insufficient grasp of analyzing various techniques at different levels of computer architecture design that can be used effectively to meet performance goals.
Critically evaluate computer architectures and systems.	Demonstrates a comprehensive grasp of evaluating computer architectures and systems.	Demonstrates a good grasp of evaluating computer architectures and systems.	Demonstrates an adequate grasp of evaluating computer architectures and systems.	Demonstrates a preliminary grasp of evaluating computer architectures and systems.	Demonstrates an insufficient grasp of evaluating computer architectures and systems.
Select and apply various performance evaluation techniques and tools.	Demonstrates a comprehensive grasp of selecting and applying various performance evaluation techniques and tools.	Demonstrates a good grasp of selecting and applying various performance evaluation techniques and tools.	Demonstrates an adequate grasp of selecting and applying various performance evaluation techniques and tools.	Demonstrates a preliminary grasp of selecting and applying various performance evaluation techniques and tools.	Demonstrates an insufficient grasp of selecting and applying various performance evaluation techniques and tools.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of the main ILOs
B	Good Performance	Shows good knowledge and understanding of the main ILOs
C	Satisfactory Performance	Possesses adequate knowledge of core subject ILOs
D	Marginal Pass	Has threshold knowledge of core subject ILOs
F	Fail	Demonstrates insufficient understanding of the subject ILOs.

Course AI Policy

We do not allow using a generative AI tool for all the assessment tasks. Because that will prevent them from think in depth applying the key knowledge points to improve the computer system performance.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include the mistake(s) the students have made and whenever appropriate we will provide alternative ways of solving the same problems. Students who have further questions about the feedback including marks can consult the instructor anytime he/she prefers within the semester.

Resubmission Policy

Resubmission is not allowed

Required Texts and Materials

Computer Architecture: A Quantitative Approach, Sixth Edition, John L. Hennessy, David A. Patterson

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.

Additional Resources

1. Computer Architecture: A Quantitative Approach, Fifth Edition, John L. Hennessy, David A. Patterson
2. Computer Organization and Design: The Hardware/Software Interface, Sixth Edition, David A. Patterson, John L. Hennessy