SystemD CampusPlan Web Service

Syllabus Reference

Course title	Digital Logic and Computer Design
Credit(s)	2
School sites	Ishikawa
Belong	Information Science courses (Ishikawa)
Course Number	I115
Language used in class	Japanese
Course Term	Term 1-1

Instructor

Full name
* Kiyofumi Tanaka

Day/Period	Term 1-1 (Mon・1) ／Term 1-1 (Wed・2)
Course goals	Upon completion of this course, students will acquire the principles of computers, not treat them as black boxes any more, and be able to design a simple computer using understanding of basic digital circuits, arithmetic units, data paths, and control logic.
Course content	This course covers the basics of binary code, Boolean algebra, combinational circuits, sequential circuits, control logic circuits, the interface between hardware and software, computer organization, and input/output.
Textbook	“Computer Organization and Design - The Hardware/Software Interface” (MIPS, 6th Edition), David A. Patterson and John L. Hennessy, Morgan Kaufmann Publishers, 2020, ISBN978-0128201091.
References	“Digital Design and Computer Architecture” (2nd Edition), David Money Harris and Sarah L. Harris, Morgan Kaufmann Publishers, 2012, ISBN978-0-1239-4424-5.
Related courses	None
Prerequisites	None
Schedule	1. Information representation and Boolean algebra (binary code, representation of numerical values, Boolean algebra, logic gates) 2. Simplifying logic circuits (Karnaugh map, QM algorithm) 3. Combinational circuits 1 (multiplexer, decoder) 4. Combinational circuits 2 (adder, multiplier) 5. Sequential circuits 1 (state transition diagram, flip-flop) 6. Sequential circuits 2 (counter, shift register, memory) 7. Review and exercises 8. Processor organization 1 (instruction set architecture) 9. Processor organization 2 (interface between hardware and software) 10. Processor organization 3 (instruction memory, program counter, register file, ALU, data memory) 11. Processor organization 4 (data paths) 12. Processor organization 5 (design of control logic) 13. Input/output (bus, input/output interface, interrupt, DMA) 14. Review and exercises
How to prepare for this course Be well prepared for the course, taking it into consideration that one credit is awarded for 45 study hours including self-study time in addition to that of in total 15-hour lectures.	Students should study the content of each lecture beforehand. Along with the schedule, students will be required to submit reports on given logic circuit design exercises. It is important to understand the mechanisms and behavior of a processor through designing it by yourself.
Viewpoint of evaluation	Students will be assessed on their understanding of the operating principles of logic circuits and computers.

Grading Method/Criteria	Final grades for the course will be determined by students' performance on reports, midterm exam, and final exam.
Evaluation criteria	Report: 20%, midterm exam: 40%, final exam: 40%.
Abilities/traits that can be acquired	・Social competencies: broad perspectives, logical thinking. ・Creative abilities: acquiring expertise and skills, coming up with new ideas. ・Practical abilities: information gathering, exploratory propulsion, problem defining.
Lecture Archive	What to record：Lectures only How to broadcast：General (available to watch over internal network anytime)

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