
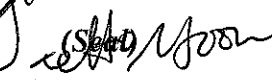


SYLLABUS

Classification	Elective	Course No.	03612	Cr. Hrs.	3	Instructor	Kim, Young Ha
Course Title	Korean	생체적합성					
	English	Biocompatibility					
<u>Course Outline</u> This course covers the basic biochemistry and the physiological reactions between implanted materials and physiological environments such as proteins, bloods, cells, or tissues. The materials/body interactions including blood coagulation, inflammation, immune reaction, or wound healing will also be discussed.							
Prerequisite		None					
Textbook and References							
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction for biomaterials and biocompatibility						
2nd week	Proteins						
3rd week	Proteins-surface interactions						
4th week	Blood						
5th week	Blood coagulation						
6th week	Blood coagulation						
7th week	Inflammation						
8th week	infection					Mid-term Exam	
9th week	Immune reaction						
10th week	Immune reaction						
11th week	Complement activation						
12th week	Wound healing						
13th week	Tissue response						
14th week	Cellular response to polymers						
15th week	Surface and Physiological Environment						
16th week	Final Exam						

* If there will be experiments, mark it in the "Remarks".

Instructor Kim, Young Ha  (Seal)

Dept. Chair Yoon, Tae-Ho  (Seal)

SYLLABUS

Classification	Elective	Course No.	03623	Cr. Hrs.	3	Instructor	Lee, Kwanghee
Course Title	Korean	유기물 광전자 II					
	English	Organic Materials for Electronics and Photonics II					
Course Outline The main purpose of this course is to understand basic concepts, mechanisms, and current issues in Polymer Electronics and Optoelectronics, so called 'Plastic Electronics', which utilizes novel materials exhibiting the electrical and optical properties of metals or semiconductors 'and' which retain the attractive mechanical properties and processing advantages of polymers. As a second stage after OMEP-I which deals with mostly semiconducting and metallic organic materials, this course will focus mainly on the devices using organic materials such as organic light-emitting diode (OLEDs), organic solar cells, organic field-effect transistors, organic memory, and organic lasers.							
Prerequisite		Not Necessarily					
Textbook and References		Hadziioannou and P.F. van Hutten (eds), 'Semiconducting Polymers', Wiley-VCH, 2000.					
Weekly Course Schedule							
Calendar	Description						*Remarks
1st week	Introduction to Organic Electronics						
2nd week	Electrical Properties of Semiconducting Organic Materials						
3rd week	Optical Properties of Semiconducting Organic Materials						QUIZ 1
4th week	Semiconducting Device Physics I : Basics						
5th week	Semiconducting Device Physics II : P-N Junction Theory						
6th week	Semiconducting Device Physics III : Organic Electronics						QUIZ 2
7th week	Organic Light-Emitting Devices I						
8th week	Organic Light-Emitting Devices II						MIDTERM
9th week	Organic Solar Cells I						
10th week	Organic Solar Cells II						
11th week	Organic Field-Effect Transistor I						
12th week	Organic Field-Effect Transistor II						QUIZ 3
13th week	Organic Circuit I						
14th week	Organic Circuit II						
15th week	Organic Memory Devices						
16th week	Organic Photonics Materials: Lasers and NLO						FINAL

* If there will be experiments, mark it in the "Remarks".

Instructor Lee, Kwanghee



Dept. Chair Yoon, Tae-Ho

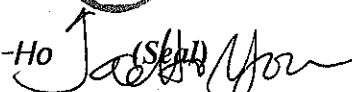
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SYLLABUS

Classification	Elevtive	Course No.	03632	Cr. Hrs.	3	Instructor	Cho, Beongki
Course Title	Korean	반도체 소자 물리학					
	English	Semiconductor Device Physics					
Course Outline The basic mechanism of semiconductors and its properties will be described. Those include the description of the physical properties of semiconductor and fundamental principles of operation of its devices. In order to give the concept of semiconductor physics, band structure, statistical description of impurity levels, transport properties, optical properties will be studied. In addition, amorphous and quantum well will be reviewed.							
Prerequisite		None					
Textbook and References		"Physics of Semiconductor Devices", S. M. Sze "Electrons in Solid", Bube					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Band structure of crystalline semiconductors						
2nd week	Energy gap, Temperature dependence						
3rd week	Constant energy surface, Mass tensor						
4th week	Statistical mechanics, Effect of impurity level						
5th week	Magnetoresistivity, Cyclotron resonance						
6th week	Trnasport properties						
7th week	Junction, Structures, Devices						
8th week	p-n junction, p-n-p-n stuctures						
9th week	Schottky barriers, JFET						
10th week	MESFET, MOS, MOSFET						
11th week	Optical properties						
12th week	Photoabsorption, LED, CD						
13th week	Photoconductivity, Luminescence						
14th week	Amorphous semiconductors						
15th week	Electronic structure, Defect states						
16th week	Quantum well structures						

* If there will be experiments, mark it in the "Remarks"

Instructor Cho, Beongki  (Seal)

Dept. Chair Yoon, Tae-Ho  (Seal)

SYLLABUS

Classification	Elective	Course No.	03633	Cr. Hrs.	3	Instructor	Hwang, Hyunsang
Course Title	Korean	반도체 소자					
	English	Semiconductor Materials and Devices					
Course Outline The subject matter of this course is fundamental theory on Semiconductor device physics. The main topics to be discussed by class are as shown below. ① Energy Band Theory and Carrier in Semiconductor ② P-N Junction Diode and Bipolar Junction Transistor ③ Basic MOSFET device physics and Advanced Device Physics on Deep submicron MOSFET ④ Simulation of MOSFET device Characteristics							
Prerequisite							
Textbook and References		Text : B. G. Streetman, "Solid State Electronic Devices" Ref. : Muller & Kamin, "Device Electronics for Integrated Circuit"					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Chap.3 Energy Band-I						
2nd week	Chap.3 Energy Band-II						
3rd week	Chap.4 Excess Carrier in Semiconductor-I						
4th week	Chap.4 Excess Carrier in Semiconductor-II/ Chap.5 Junction -I						
5th week	Chap.5 Junction -II						
6th week	Chap.7 Bipolar Transistor -I						
7th week	Chap.7 Bipolar Transistor -II						
8th week	Chap.7 Bipolar Transistor -III						
9th week	Chap.8 FET -I						
10th week	Chap.8 FET -II						
11th week	Chap.8 FET -III						
12th week	Advanced Theory on MOSFET-I						
13th week	Advanced Theory on MOSFET-II						
14th week	Simulation - I						
15th week	Simulation - II						
16th week	FINAL						

* If there will be experiments, mark it in the "Remarks".

Instructor Hwang, Hyunsang

(Seal)


Dept. Chair Yoon, Tae-Ho

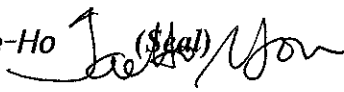
(Seal)

SYLLABUS

Classification	Elective	Course No.	03644	Cr. Hrs.	3	Instructor	Jang, Yun Hee
Course Title	Korean	응용양자화학					
	English	Applied Quantum Chemistry					
Course Outline In this course we will learn the basics of quantum mechanics (QM) and the usage of the QM methods (including DFT) in modeling materials and processes. The course will proceed with lectures, computer labs, article reading, and homeworks. Students are also encouraged to pursue a project applying the QM calculation methods to their own research.							
Grading: exam / quiz (80%) + lab report / homework / class participation (20%)							
Prerequisite		Quantum mechanics (can be helpful but not required)					
Textbook and References		Quantum Chemistry and Spectroscopy, T. Engel (2006)					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Kick-off meeting + Introduction					Engel, Ch. 1	
2nd week	Quantum postulates and the Schrödinger equation					Engel, Ch. 2-3	
3rd week	Particle in a box, pt. 1					Engel, Ch. 4 + Holiday	
4th week	Particle in a box, pt. 2					Engel, Ch. 4	
5th week	Tunneling & Uncertainty principle					Engel, Ch. 5-6	
6th week	Harmonic oscillator and Vibration spectroscopy					Engel, Ch. 7-8, Pt. 1	
7th week	Particle on a sphere and Rotation					Engel, Ch. 7-8, Pt. 2	
8th week	The hydrogen-like atoms					Ch. 9	
9th week	Mid-term exam						
10th week	Spins and Antisymmetry					Engel, Ch. 10	
11th week	Many-electron atoms and Hartree-Fock method					Engel, Ch. 10	
12th week	LCAO-MO method and Basis sets					Computer Demo, Ch. 16	
13th week	Geometry optimization & normal mode analysis					Computer Demo, Ch. 16	
14th week	Chemical bonding in di-/poly-atomic molecules					Computer lab, Ch. 12-15	
15th week	Density functional theory (DFT)					Computer lab	
16th week	Calculation: Thermochemistry / Chemical reactivity					Computer lab, Final exam	

* If there will be experiments, mark it in the "Remarks"

Instructor Jang, Yun Hee  (Seal)

Dept. Chair Yoon, Tae-Ho  (Seal)

SYLLABUS

Classification	Elective	Course No.	03648	Cr. Hrs.	3	Instructor	Noh, Do Young
Course Title	Korean	고급 X-ray 회절론					
	English	Modern X-ray Diffraction					
Course Outline X-선의 물리적 성질과 방사광을 비롯한 X-선 발생 원리를 강의한 후, X-선과 물질의 상호작용을 기반으로 X-선 회절의 원리를 강의한다. 또한 소각산란, X-선 반사율, order-disorder, 박막의 stress 분석기법 및 프론티어 방사광 X-선 회절 기법 등을 강의한다. 이러한 토픽들은 표면 및 계면, 그리고 박막의 구조 등 다양한 연구 주제에 응용될 수 있다. The course starts with studying the characteristics of x-rays and x-ray generation methods including synchrotron. Basic interaction between x-rays and matter will be discussed to understand the principle of x-ray diffraction. As advanced topics, small angle scattering, x-ray reflectivity, order-disorder transition, and stress analysis of thin films, advanced synchrotron techniques will be covered. These topics might be applied to understand the structural aspects of surfaces and interfaces of thin crystal films.							
Prerequisite		None					
Textbook and References		1. B. E. Warren X-ray Diffraction 2. B. D. Cullity Elements of X-ray Diffraction					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Properties of X-rays						
2nd week	Synchrotron X-rays						
3rd week	X-ray Scattering by Atoms						
4th week	Reciprocal Lattice Space						
5th week	Single Crystal X-ray Diffraction						
6th week	Thermal vibration and diffuse scattering						
7th week	Integrated Intensity						
8th week	Experimental methods						
9th week	X-ray studies of order-disorder						
10th week	Residual stress measurement						
11th week	Surface X-ray Scattering						
12th week	X-ray Reflectivity (1)						
13th week	X-ray Reflectivity (2)						
14th week	Small Angle X-ray Scattering (1)						
15th week	Small Angle X-ray Scattering (2)						
16th week	Advanced Synchrotron X-ray Scattering method						

* If there will be experiments, mark it in the "Remarks".

Instructor Noh, Do Young

Dept. Chair Yoon, Tae-Ho

(Seal)
(Seal)

SYLLABUS

Classification	Elective	Course No.	03679	Cr. Hrs.	3	Instructor	Kim, Won Bae
Course Title	Korean	에너지 전환 화학					
	English	Energy Conversion Chemistry					
Course Outline This course aims to present the concepts and fundamentals of energy conversion chemistry and applications to fuel cells that have highly interdisciplinary nature of technology. It covers the backgrounds of the wide area of most relevant scientific and technical aspects such as energy & environment, thermodynamics, kinetics of electrochemical reactions, and materials of electrode catalysts together with the state-of-the-art applications, thus allowing to introduce key knowledge and important issues involved in the energy and fuel cell technologies.							
Prerequisite							
Textbook and References		Fuel Cell Systems Explained (2nd ed), Wiley 2003					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction to Energy & Environment						
2nd week	Thermodynamics of Energy Conversion						
3rd week	Renewable Energies						
4th week	Fuel Processing for Fuel Cells						
5th week	Fueling Fuel Cells						
6th week	Principles of Fuel Cells						
7th week	"						
8th week	Midterm exam						
9th week	Proton Exchange Membrane Fuel Cells						
10th week	Direct Methanol Fuel Cells						
11th week	Medium & High Temperature Fuel Cells						
12th week	Theory of Electrocatalysis						
13th week	"						
14th week	"						
15th week	"						
16th week	Final exam						

* If there will be experiments, mark it in the "Remarks"

Instructor Kim, Won Bae (Seal)

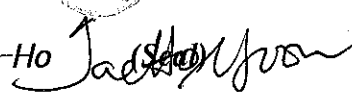
Dept. Chair Yoon, Tae-Ho (Seal)

SYLLABUS

Classification	Elective	Course No.	03682	Cr. Hrs.	3	Instructor	K. E. Geckeler
Course Title	Korean	초분자 재료					
	English	Supramolecular Materials					
<u>Course Outline</u>							
This course will cover the major aspects of supramolecular materials in the context of material science and chemistry for advanced students with interdisciplinary interests. It embraces the basics of these materials in terms of their different classes, properties, and applications. Interactive learning as well as fundamental study and thinking approaches are an important goal of the course.							
Prerequisite		Basic knowledge of chemistry and materials					
Textbook and References		J. W. Steed, J. L. Atwood, "Supramolecular Chemistry", Wiley, 2000. And selected articles and notes.					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction to Supramolecular Materials						
2nd week	History and definitions						
3rd week	Molecular forces and interactions						
4th week	Molecular and supramolecular structures						
5th week	Supramolecular building blocks						
6th week	Host-guest materials						
7th week	Catenanes and rotaxanes						
8th week	DNA						
9th week	Proteins						
10th week	Polysaccharides						
11th week	Synthetic supramolecular polymers						
12th week	Amphiphilic materials						
13th week	Self-assembled materials						
14th week	Characterization methods						
15th week	Applications						
16th week	Final Exam and evaluation						

* If there will be experiments, mark it in the "Remarks"

Instructor K. E. Geckeler (Seal)

Dept. Chair Yoon, Tae-Ho (Seal) 

SYLLABUS

Classification	Elective	Course No.	03683	Cr. Hrs.	3	Instructor	Lee, Takhee
Course Title	Korean	나노전자학					
	English	Nanoelectronics					
Course Outline Electronic properties of quantum nanostructures will be studied in this lecture. Nanofabrication and measurement techniques of nanostructures will be explained. And quantum electronic transports, such as, ballistic transport, quantized conductance, single electron effect, magnetotransport, etc will be studied for various structures such as quantum well, quantum wire, quantum point contact, quantum dot nanostructures.							
Prerequisite							
Textbook and References		Text book: Mesoscopic Electronics in Solid State Nanostructures by Thomas Heinzl, Ref: Nanoelectronics and Information Technology, edited by Rainer Waser					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Nanoelectronics: Introduction						
2nd week	Mesoscopic transport: Overview, key issues						
3rd week	Experimental techniques: Fabrications						
4th week	Experimental techniques: Measurements						
5th week	Quantum Electronic Effects: Heterostructures						
6th week	Quantum Electronic Effects: Surfaces, interfaces						
7th week	2-dim quantum films: Deposition methods						
8th week	2-dim quantum films: Quantum wells						
9th week	2-dim quantum films: Magnetotransport						
10th week	1-dim quantum wires: Ballistic transport						
11th week	1-dim quantum wires: Landauer formalism						
12th week	1-dim quantum wires: Nanowires, Nanotubes						
13th week	1-dim quantum wires: Organic wires						
14th week	0-dim quantum dot: Fabrication, overview						
15th week	0-dim quantum dot: Single electron tunneling						
16th week	Final exam						

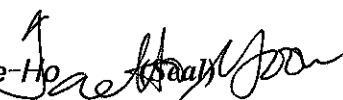
* If there will be experiments, mark it in the "Remarks"

Instructor Lee, Takhee



Dept. Chair

Yoon, Tae-Ho



SYLLABUS

Classification	Elective	Course No.	03684	Cr. Hrs.	3	Instructor	Jung, Gun Young
Course Title	Korean	리소그라피 공정					
	English	Lithography process					
Course Outline This course will introduce the conventional photo-lithography technique step by step and mention the challenges microlithographers face. An overview of process development to enhance the pattern resolution will be given. Also, a background of next generation lithography methods such as nanoimprint lithography, e-beam lithography, self-assembly lithography, dip-pen lithography and other lithography techniques based on optics (DUV, EUV, X-ray) etc. to generate sub-100 nm patterns for the fabrication of "nano-devices" will be addressed in depth. This lecture will also cover etching processes to transfer patterns onto wanted substrates by either dry- or wet-etching process method.							
Prerequisite		None					
Textbook and References		"The Science and Engineering of Microelectronic Fabrication", edited by Stephen A. Campbell "Handbook of VLSI Microlithography", edited by Glendinning and Helbert					
Weekly Course Schedule							
Calendar	Description						*Remarks
1st week	Photo lithography general methodology, terminology						
2nd week	Photo lithography issues and trends, mask fabrication						
3rd week	DUV lithography materials, light source, drawbacks						
4th week	EUV lithography, X-ray lithography						
5th week	E-beam lithography, Electron projection lithography						
6th week	Soft lithography						
7th week	Nano imprint lithography - methodology						
8th week	Mid-term exam						
9th week	Nano imprint lithography device application, Self-assembly lithography						
10th week	Immersion lithography, Dip-pen lithography						
11th week	Ion-beam lithography, Interference lithography						
12th week	Wet etching process						
13th week	Wet etching process, Dry-etching process						
14th week	Dry-etching process, Selective etching process						
15th week	Overview of current silicon technology development						
16th week	Final exam						

* If there will be experiments, mark it in the "Remarks"

Instructor Jung, Gun Young

(Seal)

Dept. Chair Yoon, Tae-Ho

(Seal)

SYLLABUS

Classification	Elective	Course No.	03686	Cr. Hrs.	3	Instructor	Park, Ji-Woong
Course Title	Korean	고급유기화학					
	English	Advanced Organic Chemistry					
Course Outline The course is designed for the students who require a knowledge of synthesis and properties of complex organic molecules and conduct researches on organic compounds and polymers for plastic electronic materials and biomaterials. It focuses on the synthetic aspects and physicochemical properties of conjugated aromatic compounds, fused aromatic compounds, organic compounds containing heteroatoms, and organic compounds constituting the biological macromolecules.							
Prerequisite		Organic Synthetic Chemistry(3617)					
Textbook and References		David R. Klein, Organic Chemistry II as a Second Language, second semester topics, Wiley Andrew Streitwieser, Introduction to Organic Chemistry, Prentice-Hall, 4th Ed.					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction						
2nd week	Conjugation and Molecular Orbital Theory						
3rd week	Benzene and the Aromatic Rings						
4th week	Electrophilic Aromatic Substitution						
5th week	Catalysed synthetic reactions of aromatic compounds						
6th week	Amines						
7th week	Other nitrogen functions						
8th week	Sulfur, Phosphorous, and Silicon Compounds						
9th week	Difunctional Compounds						
10th week	Carbohydrates						
11th week	Amino Acids, Peptides, and Proteins						
12th week	Aromatic Halides, Phenols, Phenyl Ethers, and Quinones						
13th week	Polycyclic Aromatic Hydrocarbons.						
14th week	Heterocyclic Compounds						
15th week	Molecular Recognition: Nucleic Acids and Some Biological Catalysis						
16th week	Special Topics						

* If there will be experiments, mark it in the "Remarks"

Instructor Park, Ji-Woong

Dept. Chair Yoon, Tae-Ho

(Seal)

(Seal)

SYLLABUS

Classification	Elective	Course No.	03687	Cr. Hrs.	3	Instructor	Kim, Dong-Yu
Course Title	Korean	유기광전자 재료화학					
	English	Materials chemistry for organic electronics and photonics					
Course Outline This course will cover the design and synthetic methods of organic materials for electronic, optical, and electrochemical applications such as organic light-emitting diodes (OLED), organic thin-film transistors (OTFT), and organic solar cell (OSC).							
Prerequisite		Knowledge of fundamental chemistry and polymer science					
Textbook and References		Ref. 1 Conjugated Polymers, T. A. Skotheim, J. R. Reynolds, CRC Press 2 Organic Light-Emitting Materials and Devices, Z. Li, H. Meng, CRC 3 Organic Electronic Materials, R. Farchioni, G. Grosso, Springer					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction of organic materials for electronics and optoelectronics						
2nd week	Organic molecules – Conducting polymers						
3rd week	Semiconducting materials for OLED, OTFT and OSC						
4th week	Hole transport materials for OLED						
5th week	Electron transport materials for OLED						
6th week	Emitting materials for OLED I						
7th week	Emitting materials for OLED II						
8th week	Emitting materials for OLED III						
9th week	Mid-term Exam						
10th week	Host-guest molecules						
11th week	P-type small molecule materials for OTFT						
12th week	P-type polymers for OTFT						
13th week	N-type materials for OTFT						
14th week	Semiconductors for bulkheterojunctionn OSC						
15th week	Donor and acceptor materials for bulkheterojunctionn OSC						
16th week	Final Exam						

* If there will be experiments, mark it in the "Remarks"

Instructor Kim, Dong-Yu

Dept. Chair Yoon, Tae-Ho