

Computer Architecture

Syllabus Number

3C325

Special Subjects

Elective 2 credit

WATANABE, Hiroyoshi

1. Course Description

The aim of this course is to help students understand computer systems in both "software" and "hardware" aspects. The computer architecture is an interface of hardware mechanisms and software functions. In this course students will learn computer architecture as required knowledge for software engineers. In the last half of each class, students will be required to fill out a worksheet and work in pair or group settings as needed.

This course is related to diploma policy DP4C.

2. Course Objectives

This course aims to provide students with an in-depth understanding of the inner-workings of computers and how to design computer systems. Upon completion of this course, students will be able to explain concepts and technical terms related to the topics listed below. At a minimum, students will be able to select right explanation for designated technical terms and vice versa.

- The definition of computer architecture.
- Instruction set architecture including principles and memory addressing.
- Machine-level representation of data.
- Control unit architecture including and wired logic, micro programmed control and interrupt control.
- Arithmetic and logic unit architecture.
- Memory architecture including memory hierarchy, cache memory and virtual memory.
- Interface and I/O architecture.
- High-performance computers including parallelization and pipeline.

3. Grading Policy

The criteria for passing are to score 60% points on both of midterm and final examinations. Students who failed the examinations can retry although their scores are deducted. The final grade of students who passed will be calculated according to the following process: quizzes and worksheets 20%, midterm examination 40% and final examination 40%. Feedbacks on worksheets and examinations are given via LMS.

4. Textbook and Reference

Textbook

Kiyoshi Shibayama Newly revised edition Basics of Computer Architecture Kindai kagaku sha Co.,Ltd

Reference

Takanobu Baba Computer Architecture (4th edition) Ohmsha

5. Requirements(Assignments)

Before classes, students are required to read designated pages of the text book. Make effort to understand the text book by making underlines or writing words and explanations in your note about important concepts and technical words posted on LMS. The preparation will take one hour.

After classes, complete your worksheets, take quizzes on LMS and review what you learned. The learning activities will take two hours.

6. Note

This is a required course of JABEE program and corresponds to item 4-3 in the middle classification of learning goals.

The course is conducted in Japanese.

7. Schedule

- [1] What is computer architecture (page 1 to 28 of the text book)
- [2] Basic configuration von Neumann computer (page 29 to 43 of the text book)
- [3] Instruction-set architecture (page 43 to 64 of the text book)
- [4] Instruction-set architecture and binary expression (page 64 to 79 of the text book)
- [5] Expression of decimal number and character in computer (page 79 to 97 of the text book)
- [6] Control architecture (page 123 to 142 of the text book)
- [7] Interrupt (page 142 to 162 of the text book)
- [8] Midterm examination and lecture on the exam
- [9] Arithmetic operation on fixed point number (page 164 to 189 of the text book)
- [10] Arithmetic operation on floating point number (page 189 to 209)
- [11] Logical operation and shift instructions and memory architecture (page 209 to 236 of the text book)
- [12] Virtual memory (page 236 to 264 of the text book)
- [13] Cache memory and I/O function (page 264 to 294 of the text book)
- [14] I/O control (page 294 to 320 of the text book)
- [15] Final examination and lecture on the exam