Syllabus [2025Year 1 Term]

Course Information

Course Title	Computer Architecture and Mobile Processors	Credits	3
Course Code	525060-2	Required/Elective (For Undergraduate Courses)	Mandatory Major
Department or Major	Department of Mobile Systems Engineering	Language	English
Methods of Teaching		Lecture Room	월4,5,6/목5,6,7(국제210)
Time Allotment	Lecture(3) Experiments(0) Trainging & Practice(0) Performance(0) Designing & Planning(0)	Cyber Lectures	
Course Type	offline		

Lecturer

Lecturer	Name	Yoo, Seehwan	Rank	Associate Professor	Final Academic Degree	이학박사
	Department & college	Open Source Software Center		Office	International Hall 615	
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	Field of Interest					

Course Summary

Course Description	Modern computers are composed of many interesting hardware components; including processor, memory, storage, input/output devices. This course introduces the design and organization of fundamental computer systems. Though the course focuses on hardware perspective, I believe that the fundamental understandings on this structure will be rich soil for developing next generation mobile systems, in general.
Description Related Courses	This course requires an amount of time and effort for programming lab, which is covered in 'advanced mobile project 1' course. Thus, students are strongly suggested to take two courses at the same time: mobile processor, and advanced mobile project 1. The course requires preliminary programming skills of C/assembly. Students will learn programming with Linux environment. In addition, data structure, system programming are pre-requisite courses.

	Operating systems, mobile programming are closely related course in series. For better understandings for the above-mentioned courses, I strongly recommend students to take this course.
Course Goals	This course covers the organization and design of computer systems. We will mainly focus on microprocessor architecture features, including ILP and memory hierarchy. A goal of the course is to make a simple MIPS CPU simulator.
Projected Results	This course provides fundamental materials for understanding the performance, and operational semantics, and detailed implementation inside the computer. Understanding the fundamental operating logic in computer systems is essential not only for hardware developers but for recent mobile software engineers because system development always evolve from the previous and existing system. I believe that students would get hint for building new blocks of the next generation computer system, learned from the course.
Percentage of the original language classes(%)	

Syllabus

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
1	Course overview Computer Abstraction and technology	Course overview Basic building blocks of computer	online, video lecture	
2	Computer history; Performance of computer Instructions language for computers	Performance measure, metric Number system – binary hex values	online, video lecture	Calculator with your own ISA
3	Instructions language for computers Instructions language for computers	instructions of computer – encoding basic blocks instructions of computer – procedure calls	Lecture Lecture	
4	Instructions language for computers Instructions language for computers	instructions of computer – data format, addressing mode instructions of computer – until the PC moves forward	Lecture Lecture	Single-cycle MIPS
5	Instructions language for computers Instructions language for computers	instructions of computer – misc. other architectures instructions of computer – misc. other architectures	Lecture Lecture	
6	The processor The processor	Processor – CPU overview, r-type data path Processor – Datapath with control	Lecture Lecture	
7	The processor The processor	Processor – pipeline, performance enhancements Process	Lecture Lecture	In-order 5-stage pipeline MIPS simulation

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
		or – pipeline hazards		
8		mid-term exam. mid-term exam.		
9	The processor The processor	Processor – pipelined-datapath Processor – data hazard and solution	Lecture Lecture	
10	The processor The processor	Processor – stall inside pipeline Processor – data hazard for branch	Lecture Lecture	
11	Large and fast exploiting memory hierarchy Large and fast exploiting memory hierarchy	Cache memory – basic structure – temporal, spatial locality Cache – write policy, performance	Lecture Lecture	
12	Large and fast exploiting memory hierarchy The processor	Cache – associative cache, multi-level cache Processor – Precise exception handling, Speculation, loop unrolling, OoO execution – comparisons around architectures	Lecture Lecture	term-project final microprocessor with cache
13	Arithmetic for computers Arithmetic for computers	hardware arithmetics – integer operation hardware arithmetics – floating point	Lecture Lecture	
14	Multicores, multiprocessors, and clusters	More issues in CA. – Amdahl's law, SIMD-based vector processors, SMT Semester-final exam.	Lecture	
15		Semester-final exam.		

Methods of Grading

sequence	Description	Percentage	Details
1	Mid-tem Exam	25%	mid-term written exam. (hw3)
2	Final-exam	25%	written exam. for semester-final (hw4)
3	Pop Quizzes	0%	
All		100%	

sequence	Description	Percentage	Details
4	Assignments	30%	Lab. project work for simple calculator, single-cycle, pipeline, pipeline with cache. (hw1+hw2)
5	Reports	10%	Project report, documentation
6	Presentations & Discussions	0%	
7	Attendance	10%	in-class participation, small homework
8		0%	
9	Others	0%	
All		100%	

Core of Value

핵심가치	전공역량	역량정의	역량구분	값(%)
혁신 (Discovery)	창의적문제해결 (Creative problem-solving)	주어진 상황과 문제를 창의적으로 해결할 수 있는 능력	부역량	0%
혁신 (Discovery)	도전 (Challenging)	전공 지식을 새로운 분야와 융합하고 아우를 수 있는 능력		0%
혁신 (Discovery)	지식융합 (Knowledge convergence)	새로운 분야를 개척하거나 도전적으로 임할 수 있는 능력	부역량	0%
헌신 (Dedication)	세계시민 (Universal value)	세계 공동체 구성원으로 전공자로서 국제적 이슈에 대응할 수 있는 능력		0%
헌신 (Dedication)	상호협력 (Cooperation)	공동의 목적 달성을 위해 타인과 상호협력을 할 수 있는 능력		0%
헌신 (Dedication)	공동체 (Sense of community)	공동체의 구성원으로서 필요한 태도와 윤리의식을 가질 수 있는 능력		0%
능동 (self- Determination)	자기주도 (Self-Managing)	주어진 상황과 문제를 주도적이고 능동적으로 해결할 수 있는 능력		0%
능동 (self- Determination)	지식활용 (Knowledge application)	주어진 상황과 문제에 대해 논리적으로 파악하고 분석할 수 있는 능력		0%
능동 (self- Determination)	논리적사고 (Logical thinking)	전공관련 지식을 필요에 따라 다양하게 적용하고 활용할 수 있는 능력	주역량	0%

핵심가치	전공역량	역량정의	역량구분	값(%)
능동 (self- Determination)	의사소통 (Articulation)	대화를 통해 다양한 의견을 조율하고 합의를 이끌어 낼 수 있는 능력		0%

Textbook(s) & References

Description	Title	Author	Publisher
References	Computer organization and architecture	W. Stallings	pearson edu.
References	readings in computer architecture	Mark D. Hill	Morgan and Kaufmann
Required Textbook	computer organization and design	D. Patterson and J. Hennessy	Elsevier

Memo

This course is tightly coupled with advanced mobile lab1.
Please take both courses; or drop them both.

Specific schedule is subject to change.

Evaluation is based upon your implementation.
There are several implementation options, based upon the difficulty levels.