

# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03603	<b>Cr.Hrs.</b>	3	<b>Instructor</b>	Yoon, Tae-Ho
<b>Course Title</b>	<b>Korean</b>	고분자 물성					
	<b>English</b>	Physical Properties of Polymers					
<b>Course Outline</b> 고분자 재료의 물리적, 기계적 특성을 소개하고, 고분자 재료의 구조와 물리적 특성과의 관계를 고찰한다.							
<b>Prerequisite</b>							
<b>Textbook and References</b>		1) Polymer Chemistry, P.C.Hiemenz, Marcel Dekker, Inc. New York and Basel, 1984 2) Introduction to Polymer Viscoelasticity, J.J. Aklonis & W.J. Macknight, John Wiley & Sons, New York, 1983					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Characteristics parameters of polymers						
<b>2nd week</b>	Thermomechanical behavior of polymers						
<b>3rd week</b>	Transitions in polymers-Tg, Tm						
<b>4th week</b>	Tg determination methods						
<b>5th week</b>	Crystallization						
<b>6th week</b>	Orientation						
<b>7th week</b>	Rubber elasticity						
<b>8th week</b>	Viscous flow & mid term						
<b>9th week</b>	Creep & stress relaxation						
<b>10th week</b>	Free and forced oscillation						
<b>11th week</b>	Boltzman & time-temperature superposition						
<b>12th week</b>	Mechanical models for linear viscoelasticity						
<b>13th week</b>	Mechanical behavior of polymers						
<b>14th week</b>	Fracture mechanics						
<b>15th week</b>	Impact testing						
<b>16th week</b>	Toughening mechanism & Final						

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

Instructor    Yoon, Tae-Ho



Dept. Chair    Yoon, Tae-Ho



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03611	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Kim, Young Ha
<b>Course Title</b>	<b>Korean</b>	생체의료용 고분자					
	<b>English</b>	Biomedical Polymers					
<b>Course Outline</b> Lecture and discussion on biological background and the design strategy for polymeric materials for blood compatibility, tissue compatibility, drug delivery, and artificial organs. Application of polymers to various areas including cardiovascular, ophthalmic, orthopedical, dental or plastic surgical applications will be discussed.							
<b>Prerequisite</b>		None					
<b>Textbook and References</b>							
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Definition and Criteria of Biomaterials						
<b>2nd week</b>	Classification of Materials						
<b>3rd week</b>	Natural Polymers						
<b>4th week</b>	Materials / Body Interactions and Biocompatibility						
<b>5th week</b>	Blood-material Interactions and Coagulation						
<b>6th week</b>	Cardiovascular Application and Blood Compatible Polymers						
<b>7th week</b>	Inflammation and Immune System						
<b>8th week</b>	Wound Healing						
<b>9th week</b>	Hard/Soft Tissue Replacements						
<b>10th week</b>	Surgical Application						
<b>11th week</b>	Ophthalmic Application						
<b>12th week</b>	Dental Application						
<b>13th week</b>	Biodegradable Polymers and Application						
<b>14th week</b>	Tissue Engineering						
<b>15th week</b>	Drug / Gene Delivery Systems						
<b>16th week</b>	Final exam						

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

**Instructor**    Kim, Young Ha    (Seal)

**Dept. Chair**    Yoon, Tae-Ho    (Seal)

# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03618	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Kim, Dong-Yu
<b>Course Title</b>	<b>Korean</b>	고분자 구조 및 특성					
	<b>English</b>	Structure Property Relationship of Polymers					
<b>Course Outline</b> The main purpose of this course is to collect and organize understanding of the relationships between structure, properties and applications of polymer materials. The important polymer properties such as processability, mechanical, thermal, electrical, optical, acoustic, chemical and surface properties will be discussed from various aspects of polymer structures. (More thorough discussion of the physical and mechanical properties will be given at the course No. 3603.)							
<b>Prerequisite</b>							
<b>Textbook and References</b>		Polymer Structure, Properties and Applications, R. D. Deanin, Cahnners, Boston, 1972					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Introduction						
<b>2nd week</b>	submolecular structure:						
<b>3rd week</b>	chemical composition & properties						
<b>4th week</b>	Molecular structure I:						
<b>5th week</b>	size and shape & properties						
<b>6th week</b>	Molecular structure II:						
<b>7th week</b>	molecular flexibility & properties						
<b>8th week</b>	Intermolecular structure I:						
<b>9th week</b>	intermolecular order & properties						
<b>10th week</b>	Intermolecular structure II:						
<b>11th week</b>	intermolecular bonding & properties						
<b>12th week</b>	Supramolecular structure I: multiple phases						
<b>13th week</b>	Supramolecular structure II: macrostructure						
<b>14th week</b>	Commercial polymers: properties and applications						
<b>15th week</b>	Commercial polymers: properties and applications						
<b>16th week</b>	Commercial polymers: properties and applications						

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

**Instructor**      Kim, Dong-Yu



**Dept. Chair**      Yoon, Tae-Ho



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03620	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Park, Ji-Woong
<b>Course Title</b>	<b>Korean</b>	연성응집 물질					
	<b>English</b>	Soft Condensed Matter					
<b><u>Course Outline</u></b>							
This course is to give a unified overview of the various aspects of chemistry and physics of soft condensed matter, including polymers, colloids, liquid crystals, and the structural materials of biological species, to graduate students with various undergraduate backgrounds including materials science, chemistry, chemical engineering and physics. The themes of this course are the features which the different soft materials have in common: (a) structural and physical phenomena in the mesoscopic length scale, (b) fluctuations, Brownian motions and relaxations, and (c) self-assembly and phase transition. This course will provide important knowledge to the people who want to study and manipulate soft materials for the emerging nanotechnology							
<b>Prerequisite</b>		Undergraduate physical chemistry or equivalent					
<b>Textbook and References</b>		R. A. L. Jones, <i>Soft condensed matter</i> , New York: Oxford University Press, 2002. (ref) I.W. Hamley, <i>Introduction to soft matter</i> , New York: John Wiley & Sons, 2000. (ref) S.M. Allen, E.L.Thomas, <i>The structure of materials</i> , New York:Wiley,					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>						<b>*Remarks</b>
<b>1st week</b>	Introduction, overview,						
<b>2nd week</b>	Force, energies, and timescales in condensed matter						
<b>3rd week</b>	Phase transitions in soft matter						
<b>4th week</b>	Colloidal dispersions						
<b>5th week</b>	Colloids, polymers						
<b>6th week</b>	Polymers						
<b>7th week</b>	Gelation						
<b>8th week</b>	Mid-term exam						
<b>9th week</b>	Molecular order- liquid crystallinity						
<b>10th week</b>	Molecular order- liquid crystallinity						
<b>11th week</b>	Molecular order-crystallinity						
<b>12th week</b>	Self-assembly-amphiphilic molecules						
<b>13th week</b>	Self-assembly-copolymers						
<b>14th week</b>	Defects in soft materials						
<b>15th week</b>	Soft materials in nature						
<b>16th week</b>	Final exa						

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

Instructor Park, Ji-Woong (Seal)

Dept. Chair Yoon, Tae-Ho (Seal)

# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03621	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Lee, Kwanghee
<b>Course Title</b>	<b>Korean</b>	유기물 광전자 I					
	<b>English</b>	Organic Materials for Electronics and Photonics I					
<b>Course Outline</b> 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.							
<b>Prerequisite</b>		"Introduction to Solid State Physics" (C. Kittel)					
<b>Textbook and References</b>		- Pope and Swenberg, "Electronic Processes in Organic Crystals and Polymers", Second Edition, Oxford Univ. Press, 1999. - Hadziioannou and P.F. van Hutten (eds), 'Semiconducting Polymers', Wiley-VCH, 2000.					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>						<b>*Remarks</b>
<b>1st week</b>	Introduction: Vision of 'Plastic Electronics'						
<b>2nd week</b>	Semiconducting Polymers I: Basic						
<b>3rd week</b>	Semiconducting Polymers II: Electronic Structure						
<b>4th week</b>	Semiconducting Polymers III: Bond Relaxation						Quiz 1
<b>5th week</b>	Semiconducting Polymers IV: Photoexcitation						
<b>6th week</b>	Semiconducting Polymers V: Photoinduced Charge Transfer						
<b>7th week</b>	Metallic Polymers I: Basic						
<b>8th week</b>	Metallic Polymers II: Doping						Midterm
<b>9th week</b>	Metallic Polymers III: Metal-Insulator Transition						
<b>10th week</b>	Metallic Polymers IV: True Metallic Transport						
<b>11th week</b>	Polymer Light-emitting Diodes I: Basic						
<b>12th week</b>	Polymer Light-Emitting Diodes II: Advanced						Quiz2
<b>13th week</b>	Polymer Solar Cells I: Basic						
<b>14th week</b>	Polymer Solar Cells II: Advanced						
<b>15th week</b>	Polymer Field-Effect Transistors I: Basic						
<b>16th week</b>	Polymer Field-Effect Transistors II: Advanced						Final

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

**Instructor**    Lee, Kwanghee (Seal)

**Dept. Chair**    Yoon, Tae-Ho (Seal)



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03626	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	K. E. Geckeler
<b>Course Title</b>	<b>Korean</b>	나노재료화학					
	<b>English</b>	Chemistry of Nano Materials					
<b>Course Outline</b> The course covers the introduction to nanomaterials and is designed for students who require a knowledge of nanomaterials on an interdisciplinary basis, especially in the context with the different classes of nanomaterials, their syntheses, properties, and applications. It comprises both the theoretical and practical aspects of modern nanomaterials in view of their advanced technology. Emphasis is laid on interactive teaching, problem solving, associative and fundamental approaches. In addition, novel and advanced techniques are highlighted and discussed. All important aspects on the novel class of nanomaterials as well as their chemical, physico-chemical, and mechanical properties are included							
<b>Prerequisite</b>		Basic Knowledge of Materials Science					
<b>Textbook and References</b>		Chow, G.-M., Nanomaterials, 1999					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Introduction						
<b>2nd week</b>	Definition and history						
<b>3rd week</b>	Classification						
<b>4th week</b>	Properties and applications						
<b>5th week</b>	Types and examples						
<b>6th week</b>	Characterization						
<b>7th week</b>	Preparation methods						
<b>8th week</b>	Self-assembly						
<b>9th week</b>	Functionalization reactions						
<b>10th week</b>	Supramolecular nanomaterials						
<b>11th week</b>	Nanostructured surfaces						
<b>12th week</b>	Nanoparticles and nanocomposites						
<b>13th week</b>	Biomedical nanomaterials						
<b>14th week</b>	Nanomicelles and vesicles						
<b>15th week</b>	Nanoengineering						
<b>16th week</b>	Potential and outlook						

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

**Instructor**

**K. E. Geckeler**

(Seal)

**Dept. Chair**

**Yoon, Tae-Ho**

(Seal)



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03628	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Kim, Won Bae
<b>Course Title</b>	<b>Korean</b>	고체전기화학					
	<b>English</b>	Solid State Electrochemistry					
<b><u>Course Outline</u></b>							
This course aims to present the fundamentals and experimental techniques of solid state electrochemistry, the backgrounds of ionic or electronic conduction of inorganic & polymeric materials, and the applications in the areas of batteries, fuel cells, electrochemical photonics, sensors and corrosion.							
<b>Prerequisite</b>							
<b>Textbook and References</b>		P. G. Bruce, Solid State Electrochemistry					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Principles of electrochemistry 1						
<b>2nd week</b>	Principles of electrochemistry 2						
<b>3rd week</b>	Experimental methods of electrochemistry 1						
<b>4th week</b>	Experimental methods of electrochemistry 2						
<b>5th week</b>	Solid state background						
<b>6th week</b>	Ionic conductors 1. crystalline solid electrolytes						
<b>7th week</b>	Ionic conductors 2. polymer electrolytes						
<b>8th week</b>	Mixed ionic–electronic conductors						
<b>9th week</b>	mid-term exam						
<b>10th week</b>	Electrode materials 1						
<b>11th week</b>	Electrode materials 2						
<b>12th week</b>	Batteries & fuel cells						
<b>13th week</b>	Electrochromic devices & photonic electrochemistry						
<b>14th week</b>	Sensors & monitoring techniques						
<b>15th week</b>	Corrosion & its control						
<b>16th week</b>	Review & final exam						

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

**Instructor**     Kim, Won Bae



**Dept. Chair**     Yoon, Tae-Ho



# SYLLABUS


<b>Classification</b>	Elective	<b>Course No.</b>	03629	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Lee, Takhee
<b>Course Title</b>	<b>Korean</b>	전자재료 과학					
	<b>English</b>	Electronic Properties of Materials					
<b><u>Course Outline</u></b> Basic electrical, optical, magnetic, and thermal properties of various materials such as metals, semiconductors, and ceramics (and superconductors) will be studied based on their electronic structures.							
<b>Prerequisite</b>							
<b>Textbook and References</b>		Text book: Electronic Properties of Materials by Rolf E. Hummel Reference: Materials science for Electrical and Electronic Engineers by Ian P. Jones					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Fundamentals of electron theory						
<b>2nd week</b>	Energy band						
<b>3rd week</b>	Crystal						
<b>4th week</b>	Metals, alloys						
<b>5th week</b>	Polymers, ceramics						
<b>6th week</b>	Dielectrics, amorphous materials						
<b>7th week</b>	Semiconductors I						
<b>8th week</b>	Semiconductors II						
<b>9th week</b>	Optical properties I						
<b>10th week</b>	Optical properties II						
<b>11th week</b>	Magnetic properties I						
<b>12th week</b>	Magnetic properties II						
<b>13th week</b>	Thermal properties I						
<b>14th week</b>	Thermal properties II						
<b>15th week</b>	Superconductors I						
<b>16th week</b>	Superconductors II						

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

**Instructor**

**Lee, Takhee**  (Seal)

**Dept. Chair**

**Yoon, Tae-Ho**  (Seal)



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03636	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Hwang, Hyunsang
<b>Course Title</b>	<b>Korean</b>	반도체 공정					
	<b>English</b>	Semiconductor Processing					
<b><u>Course Outline</u></b>							
The purpose of this course is to provide students with technical background on silicon process technology for VLSI. The topics to be discussed by class are as shown below							
1. Semiconductor process review2. Crystal growth and oxidation							
3. Doping Process such as ion implantation and diffusion							
4. Deposited thin film: polysilicon, oxide, nitride, metals5. Metallization and Contacts process							
6. Lithography & Etching Process modeling7. Process Integration and SUPREM							
<b>Prerequisite</b>							
<b>Textbook and References</b>		1.ULSI Technology, C.Y. CHANG and S. M. SZE, McGrow-Hill Book Co. 1996 2. VLSI Fabrication Principles, 2nd Ed, Ghandhi, John wiley & Sons, 1994 3. Silicon Processing for the VLSI Era. Vol. 3: process integration, S. Wolf, Lattice Press					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>						<b>*Remarks</b>
<b>1st week</b>	ULSI Process Overview : Introduction						
<b>2nd week</b>	Wafer Cleaning Technology						
<b>3rd week</b>	EPITAXY						
<b>4th week</b>	Conventional and Rapid Thermal Process-I						
<b>5th week</b>	Conventional and Rapid Thermal Process-II						
<b>6th week</b>	Dielectric and Polysilicon Deposition						
<b>7th week</b>	Etching						
<b>8th week</b>	Lithography						
<b>9th week</b>	MIDTERM/ Ion Implantation - I						
<b>10th week</b>	Ion Implantation - II						
<b>11th week</b>	Metallization -I						
<b>12th week</b>	Process Modeling : SUPREM-III, IV part-1						
<b>13th week</b>	Process Modeling : SUPREM-III, IV part-2						
<b>14th week</b>	Process Integration-I						
<b>15th week</b>	Process Integration-II						
<b>16th week</b>	FINAL						

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

**Instructor**    Hwang, Hyunsang (Seal)  
**Dept. Chair**    Yoon, Tae-Ho (Seal)



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03651	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Jung, Gun-Young
<b>Course Title</b>	<b>Korean</b>	열역학 특론					
	<b>English</b>	Advanced Thermodynamics					
<b>Course Outline</b> A broad coverage of the basic concepts of thermodynamics. The first law, the second law, and the third law of thermodynamics. Combined first and second laws. Thermodynamic potentials, applications of thermodynamics to simple systems. Kinetic theory. Transport phenomena. Statistical thermodynamics. Applications of statistics to gases.							
<b>Prerequisite</b>							
<b>Textbook and References</b>		1. F.W. Sears, G.L. Salinger, Thermodynamics, Kinetics Theory, and Statistical Thermodynamics, Addison-Wesley Pub. Co. 2. D.V. Ragone, Thermodynamics of Materials, John Wiley & Sons. Co.					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Fundamental concepts						
<b>2nd week</b>	Equations of state						
<b>3rd week</b>	The first law of thermodynamics						
<b>4th week</b>	"						
<b>5th week</b>	Some consequences of the first law						
<b>6th week</b>	Entropy and the second law of thermodynamics						
<b>7th week</b>	Combined first and second laws						
<b>8th week</b>	Mid-term examination						
<b>9th week</b>	Thermodynamics potentials						
<b>10th week</b>	Applications of thermodynamics to simple systems						
<b>11th week</b>	"						
<b>12th week</b>	Kinetic theory						
<b>13th week</b>	"						
<b>14th week</b>	Statistical thermodynamics						
<b>15th week</b>	"						
<b>16th week</b>	Final examination						

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

Instructor    Jung, Gun-Young (Seal)

Dept. Chair    Yoon, Tae-Ho (Seal)

# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03674	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Heung Cho Ko
<b>Course Title</b>	<b>Korean</b>	고분자 물리화학					
	<b>English</b>	Physical Chemistry of Polymer					
<b>Course Outline</b> Studies on classical theories concerning the general physicochemical phenomena of polymeric systems including polymer swelling, gelation, chain configuration, polymer solution behavior, network elasticity, phase separation, viscosity, and so on.							
<b>Prerequisite</b>							
<b>Textbook and References</b>		P. J. Flory, Principles of Polymer Chemistry (main text) H. R. Allcock, Contemporary polymer chemistry					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Statistical Chain Configuration						
<b>2nd week</b>	Statistical Chain Configuration						
<b>3rd week</b>	Thermodynamics of Polymer solution						
<b>4th week</b>	Thermodynamics of Polymer solution						
<b>5th week</b>	Thermodynamics of Polymer solution						
<b>6th week</b>	Rubber Elasticity						
<b>7th week</b>	Mid-term Exam						
<b>8th week</b>	Phase Equilibria in Polymer Systems						
<b>9th week</b>	Phase Equilibria in Polymer Systems						
<b>10th week</b>	Frictional Properties of Polymer Molecules						
<b>11th week</b>	Frictional Properties of Polymer Molecules						
<b>12th week</b>	Frictional Properties of Polymer Molecules						
<b>13th week</b>	Molecular Weight Determination						
<b>14th week</b>	Molecular Weight Determination						
<b>15th week</b>	Special Topics						
<b>16th week</b>	Final Exam						

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

**Instructor:** Heung Cho Ko  
**Dept. Chair:** Yoon, Tae - Ho

  
 (Seal)

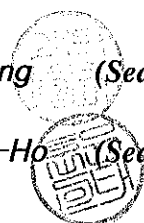
# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03675	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Noh, Do Young
<b>Course Title</b>	<b>Korean</b>	고체물리					
	<b>English</b>	Solid State Physics					
<b><u>Course Outline</u></b> In this course, basic physical concepts in understanding solids, crystals and electrons in crystals, will be discussed at introductory level. After studying the concepts of crystal structures and the reciprocal lattice, we will study the thermal vibrations and properties of phonon, electronic energy band structure, basic concepts of semiconductor crystal and metal crystals. Advanced topics such as magnetism and superconductivity will be covered at the end of the semester. Recommended to graduate students in physics and materials science.							
<b>Prerequisite</b>							
<b>Textbook and References</b>		Introduction to Solid State Physics, by Kittel (Text)					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Crystal Structure						
<b>2nd week</b>	Crystal Structure / Reciprocal Lattice						
<b>3rd week</b>	X-ray Diffraction						
<b>4th week</b>	Crystal Binding						
<b>5th week</b>	Lattice Vibrations						
<b>6th week</b>	Phonon						
<b>7th week</b>	Free Electron Gas						
<b>8th week</b>	Free Electron Gas / Energy Band					Midterm Exam	
<b>9th week</b>	Energy Band						
<b>10th week</b>	Semiconductor Crystals						
<b>11th week</b>	Semiconductor Crystals						
<b>12th week</b>	Fermi Surface and Metals						
<b>13th week</b>	Magnetism						
<b>14th week</b>	Magnetism						
<b>15th week</b>	Dielectric properties and Ferroelectricity						
<b>16th week</b>	Superconductivity					Final Exam	

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

Instructor    Noh, Do Young    (Seal)

Dept. Chair    Yoon, Tae-Ho    (Seal)



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03676	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Cho, Beong Ki
<b>Course Title</b>	<b>Korean</b>	통계열역학					
	<b>English</b>	Statistical Thermodynamics					
<b><u>Course Outline</u></b> The lecture introduces basic principles of statistical mechanics. The classical and quantum statistical mechanics will be discussed and applied to various statistical thermodynamic phenomena of ideal solids, gases, and quantum particles. Phase transitions will also be discussed in terms of statistical mechanics.							
<b>Prerequisite</b>		Introductory thermodynamics is recommended					
<b>Textbook and References</b>		Statistical Mechanics (Kerson Huang), Statistical Physics (Landau and Lifshitz part1), Lecture notes					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Review of thermodynamics						
<b>2nd week</b>	Thermodynamics of Phase transition						
<b>3rd week</b>	Elementary probability theory						
<b>4th week</b>	Classical statistical mechanics						
<b>5th week</b>	Ensemble approach; microcanonical, canonical, grand canonical ensemble						
<b>6th week</b>	Ensemble approach; microcanonical, canonical, grand canonical ensemble						
<b>7th week</b>	Quantum statistical mechanics					Midterm exam	
<b>8th week</b>	Partition Functions						
<b>9th week</b>	Ideal Fermi systems						
<b>10th week</b>	Ideal Fermi systems						
<b>11th week</b>	Ideal Bose systems						
<b>12th week</b>	Ideal Bose systems						
<b>13th week</b>	Chemical Reactions						
<b>14th week</b>	Ising Model						
<b>15th week</b>	Phase transition of second kind						
<b>16th week</b>	Phase transition of second kind					Final exam	

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

**Instructor**    Cho, Beong Ki (Seal)


**Dept. Chair**    Yoon, Tae-Ho (Seal)



# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03681	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Jang, Yun Hee
<b>Course Title</b>	<b>Korean</b>	분자모델링					
	<b>English</b>	Molecular Modeling in Materials Science					
<b>Course Outline</b> This course will discuss multi-scale modeling approach [quantum mechanics (QM), molecular mechanics (MM), molecular dynamics (MD), Monte Carlo (MC)] applied to materials science. The course will be project-based, and students will be encouraged to pursue projects related to their own research. <b>Grading:</b> term paper (30%), project presentation (30%), participation in discussion/reviewing (20%), quiz (20%) + Additional points will be given to projects qualified for presentation in a conference or publication to a journal.							
<b>Prerequisite</b>		Basic knowledge of quantum mechanics, statistical mechanics, solid state physics, unix/linux, programming language is not required, but may be useful.					
<b>Textbook and References</b>		No textbook; References to be announced					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Case studies in molecular modeling, Project set-up					discuss with group advisor	
<b>2nd week</b>	QM basics						
<b>3rd week</b>	QM for molecular systems						
<b>4th week</b>	QM for periodic systems						
<b>5th week</b>	QM software: learn, practice, apply to project					computer lab	
<b>6th week</b>	QM project continued, Q&A, basics revisited					computer lab	
<b>7th week</b>	QM quiz, presentation, progress report due					peer discussion/review	
<b>8th week</b>	Force Field (FF) approach (MM/MD/MC) basics						
<b>9th week</b>	FF(MM/MD/MC) software: learn, practice, apply					computer lab	
<b>10th week</b>	FF validation and/or development					computer lab	
<b>11th week</b>	MD/MC analysis, property calculation					computer lab	
<b>12th week</b>	MD/MC project continued, Q&A, basics revisited					computer lab	
<b>13th week</b>	FF(MM/MD/MC) quiz, presentation, term paper					peer discussion/review	
<b>14th week</b>	Project revisit based on peer discussion/review					computer lab	
<b>15th week</b>	Final term paper due (& apply for a conference)					discuss with group advisor	
<b>16th week</b>	End-of-class conference (poster presentation)?					Invite group members	

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

**Instructor**      Jang, Yun Hee       (Seal)

**Dept. Chair**      Yoon, Tae-Ho       (Seal)

# SYLLABUS

<b>Classification</b>	Elective	<b>Course No.</b>	03688	<b>Cr. Hrs.</b>	3	<b>Instructor</b>	Lee, Byoung Hun
<b>Course Title</b>	<b>Korean</b>	고급 전자 소자 분석 방법					
	<b>English</b>	Advanced Electrical characterization methods for nano scale devices					
<b>Course Outline</b>							
This class covers basic and advanced electrical characterization methods for electronic devices so that the student can utilize these methods in their research with good knowledge on the validity and limit of each method. After taking this class, student will be able to develop their test methods and understand the electrical test results with a theoretical knowledge.							
<b>Prerequisite</b>		Knowledge of semiconductor device physics					
<b>Textbook and References</b>		Text					
		1.Semiconductor material and device characterization, 3rd edition, D.K.Schroder, IEEE Press, John Wiley & Sons, Inc., 2006					
		References					
		2. CMOS circuit design, layout and simulation, R.J. Baker, IEEE Press, John Wiley & Sons, Inc., 2005					
		3. Electrical and thermal characterization of MESFTEs, HEMTs and HBTs, R.Anholt, Artech house, 1995					
<b>Weekly Course Schedule</b>							
<b>Calendar</b>	<b>Description</b>					<b>*Remarks</b>	
<b>1st week</b>	Introduction/ Capacitor characterization						
<b>2nd week</b>	Interface / bulk trap characterization						
<b>3rd week</b>	Basic transistor characterization						
<b>4th week</b>	Advanced transistor analysis I (Series resistance, Channel length, mobility)						
<b>5th week</b>	Advanced transistor analysis II (Performance, self heating, ring oscillator)						
<b>6th week</b>	High frequency test (equipment, test structures)						
<b>7th week</b>	Lab class (MOSFET characterization)						
<b>8th week</b>	Midterm exam and catch up						
<b>9th week</b>	Reliability physics (BTI, GIDL, DIBL, burn in test etc)						
<b>10th week</b>	Characterization of SOI devices (SOI, finFET, nanowire)						
<b>11th week</b>	Characterization of memory devices						
<b>12th week</b>	Reliability of memory and other devices						
<b>13th week</b>	Characterization method for novel devices (graphene devices, solar cell etc)						
<b>14th week</b>	Characterization method for other devices (TBD)						
<b>15th week</b>	Term project presentation						
<b>16th week</b>	Final Exam						

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

Instructor Lee, Byoung Hun (Seal)  
 Dept. Chair Yoon, Tae-Ho (Seal)



# SYLLABUS

Classification		Course No.	07407	Cr. Hrs.	2	Instructor	Yang, Mo or Kihong Park
Course Title	Korean	환경오염물질기기분석					
	English	Instrumental analysis on environmental pollutants					
<u>Course Outline</u> : This course will cover the basics of instrumental analysis, instrumentation, electronics, and data processing generally required for physical and chemical analysis. The principles and applications of commonly used analytical instruments including optical spectroscopy and mass spectrometry will be taught.							
Prerequisite							
Textbook and References		Principles of Instrumental Analysis, D.A. Skoog, E.J. Holler, S.R. Crouch, Thomson Books					
Weekly Course Schedule							
Calendar	Description						Lecturers
1st week	Concept of Measurement and Analysis						
2nd week	Analog electronics						
3rd week	Digital electronics						
4th week	Data processing						
5th week	Optical instruments						
6th week	Laser principle and application						
7th week	Atomic spectroscopy						
8th week	Molecular spectroscopy						
9th week	Principle of mass spectrometry						
10th week	Ionization methods						
11th week	Ion mass separators						
12th week	Tandem mass spectrometry						
13th week	Chromatography						
14th week	Hypernated instruments: GC-MS, ICP-MS, MALDI-TOF, etc						
15th week	Review						
16th week	Final examination						

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

Coordinator Yang, mo and Kihong Park

Dept. Chair

조재원





# SYLLABUS

Classification		Course No.	7408	Cr. Hrs.	3	Instructor	Seunghee Han
Course Title	Korean	미량금속					
	English	Trace Metals in Environments					
<b>Course Outline :</b> 환경미량금속에서는 생태환경에 독성을 나타내는 미량금속들의 근원, 순환, 반응과 생태 축적 메커니즘을 다룬다. 교과 내용은 미량금속의 거동을 이해하는데 필요한 기초 수화학 부터 시작하여, 미량분석에 이용되는 기기분석법, Cd, Pb, Se Hg의 근원, 순환, 종변화, 생태반응을 포함한다. This subject focuses on the sources, cycling, and biological interactions of toxic trace metals in natural environments. The main contents include basic aquatic chemistry, instrumental analysis, and behavior, speciation and bioaccumulation of Cd, Pb, Se, and Hg in natural environments.							
Prerequisite							
Textbook and References		Trace Elements (B Market and K Friese, Elsevier) Biogeochemistry of Environmentally Important Trace Elements (Y Cai and OC Braids, ACS) Aqueous Environmental Geochemistry (D Langmuir, Prentice Hall)					
Weekly Course Schedule							
Calendar	Description					Lecturers	
1st week	Aqueous complexes						
2nd week	Activity coefficient of dissolved species						
3rd week	Adsorption-desorption						
4th week	Iron and sulfur geochemistry						
5th week	Trace metal input to the soil-sediment-water						
6th week	Instrumental technique for trace analysis 1						
7th week	Instrumental technique for trace analysis 2						
8th week	Cd in the environments						
9th week	Pb in the environments						
10th week	Se in the environments						
11th week	Hg in the environments						
12th week	Geochemical control over methyl Hg production						
13th week	Methyl Hg bioaccumulation						
14th week	Final Exam						

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

Coordinator

한 승 희

Dept. Chair

조 재 원

