Syllabus

Introduction to Solar Cell Technology

Course Name	Course type (credit/hours)	전선(3/3)		Course code	
	Target students Division/major/grade	/		Opening semester	2018년 1학기
	Class time and classroom	목2(원534-2) 목3(원534-2) 목4(원534-2)(원534-2)			
Reference to this course	Related basic courses				
	Recommended concurrent courses				
	Related advanced courses				
Instructor	Name (title/division)				
	Office Room Number		Office phone Number	2576	e-mail	hseo2017@ajou.ac.kr
	Office hours		Homepage address		
Teaching Assistant	Name (title/division)				
	Office Room Number		Office phone Number		e-mail	

1. Introduction

Solar photovoltaic energy conversion is a process, which generates electrical energy from light energy. The purpose of this class is to provide an introduction to the physics of the photovoltaic cell. This class should be suitable for physicists, chemists, and engineers who are interested in the solar cell physics and applications. The underlying mechanism of solar cells is based on the quantum theory of lights, semiconductor physics, and the interaction between lights and semiconductors. We will review the basic semiconductor physics such as band structure, the basic principles of photovoltaic effect, the generation and recombination of photo-carriers in semiconductors, and the PN junction. Then, we will discuss various types of solar cells such as monocrystalline solar cells, thin film solar cells, and third-generation solar cells.

2. Course Objectives

3. Class types and activities

4. Teaching Method

The two main purposes of this course are 1) to learn the basic principles of solar cell operation and 2) to overview the current status of the solar cell technology development. To achieve the first goal, we will have a series of lectures followed by a written exam. The lectures will cover the basic semiconductor physics such as electronic band structure for electrons in crystalline environments and the optical and transport properties of electrons in semiconductors. For the second part of the course, each student will survey a certain type of solar cell that is being developed in the literature and do a presentation. Several possible topics will be suggested by the instructor.

5. Knowledge and ability required for taking this course

6. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance			
midterm exam			
final exam			
quiz			
presentation			
discussion			
homework			
etc			

Student's learning progress will be evaluated based on one written exam (30%), two or three homework assignments (30%), class presentation (20%), and the attendance and class attitude (20%).

7. Textbooks

Main/Sub	Title	Writer	Publisher	Publication year
주교재	The physics of solar cells	Jenny Nelson	Imperial College Press	2004
참고웹	www.pveducation.org	C. Honsberg and S. Bowden		
참고자료	http://www.kier.re.kr/upload/notic/PVCDROM-KOR.pdf	C. Honsberg and S. Bowden (Translated by Yoon, Kyung-Hoon)		
참고자료	Physics of solar cells: from basic principles to advanced concepts	Peter Wurfel	John Wiley & Sons	2016
참고자료	Third generation photovoltaics	Martin Green	Springer	2003

8. Lecture Schedule

Week	Lecture contents	Lesson type	Remark
1	Introduction: the photovoltaic effect		
2	Basic principles of PV		
3	Electrons and holes in semiconductors		
4	Electrons and holes in semiconductors		
5	Generation and Recombination		
6	The P-N junctions		
7	The P-N junctions		
8	Mid-term exam period		
9	Monocrystalline and thin-film solar cells		
10	Managing light		
11	Over the limit: strategies for high efficiency		
12	Special topics of solar cells		
13	Special topics of solar cells		
14	Special topics of solar cells		
15	Special topics of solar cells		
16	Final exam period		

9. Others