

Syllabus Reference

Course title	Computer Architecture
Number of credit(s)	2
School sites	Ishikawa
Course group	Information Science courses (Ishikawa)
Course Number	I218
Language used in class	Japanese
Course Term	Term 1-2

Instructor

Full name

* Kiyofumi Tanaka

Day/Period	Term 1-2 (Mon・2) /Term 1-2 (Fri・1)
Course goals	Students study the basic technology for improving performance of modern computers: pipelining, cache memory, and memory hierarchy. In addition, students acquire the fundamentals to construct advanced computers such as superscalar processors and multiprocessors. Students are able to learn the ability and attitude to conduct research on computer architecture by gaining deeper knowledge of computer architecture.
Course content	Pipeline technique, cache memory organization, memory hierarchy, branch prediction, fundamentals of superscalar processor, and organization of multiprocessors as bases of high-performance computers.
Textbook	"Computer Organization and Design -- The Hardware/Software Interface" (6th Edition), David A. Patterson and John L. Hennessy, Morgan Kaufmann Pub., 2020.
References	None
Related courses	I115 Digital Logic and Computer Design
Prerequisites	Students should have either fundamental knowledge about computer architecture or knowledge of I115 "Digital Logic and Computer Design".
Schedule	<ol style="list-style-type: none"> 1. Performance vs. Cost (Measures of Performance, Cost Factor) 2. Execution of Instructions 1 (Instruction Set Architecture) 3. Execution of Instructions 2 (Single-cycle Execution) 4. Pipelining 1 (Overview of Pipelining) 5. Pipelining 2 (Pipelined Control) 6. Pipelining 3 (Hazards, Branch Prediction) 7. Pipelining 4 (Superscalar, Dynamic Pipelining) 8. Review of the 1st half and exercise 9. Memory System 1 (Cache Memory) 10. Memory System 2 (Performance Analysis and Evaluation of Cache Memory) 11. Memory System 3 (Virtual Memory) 12. Memory System 4 (Memory Hierarchies) 13. Multicores and Parallel Processors 14. Review of the 2nd half and exercise
How to prepare for this course	It is important to check and understand the definitions and meanings of the keywords in the next lecture. Be well prepared for the courses, taking it into consideration that one credit is awarded for every 45 hours including self-study time in addition to that of in total 15-hour lectures.
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Viewpoint of evaluation	Comprehension of performance, cost, and techniques for performance improvement of computers.
Evaluation method	Reports, midterm examination, and final examination.
Evaluation criteria	Comprehension based on reports (20%), midterm examination (40%) and final examination (40%).
Abilities/traits that can be acquired	<ul style="list-style-type: none"> • Social competencies: broad interests, logical thinking • Creative abilities: ambition for expertise and skills, ideation • Practical abilities: information gathering, exploratory propulsion, problem definition
Lecture Archive	<p>What to record : Lectures only</p> <p>How to broadcast : General (available to watch over internal network anytime)</p> <p>Note: Since exercises will be given in class, simultaneous face-to-face lectures is necessary. (You cannot take this course in archive only.)</p>

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