

Semiconductor Laboratory

Course Name	Course type (credit/hours)	Elective course(3/5)			Course code	C086
	Target students Division/major/grade	Electrical and Computer Engineering/Junior			Opening semester	2021 2ND SEMESTER
	Class time and classroom	Thu 8.5(WH537) Thu 9.5(WH537) Thu 10.5(WH537) Thu 11.5(WH537) Thu 12.5(WH537)			English Grade	A(100%English)
Reference to this course	Prerequisite courses	Semiconductor Engineering 1				
	Related basic courses	Electronic Circuits1, 2				
	Recommended concurrent courses	Semiconductor Engineering 2, Analog Integrated Circuits				
	Related advanced courses	IC Process, VLSI Engineering				
Instructor	Name (title/division)	Il-Kwon Oh(Assistant Professor, Electrical and Computer Engineering)				
	Office Room Number	Industrial-Academic Cooperation Center 434호	Office phone Number	2360	e-mail	
	Office hours			Homepage address		
Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

1. Introduction

- 1) PN Diode, BJT, MOSFET-based semiconductor device characterization (학습성과 1-2)
- 2) Measurement of semiconductor devices (학습성과 2-1, 2-2, 5-1)
- 3) Simulation of semiconductor devices (학습성과 4-2)
- 4) Learning how to measure the electrical properties and logically think the problems (학습성과 2-3, 3-2)
- 5) Team-based project (학습성과 6, 7)
- 6) Understanding of the social impact of semiconductor devices (학습성과9-1, 9-2)
- 7) Understanding of semiconductor market share (학습성과 10, 5-2)
- 8) Learning the attitude of semiconductor engineer (학습성과 11-2)

2. Course Objectives

- 1) PN Diode, BJT, MOSFET-based semiconductor device characterization (학습성과 1-2)
- 2) Measurement of semiconductor devices (학습성과 2-1, 2-2, 5-1)
- 3) Simulation of semiconductor devices (학습성과 4-2)
- 4) Learning how to measure the electrical properties and logically think the problems (학습성과 2-3, 3-2)
- 5) Team-based project (학습성과 6, 7)
- 6) Understanding of the social impact of semiconductor devices (학습성과9-1, 9-2)
- 7) Understanding of semiconductor market share (학습성과 10, 5-2)
- 8) Learning the attitude of semiconductor engineer (학습성과 11-2)

3. Class types and activities

- * Experiments lecture
 - Before starting experiments: SPICE model and variables
 - During experiment: experiments or presentation
- *Experiments
 - Pre-learning of SPICE model and variables (pre-report)
 - Measurement experiment of semiconductor devices (experiment)
 - Verification of variables by comparing the results of SPICE simulation and experiment (experiment)
 - Analysis of the impact on SPICE model variables to semiconductor device performance by simulation (report)
- *Design project
 - Proposal submission (1 week) - performing the project (4 weeks) - presenting the results (1 week)
- *Reports and presentation
 - Submission and presentation of the report on semiconductor device development and its impact
- *ACAT and presentation skills

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 checked="" type="checkbox"/> designing and production | <input type="checkbox"/> on-site learning(on-site training) |
| <input type="checkbox"/> others | |

5. Support Systems in Use

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|--|---|---|
| <input checked="" type="checkbox"/> AjouBb | <input type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input checked="" type="checkbox"/> cyber lecture | <input checked="" 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 checked="" 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

- *SPICE model
- *Basic knowledge on semiconductor physics
- *Analysis of data and mathematical software (curve-fitting, graph fitting, etc.)

8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance			
midterm exam			
final exam			
quiz			
presentation	1	50%	Project report and presentation
discussion			
homework	1	5%	Case report
etc		45%	Experiment 1-3 report and presentation
study hours			

9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	반도체 실험 (파일을 제공)	아주대 전자공학과		
Sub	MOSFET Modeling for VLSI Simulation	N. Arora	World Scientific	2007
Sub	Modern Semiconductor Devices for IntegratedCircuits	C. C. Hu	Pearson	2010

10. Class system and Class shedule

- *PN junction diode → Bipolar junction transistor (BJT) → MOSFET → Design project
- *Experiments
 - Pre-learning of SPICE model, model variable, extracting method and the effect on model variables to device performance (pre-report)
 - Measurement of electrical properties of semiconductor devices (report)
 - Verification of the results of SPICE simulation by comparing the experiment results (report)
- *Design project: proposal submission (1 week), project performing (4 week), presentation (1 week)
- *Case report
 - Case study of semiconductor device development

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction	E	II-Kwon Oh			
2	Si pin diode	E	II-Kwon Oh			
3	Temperature property of pin diode	E	II-Kwon Oh			
4	Basics and measurement of BJT	E	II-Kwon Oh			
5	Basics of MOSFET	E	II-Kwon Oh			
6	Measurement of MOSFET	E	II-Kwon Oh			
7	Analysis of MOSFET	E	II-Kwon Oh			
8	Case study of semiconductor development	E	II-Kwon Oh			
9	Introduction of Silvaco simulation	E	II-Kwon Oh			
10	MOSFET simulation	E	II-Kwon Oh			
11	Presentation of simulation	E	II-Kwon Oh			
12	Presentation of project proposal	E	II-Kwon Oh			
13	Performing project	E	II-Kwon Oh			
14	Performing project	E	II-Kwon Oh			
15	Performing project	E	II-Kwon Oh			
16	Final presentation	E	II-Kwon Oh			

11. Other items of notification