Semiconductor Engineering1

Course Name	Course section (credit/hours)	Required course(3/3)		course code	C019
	course item			course component	
	Target students Division/major/grade			opening semester	2021 1ST SEMESTER
	Class time and classroom	Tue D(WH317-1)Thu C(WH317-1)		English Grade	A(100%English)
Reference to this course	Credit compositon	Theory(3) + Design(0) + Practice(0)			
	Prerequisite courses	회로이론			
	Related basic courses	회로이론, 전자회로1, 전자기학			
	Recommanded concurrent courses	전자회로2, 전자회로실험			
	Related advanced course	반도체공학2, 반도체실험, 아날로그IC, IC프로세스			

Instructor	Name (title/division)	Il-Kwon Oh(Assistant Professor, Electrical and Computer Engineering)				
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Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

1. Course Introduction

Semiconductor Engineering 1 is intended for juniors majoring in Electrical and Computer Engineering to understandsemiconductors devices. This course is grouped into two major parts. The first part will convers basic and fundamentalaspects of semiconductors which include band structure of semiconductor, what carriers (electrons and hole) are,carrier recombination and generation, and drift and diffusion of carriers. The other will discuss a pn diode as a basicsemiconductor device. Its formation and equilibrium state, current-voltage characteristics, and AC characteristics willbe covered. In the end, Schottky diode (metal-semiconductor junction) will be also lectured.
*This lecture will be conducted in 100% English.

2. Course Objectives & course outcome

교육목표
1) 반도체의 물성, 소자 및 기술과 관련된 용어와 개념들의 이해
2) 전하를 실어 나르는 입자인 캐리어(carrier)로서의 전자와 홀의 속성 및 캐리어 농도 조절 원리 이해, 캐리어 농도 계산 능력 배양
3) 캐리어 이동 원리인 drift와 diffusion의 원리 이해 및 이에 따른 전류 계산 능력 배양
4) 에너지 밴드 그림을 그리고 해석하고 활용하는 능력 배양
5) Minority carrier diffusion equation을을 이해하고 활용하는 능력 배양
6) 전압 인가에 따른 PN 접합 diode의 전류흐름 메커니즘의 이해
7) PN diode의 AC/DC 특성, 그리고 등가회로 이해
8) PN diode로 transient response 이해

교과목 학습성과
1) 반도체의 물성, 소자 및 기술과 관련된 용어와 개념들을 이해한다. (PO1)
2) 전하를 실어 나르는 입자인 캐리어(carrier)로서의 전자와 정공의 속성 및 캐리어 농도 조절 원리를 이해하며, 캐리어 농도를 계산할 수 있다. (PO1)
3) 캐리어 이동 원리인 drift와 diffusion의 원리를 이해하고 이에 따른 전류를 계산할 수 있다. (PO1)
4) 에너지 밴드 그림을 그리고 해석하고 활용할 수 있다. (PO1)
5) Minority carrier diffusion equation을 이해하고 활용할 수 있다. (PO1)
6) 전압인가에 따른 PN diode의 전류흐름 메커니즘을 이해하고 문제해결에 활용할 수 있다. (PO2, 3, 4, 5)
7) PN diode의 AC/DC 특성, 그리고 등가회로를 회로 설계와 문제해결에 활용할 수 있다. (PO2, 3, 4, 5)

3. Class types and activities

1) Students are asked to actively participate in class. Don't hesitate to ask if you can't understand.
2) PowerPoint slides will be mainly used in class. Lecture notes will be uploaded prior to the lecture.
3) There is some homework.

*This lecture will be conducted in English.

4. Teaching Method

- [V] lecture
- [ ] discussion and debate
- [ ] team project(presentation and case studies)
- [ ] experiments(role-playing,etc)
- [ ] designing and production
- [ ] on-site learning(on-site training)
- [ ] others

5. Support Systems in Use

- [V] AjouBb
- [ ] automatic recording system
- [ ] web-based assignment
- [ ] cyber lecture
- [V] online content
- [ ] class behavior analyazing system
- [ ] others

6. Teaching Tools

- [ ] PBL(Problem Based Learning)
- [ ] CBL(Case Based Learning)
- [ ] TBL(Team Based Learning)
- [ ] UR(Undergraduate Research)
- [V] FL(Flipped Learning)
- [ ] DSAL(Data Sciencd Active Learning)
- [ ] others

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	
midterm exam		30%	
final exam		40%	
quiz			

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
presentation			
discussion			
homework		20%	
etc			
study hours			

8. Textbook and Reference material

Main/Sub	Title	Writer	Publisher	Publication year
Main	Semiconductor Physics and Devices, 4/E	Donald A.Neamen	McGraw Hill	2011
Main	Solid State Electronic Devices, 7/E (GlobalEdition)	Ben G.Streetman	Pearson	2015
Sub	Fundamentals of Semiconductor Devices, 2/E	B. L.Anderson andR. L.Anderson	McGraw Hill	2018

9. Class system and Class shedule

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	langua ge	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experimen t practice		
1	Introduction and Semiconductor Materials	E					
2	Diamond Lattice	E					
3	Shrodinger Wave Equation	E					
4	Bonding Forces and Energy Bands in Solids	E					
5	Direct and Indirect Semiconductors	E					

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
6	Carrier Concentrations	E					
7	Drift of Carriers in Electric and Magnetic Fields	E					
8	Midterm Exam	E					
9	Carrier Lifetime and Photoconductivity	E					
10	Diffusion and Drift of Carriers	E					
11	Junctions	E					
12	Space Charge	E					
13	Reverse-Bias Breakdown	E					
14	Deviations from the Simple Theory	E					
15	Summary	E					
16	Final Exam	E					

10. Contribution index of the course for attaining ABEEK program outcomes

course outcome	contribution scale
No Data	

11. Analysis of improved matters for the previous semester

13. Reference items