Syllabus 2019 Computer and Mathematical Sciences

Computer Structures

- **Basic information**

<table>
<thead>
<tr>
<th>held this year</th>
<th>yes</th>
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<tbody>
<tr>
<td>instructor(s)</td>
<td>Prof. Takafumi AOKI, Assoc. Prof. Koichi ITO</td>
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<tr>
<td>room</td>
<td>Large Lecture Hall, GSIS</td>
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<td>schedule</td>
<td>The first half year (Monday) 14:40-16:10</td>
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<td>begins on</td>
<td>04/08</td>
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- **Objectives and outline**

The microprocessor is considered to be a key technology in present-day information society — its applications are ranging from embedded systems to high-end supercomputers. The course will introduce the basic organization of computers and their design principle. The goal of this course is to learn the fundamentals of computers, performance measures, performance evaluation with benchmarks, machine languages, computer arithmetic, processors (with datapath and control), performance enhancement through pipelining, and application case studies, resulting in better understanding of the basic concept of hardware/software interface.

- **Class plan**

1. Fundamentals of Computers (Historical Perspective)
2. Performance Measures for Computers
3. Measuring Performance with Benchmarks
4. Fundamentals of Machine Language (Hardware/Software Interface)
5. Fundamentals of Machine Language (Supporting Procedures in Computer Hardware)
6. Translating High-Level Languages into Machine Codes
7. Computer Arithmetic (Integer Operation)
8. Computer Arithmetic (Floating-Point Operation)
9. Processor (Single-Cycle Machine)
10. Processor (Multi-Cycle Machine)
11. Enhancing Performance with Pipelining (Overview of Pipelining)
12. Enhancing Performance with Pipelining (Pipelined Datapath)
13. Superscalar and Dynamic Pipelining
14. Other Techniques for Performance Improvement
15. Practical Microprocessors and Their Applications

- **Evaluation**

Evaluated based on the results of final examination, home assignments (three times) and record of attendance.

- **Textbook(s)**


- **Web site**

http://syllabus.is.tohoku.ac.jp/syllabus/syllabus.aspx
Office hours

students can contact the instructor via e-mail.

Other information

students are required not only to submit class assignments but also to review each class using handouts. The lecture is challenging and hard, from which students can learn many.

http://syllabus.is.tohoku.ac.jp/syllabus/syllabus.aspx