

Experiments Electronics1

in Fundamental

Syllabus Number

3E213

Basic Major Subjects

Elective Requisites 1
credit

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1. Course Description

The following themes will be experimented on:

- (1) Assembling and understanding basic logic circuits with logic-ICs.
- (2) Making and understanding basic logic circuits with FPGA.
- (3) Basic training to write scientific documents.

This course corresponds with DP2 and DP4E.

2. Course Objectives

According to the diploma policies DP2 and DP4E of the department, this course aims for students to obtain basic knowledge and skills of electronic engineers to master. In details, students will be able to understand the basic technologies of logic circuits as digital circuits, their active components (logic-ICs), and FPGA (field-programmable gate array) on which any circuits can be designed freely by programming, and will be able to make and analyze the basic logic circuits. In parallel, students will be able to obtain basic skills to write scientific documents.

3. Grading Policy

The overall grade in the course will be decided based on all the experimental reports of all the themes, experiment notebooks, and the attitude.

In details, after completing the experiment notebooks and the experimental reports of all the themes above the level designated by teachers in charge, finally the average scores of all the reports will be the graded.

However, regardless of the above, if you are absent from, late for, not serious in the class, or do not submit any experiment notebooks or experimental reports, you will have difficulty passing this course. Especially, if you are absent from class even once without good reason, or if you do not submit one or more experimental reports, you will immediately disqualify from this course.

As for feedback, each experimental report will be corrected and commented within the session in which this course is offered. If your experimental report is ordered to correct and resubmit, you must certainly correct and resubmit the report by the due date given.

4. Textbook and Reference

Textbook

Individual documents for each theme will be distributed through LMS.

Students must follow the instruction given by the teacher in charge.

If you do not bring the documents to class, you are not allow to attend class. So, please bring the documents with you to class.

Reference

Any textbooks for digital circuits related to the experiments.

Masaru Kobayashi The following book contains the advanced topics, therefore, you do not need to buy the book.

"FPGA programming encyclopedia for Xilinx, Second ver." (ISBN: 978-4798063263) Shuwa System Co., Ltd.

5. Requirements(Assignments)

For preparations, students must read carefully and understand the experimental contents of the next class in the documents, and do the exercises indicated before the experiment (about 1.5 hours). For reviews, students must summarize the experimental results and make the charts and diagrams, and then write the experimental report (about 1.5 hours).

After the experiments, students must complete the experimental reports by the due date. The teacher in charge will be correcting the experimental reports.

6. Note

Students must bring the followings: text documents, experiment notebooks, textbooks about digital circuits corresponding to the experiments, cross-section paper, scientific calculators, and writing materials. Students must bring the experiment notebooks with them all the time because the notebooks are checked by the teacher during each experimental theme and at the end of the session.

Especially, for the experiments using FPGA at the 4th, 5th, and 7th class, students must backup the data to several media appropriately so that the electronic data are saved in the media.

LMS will be used.

7. Schedule

Guidance: The process of experiments in the following classes will be explained.

For preparations, students must recall manipulating various measurement devices used in the course of Laboratory in Fundamental Engineering.

For reviews, each teacher instructs the necessary preparations for each experimental theme, therefore, students must finish each preparation before the corresponding theme.

Logic circuits (1) fundamental experiment of logic circuits: Students will understand the function of basic logic gates through the experiment.

For preparations, students must read the text of logic circuits (1) carefully, check how to handle necessary experimental apparatus and electronic components, and draw the wiring diagrams for the experiment.

For reviews, students must organize the experimental results to the tables.

Logic circuits (2) experiment of adder circuits: Students will compose one-bit adders and a two-bit adder with logic-ICs and understand their functions through the experiment.

For preparations, students must read the text of logic circuits (2) carefully, and draw the wiring diagrams of a half adder, a full adder, and a two-bit binary adder.

For reviews, students must organize the relations between the inputs and outputs of each adder obtained in the experiment to tables.

FPGA (1) fundamental experiment of logic circuits with FPGA: Students will study how to use the tools and software to manipulate FPGA, and reproduce with FPGA the logic circuits at logic circuits (1).

For preparations, students must read the text of FPGA (1) carefully, and check the experimental results of Logic circuits (1).

For reviews, students must prepare and write a report for the previous experiments.

FPGA (2) experiment of adder circuits with FPGA: Students will reproduce with FPGA the logic circuits at Logic circuits (2).

For preparations, students must read the text of FPGA (2) carefully, and check the experimental results of logic circuits (2).

For reviews, students must prepare and write a report for the previous experiments.

Logic circuits (3) experiment of sequential circuits: Students will understand JK flip-flops composing a simple base-4 counter through the experiment.

For preparations, students must read the text of logic circuits (3) carefully, and draw the wiring diagrams of a base-4 counter etc.

For reviews, students must organize a time chart obtained in the experiment and check whether the time chart is as expected.

FPGA (3) experiment of sequential circuits with FPGA: Students will reproduce with FPGA the logic circuits at Logic circuits (3). And Students will compose a base-16 counter with FPGA and understand that the expansion of counters is easy.

For preparations, students must read the text of FPGA (3) carefully, and check the experimental results of logic circuits (3).

For reviews, students must prepare and write a report for the previous experiments.

Instructing reports: The experimental reports of the above two themes will be instructed to improve by each teacher of charge.

For preparations, students must organize their reports of the summaries and consideration for the results of the above experiments before this class. The brought reports will be instructed to improve.

For reviews, students must submit the corrected reports by the due date if the teacher indicates the correction of the reports.

The followings are omitted.