

## Digital Circuit

|                          |                                      |                                            |                  |                   |
|--------------------------|--------------------------------------|--------------------------------------------|------------------|-------------------|
| Course Name              | Course type (credit/hours)           | Required course(3/3)                       | Course code      | F068              |
|                          | Target students Division/major/grade | Software and Computer Engineering/Freshman | Opening semester | 2021 2ND SEMESTER |
|                          | Class time and classroom             | Mon B(Pa11025)Thu B(Pa11025)               | English Grade    | A(100%English)    |
| Reference to this course | Prerequisite courses                 |                                            |                  |                   |
|                          | Related basic courses                |                                            |                  |                   |
|                          | Recommended concurrent courses       |                                            |                  |                   |
|                          | Related advanced courses             | Computer structure                         |                  |                   |

|                    |                       |                      |                                                                    |                  |        |
|--------------------|-----------------------|----------------------|--------------------------------------------------------------------|------------------|--------|
| Instructor         | Name (title/division) |                      | PAUL RAJIB(Assistant Professor, Software and Computer Engineering) |                  |        |
|                    | Office Room Number    | Palda1 1011          | Office phone Number                                                |                  | e-mail |
|                    | Office hours          | Tue A/C/E, Thu B/D/F |                                                                    | Homepage address |        |
| Teaching Assistant | Name (title/division) |                      |                                                                    |                  |        |
|                    | Office Room Number    |                      | Office phone Number                                                |                  | e-mail |

### 1. Introduction

This course deals with principles and applications of digital systems.

The topics covered are Logic Gates and Boolean Algebra, Combinational Logic Circuits, Flip-Flops and Related Devices, Digital Arithmetic: Operations and Circuits, Counters and Registers, Integrated-Circuit Logic Families, MSI Logic Circuits, Interfacing with the Analog World, and Memory Devices. There is a project assignment in this course to enhance the practical skill of digital systems.

### 2. Course Objectives

- ◇ Educational goals
- Empower students to understand the fundamental principles and concepts of digital circuits and apply knowledge, process design, through the learning of problem-solving methods, etc.,  
Information and computer engineers accurately recognize information and communication-related problems to be solved.  
Develop creative problem-solving and digital circuit design capabilities and generate interest in digital circuit design.
- ◇ Learning outcomes for subjects
- ① Use the knowledge of mathematics, basic science, engineering and information technology to solve everything that happens within the digital circuit.
  - ② Understand the various phenomena that occur between logical elements and IC chips and by defining and modeling the problems that can be occur during the development of digital logical circuit or systems, can solve it effectively,
  - ③ Depending on realistic constraints, the structure of the digital system as a whole, the components that make it, and the relationships between the components can be creatively designed cost-effectively.

### 3. Class types and activities

### 4. Teaching Method

|                                                                                 |                                                                   |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------|
| <input checked="" type="checkbox"/> lecture                                     | <input checked="" type="checkbox"/> discussion and debate         |
| <input checked="" type="checkbox"/> team project(presentation and case studies) | <input checked="" type="checkbox"/> experiments(role-playing,etc) |
| <input type="checkbox"/> designing and production                               | <input type="checkbox"/> on-site learning(on-site training)       |
| <input type="checkbox"/> others                                                 |                                                                   |

### 5. Support Systems in Use

|                                                          |                                                     |                                               |
|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------|
| <input checked="" type="checkbox"/> AjouBb               | <input type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input type="checkbox"/> cyber lecture                   | <input type="checkbox"/> online content             |                                               |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others                     |                                               |

### 6. Teaching Tools

|                                                      |                                                   |                                                             |
|------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------|
| <input type="checkbox"/> PBL(Problem Based Learning) | <input type="checkbox"/> CBL(Case Based Learning) | <input type="checkbox"/> TBL(Team Based Learning)           |
| <input type="checkbox"/> UR(Undergraduate Research)  | <input type="checkbox"/> FL(Flipped Learning)     | <input type="checkbox"/> DSAL(Data Science Active Learning) |
| <input type="checkbox"/> others                      |                                                   |                                                             |

### 7. Knowledge and ability required for taking this course

To take this course, you must understand the binary system.

## 8. Method of Evaluation

| Evaluation Item | The Number of Times | Evaluation Proportion | Remarks |
|-----------------|---------------------|-----------------------|---------|
| Attendance      |                     |                       |         |
| midterm exam    | 1회                  | 20%                   |         |
| final exam      | 1회                  | 30%                   |         |
| quiz            |                     |                       |         |
| presentation    |                     |                       |         |
| discussion      |                     |                       |         |
| homework        | 4회                  | 30%                   |         |
| etc             | 14회                 | 20%                   |         |
| study hours     | 주당 12시간             |                       |         |

## 9. Textbook and supplementary material

| Main/Sub | Title (Web-site)                                       | Writer               | Publisher | Publication year |
|----------|--------------------------------------------------------|----------------------|-----------|------------------|
| Main     | Digital Systems: Principles and Applications, 11th ed. | Ronald J. Tocci etc. | Pearson   | 2011             |
| Main     | bCube-DLC를 활용한 논리회로 실험실습                               | CNDI 기술연구소           | CNDI      | 2015             |

## 10. Class system and Class shedule

Logic Gates and Boolean Algebra => Combinational Logic Circuits => Flip-Flops and Related

Devices => Digital Arithmetic: Operations and Circuits => Counters and Registers =>

Integrated-Circuit Logic Families => MSI Logic Circuits => Memory Devices

< Class Schedule >

\* language : K-korean, E-English

| Weeks | Topics                                                                                                                                                                                                                          | language | Instructor | Teaching Method   | Evaluation Method | Matter to be prepared |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|-------------------|-------------------|-----------------------|
| 1     | Logic Gates and Boolean Algebra, Basic Practice                                                                                                                                                                                 |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 2     | Combinational Logic Circuits, 디지털 논리회로 실습장비 소개                                                                                                                                                                                  |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 3     | - Flip-Flops and Related Devices 1 -Latches, Flip-Flops, Timing Considerations, Applications, Synchronization, 논리 게이트 실습                                                                                                        |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 4     | - Flip-Flops and Related Devices 2 -Shift Registers, Schmitt-Trigger Devices, One-Shot, Clock Generator Circuits, 가산기/감산기 실습                                                                                                    |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 5     | - Digital Arithmetic: Operations and Circuits -Addition, Subtraction, Multiplication, Division, BCD Addition, Arithmetic Circuits, Parallel Binary Adders, IC Parallel Adder, 2's-Complement System, BCD Adder, ALU ICs, 비교기 실습 |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 6     | - Counters and Registers 1 -Asynchronous Counters, Synchronous Counters, Presettable Counters, BCD Counters, 인코더/디코더 실습                                                                                                         |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 7     | - Counters and Registers 2 - IC Registers, 멀티플렉서/디멀티플렉서 실습                                                                                                                                                                      |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 8     | - Mid term Exam                                                                                                                                                                                                                 |          | PAUL RAJIB | Exam              |                   |                       |
| 9     | - MSI Logic Circuits 1 -Decoders, BCD-to-7-Segment Decoder/Drivers, Encoders, MUX/DEMUX, 7-세그먼트 디코더 실습                                                                                                                          |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 10    | - MSI Logic Circuits 2 -Magnitude Comparator, Code Converters, Data Busing, Data Bus Operation, 코드 변환기 실습                                                                                                                       |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |
| 11    | - Memory Devices 1 -Memory Technology, General Memory Operations, ROMs, SRAM, 병렬 가산기 실습                                                                                                                                         |          | PAUL RAJIB | Lecture, Practice | Task Evaluation   |                       |

< Class Schedule >

\* language : K-korean, E-English

| Weeks | Topics                                                                                                  | language | Instructor | Teaching Method   | Evaluation Method       | Matter to be prepared |
|-------|---------------------------------------------------------------------------------------------------------|----------|------------|-------------------|-------------------------|-----------------------|
| 12    | - Memory Devices 2 -DRAM, Expanding Word Size and Capacity, Troubleshooting Memory Systems, Latch&FF 실습 |          | PAUL RAJIB | Lecture, Practice | Task Evaluation         |                       |
| 13    | - Case Studies I, 레지스터 실습                                                                               |          | PAUL RAJIB | Lecture, Practice | Presentation Evaluation |                       |
| 14    | - Case Studies II, 동기식 카운터 실습                                                                           |          | PAUL RAJIB | Lecture, Practice | Presentation Evaluation |                       |
| 15    | - Case Studies III, 비동기식 카운터 실습                                                                         |          | PAUL RAJIB | Lecture, Practice | Presentation Evaluation |                       |
| 16    | - Final Exam                                                                                            |          | PAUL RAJIB | Exam              |                         |                       |

11. Other items of notification

Students who do not carry out design projects are rated as F.