The Hong Kong University of Science and Technology (Guangzhou)

UG Course Syllabus Template

Course Title: Computer Architecture and Systems

Course Code: DSAA2042

Credits: 4

Prerequisites: UFUG2601 C++ Programing

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Course Description

This course introduces the basic mechanisms of computer hardware of modern computers, and covers operating systems fundamentals such as memory systems, input-output systems, interrupts and exceptions, pipelining, performance and cost analysis. Students will learn the purpose and structure of operating systems, as well as the basic knowledge on process management, CPU scheduling, file systems, security and protection.

Intended Learning Outcomes (ILOs)

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

1. Understand and evaluate key components of a computer architecture, including instruction set and its execution, the memory hierarchy, system-level interconnects and I/O sub-systems.
2. Analyze core operating-system concepts to explain how they interact and impact overall system behavior.
3. Evaluate computer hardware architectures to predict their effects on performance and scalability.
4. Evaluate computer hardware architectures to predict their effects on performance and scalability.
5. Assess networking protocols and security mechanisms used in modern computer systems to identify vulnerabilities and propose appropriate mitigation strategies.

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
Written Assignment	20%	TBD *
Project Report	30%	TBD *
Final Examination	50%	TBD

* 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
Final exam	CILO-1, CILO-2, CILO-3, CILO-4, CILO-5	This final exam assesses students' ability to understand and evaluate the key components of computer architecture, such as the instruction set, memory hierarchy, and I/O subsystems (CILO 1), analyze core operating-system concepts and explain their interaction and impact on overall system behavior (CILO 2), evaluate computer hardware architectures to predict their effects on performance and scalability (CILO 3 & 4), and assess networking protocols and security mechanisms to identify vulnerabilities and propose appropriate mitigation strategies (CILO 5).
Written Assignment	CILO-1, CILO-2, CILO-4	This task assesses students' ability to understand and evaluate the key components of a computer architecture, including the instruction set and memory hierarchy (CILO 1), analyze core operating-system concepts to explain their interaction and impact on overall system behavior (CILO 2), and evaluate computer hardware architectures to predict their effects on performance and scalability (CILO 4).
Project Report	CILO-1, CILO-2, CILO-3, CILO-4, CILO-5	This project report assesses students' ability to evaluate a complete computer hardware architecture by analyzing its key components, from the instruction set to the memory hierarchy (CILO 1), critically analyze the interplay between the operating system and hardware to explain their combined impact on system behavior (CILO 2), evaluate and predict the effects of architectural choices on system performance and scalability (CILO 3 & 4), and assess the system's networking and security posture to identify vulnerabilities and propose well-reasoned mitigation strategies (CILO 5).

Grading Rubrics

Final Exam Rubric					
Criteria	**Excellent (A)**	**Good (B)**	**Satisfactory (C)**	**Marginal (D)**	**Fail (F)**
Mastery of Core Concepts	Demonstrates mastery of architecture, OS fundamentals, I/O, memory hierarchy, and performance analysis.	Good understanding with minor lapses.	Adequate understanding of essential topics.	Basic grasp with significant gaps.	Little to no understanding of topics.
Problem-Solving Accuracy	Provides fully correct solutions with clear reasoning; handles complex, multi-step problems.	Mostly correct solutions; reasoning generally sound.	Solutions partially correct; reasoning sometimes weak.	Limited ability to solve problems; frequent mistakes.	Incorrect or missing solutions; no reasoning shown.
Application and Integration	Integrates knowledge across multiple components (e.g., pipeline + cache + I/O interaction).	Shows ability to connect concepts but not always deeply.	Limited but acceptable integration of concepts.	Minimal ability to connect multiple ideas.	No demonstration of integration or application.

Writing Assignment Rubric					
Criteria	**Excellent (A)**	**Good (B)**	**Satisfactory (C)**	**Marginal (D)**	**Fail (F)**
Conceptual Understanding	Demonstrates a comprehensive grasp of computer architecture and OS concepts; explanations are accurate, rigorous, and insightful.	Shows good understanding of key ideas with mostly correct explanations; minor gaps.	Adequate understanding of core concepts; explanation may lack depth or clarity.	Basic but incomplete or superficial understanding; significant conceptual gaps.	Little or no understanding of concepts; major inaccuracies.
Technical Analysis and Problem-Solving	Applies concepts to analyze system behavior with precision; solutions are complete and logically reasoned.	Provides correct or mostly correct solutions with reasonable justification.	Solutions are partially correct but may contain errors or weak reasoning.	Minimal ability to solve problems; reasoning unclear or incorrect.	Solutions largely incorrect or missing; no evidence of problem-solving skills.
Quality of Arguments and Writing	Writing is clear, well-structured, and concise; arguments are coherent and well-supported.	Writing is generally clear with good structure; some lapses in logic or clarity.	Writing is understandable but may be disorganized or vague.	Writing is unclear or poorly structured; significant issues with coherence.	Unclear, disorganized writing; difficult to follow; severe issues.

Project Report Rubric					
Criteria	**Excellent (A)**	**Good (B)**	**Satisfactory (C)**	**Marginal (D)**	**Fail (F)**
Depth of Analysis	Provides thorough, critical, and original analysis of the architecture/system; integrates concepts coherently.	Solid analysis with good use of course concepts; some depth but less comprehensive.	Adequate analysis, but may lack depth or completeness.	Limited analysis; relies on surface-level descriptions.	Minimal or no meaningful analysis; largely descriptive or incorrect.
Technical Correctness	All methods, measurements, and conclusions are correct and well-justified.	Mostly correct with minor mistakes that do not undermine conclusions.	Some errors present; conclusions partially supported.	Frequent errors; conclusions weak or unjustified.	Major errors throughout; conclusions invalid.
Use of Evidence and Examples	Uses relevant data, diagrams, evaluations, and comparisons effectively.	Good use of examples and data, though some may be underdeveloped.	Limited use of evidence; examples may be generic.	Minimal supporting evidence; examples missing or irrelevant.	No supporting evidence or inappropriate references.
Organization and Presentation	Report is exceptionally clear, logically organized, and professionally formatted.	Well-organized and readable; minor issues in presentation.	Organization acceptable but may lack clarity or flow.	Poorly organized; difficult to follow.	Very disorganized or incomplete presentation.

Final Grade Descriptors:

Grades	Short Description	Elaboration on Subject Grading Description
A	Excellent Performance	Demonstrates comprehensive understanding of computer architecture and OS principles; solves problems accurately and with insight; integrates concepts across components (e.g., memory, CPU, I/O, pipelining) and communicates ideas clearly and logically.
B	Good Performance	Shows solid understanding of major concepts with generally correct reasoning; able to analyze and evaluate system behaviors; minor gaps in depth or clarity but overall competent performance.
C	Satisfactory Performance	Possesses adequate but uneven understanding; capable of handling familiar problems; analysis may be shallow or occasionally incorrect; demonstrates effort but lacks consistency and depth.
D	Marginal Pass	Meets minimum threshold of understanding; can perform basic reasoning but with significant conceptual or analytical limitations; work shows limited clarity and accuracy.
F	Fail	Demonstrates insufficient understanding of core concepts; major errors in problem-solving; little evidence of analytical reasoning or ability to apply course material.

Course AI Policy

Generative AI tools may be used in this course with restrictions depending on the assessment type:

- For the final examination: The use of AI tools, online resources, or any external computational aid is strictly prohibited, in alignment with HKUST policies.
- For written assignments and the project report: Students may use AI tools to assist with brainstorming, drafting, grammar correction, or debugging, provided that all AI-assisted content is reviewed, verified, and meaningfully revised by the student. Students must ensure that the final submission reflects their own understanding, and they remain fully responsible for accuracy and correctness.
- Academic integrity: AI tools must not be used to generate full solutions, circumvent learning, or fabricate analysis, diagrams, data, or citations. Any misuse will be treated as academic misconduct under HKUST(GZ)'s Academic Honor Code.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include explanation and/or comments on marks. 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

If a student has an unforeseen, uncontrollable, and unavoidable reason, resubmitting work or reassessment, opportunity will be considered. In such a case, the student is expected to contact the instructor immediately, but no later than within five working days, for further details.

Required Texts and Materials

None required.

Academic Integrity

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

Additional Resources

- Computer Systems: A Programmer's Perspective (CS:APP) — Randal Bryant & David O'Hallaron