

SYLLABUS

Classification	Required	Course No. 24501	Cr. Hrs. 3:0:3	Instructor Vladimir Shin
Course Title	Korean	응용공학수학		
	English	Applied Engineering Mathematics		
<u>Course Outline</u>				
<p>The course "Applied Engineering Mathematics" contains the following sections:</p> <p>Section 1. "Linear and Matrix Algebra" (4 weeks)</p> <p>Section 2. "Complex Analysis" (4 weeks)</p> <p>Section 3. "Probability and Statistics" (4 weeks)</p> <p>Section 4. "Numerical Analysis" (4 weeks)</p> <p>The course can serve a source of information and hand-book on these sections. The course contains all definitions, proofs and calculation techniques which should be known the modern engineer. Main objective of the course is to present in the convenient and accessible form basic mathematical ideas and methods, which should have the engineer. Not achieving strictness in the proofs, concerning which the student is refer to the classical books and the course references, the attention of brevity and clearness of a statement, and also calculations and numerical algorithms is in detail given in the course. The examples of practical application of the mathematical methods in concrete problems are given. On these examples the student sees, for which purpose mathematical methods are intended and how to use them.</p> <p>The course "Applied Engineering Mathematics" is designed for 16 weeks for 3 hours per week.</p>				
<u>Prerequisite</u>				
<u>Textbook and References</u>	<p>(1) Hildebrand F.B. <i>Methods of Applied Mathematics</i> (2d ed.). Prentice-Hall. Inc.</p> <p>(2) Fisher, S.D. (1999). <i>Complex Variables</i> (2d ed.). Dover Publication.</p> <p>(3) Churchill R.V., Brown J.W. and Verhey R.F. (1974). <i>Complex Variables and Applications</i> (3d ed.). McGraw-Hill. Inc.</p> <p>(4) D. Kincaid and W. Cheney (1991). <i>Numerical Analysis</i>. Brooks/Cole Publishing Company.</p> <p>(5) Papoulis, A. (1990). <i>Probability and Statistics</i> (2d ed.). Prentice-Hall. Inc.</p>			

Weekly Course Schedule		
Calendar	Description	Remarks
1 st week	Linear Algebra. Linear spaces	
2 nd week	Linear Algebra. Euclidean spaces	
3 rd week	Linear Algebra. Matrix Algebra	
4 th week	Linear Algebra. Solution of Linear Algebraic Equations	
5 th week	Complex Variables. Basis of Complex Numbers	
6 th week	Complex Variables. Functions of Complex Variables	
7 th week	Complex Variables. Analytic & Harmonic Functions.	
8 th week	Complex Variables. Conformal Mapping	
9 th week	Numerical Analysis. Nonlinear Equations and Systems	
10 th week	Numerical Analysis. Approximate Intergration	
11 th week	Numerical Analysis. Interpolation and Approximation	
12 th week	Numerical Analysis. Ordinary Differential Equations	
13 th week	Probability. Probability Theory and Random Variables	
14 th week	Probability. Random Processes and Random Sequences	
15 th week	Statistics. Basic Statistics. Estimation of Distribution Parameters.	
16 th week	Statistics. Confidence Regions. Testing of Hypotheses. Linear Regression and Least Squares Method	

Instructor

Shin Vladimir

V. Shin

Dept. Chair

Jong Hyeon Lee

(Seal)

SYLLABUS

Classification	Required	Course No.	24503	Cr. Hrs.	1:0:1	Instructor	Yang, Sung
Course Title	Korean	콜로퀴움 I					
	English	Medical Engineering Colloquium I					
<u>Course Outline</u>							
Series of seminars by speakers from outside and within GIST on new and developing research areas in medical engineering, and presentations by registered students on their thesis research. <u>All students are required to attend: M.S. degree and PhD students must register at least once during their thesis research.</u> All students registered must present their research achievements at the end of semester according to the schedule designated at the beginning of the semester. The total presentation time for each presentation should be no longer than 15 min. including Q&A.							
Prerequisite		None					
Textbook and References		None					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	Seminar schedule will be regularly announced through a board in http://smse.gist.ac.kr .					All registered students are supposed to submit an abstract for their presentations 4 weeks in advance of their presentation day.	
2nd week							
3rd week							
4th week							
5th week							
6th week							
7th week							
8th week							
9th week							
10th week							
11th week							
12th week							
13th week							
14th week							
15th week							
16th week							

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

Instructor Yang, Sung

Dept. Chair Lee Jong-hyun

(seal)

(seal)

SYLLABUS

Classification	Required	Course No.	24505	Cr. Hrs.	1:4:3	Instructor	Sung Yang
Course Title	Korean	의생명 기초 계측 실험					
	English	Basic Biomedical Instrumentation Lab.					
Course Outline Efficient data acquisition and analysis are crucial steps of successful researches in science or engineering fields. This course is designed to provide technical information about how to acquire and analyze data during and after experiments. Throughout semester, LabVIEW will be used as a tool of data acquisition and analysis. In this lecture, students are expected to learn computer interface techniques (GPIB, RS232), analog data acquisition and analysis, image acquisition and processing techniques as well as LabVIEW programming. In addition, students are subject to carry out "independent project", which is closely relate with his or her actual research project conducted in their lab.							
Prerequisite		None					
Textbook and References		<u>Text and Reference Books</u> Most course material will be distributed before class start					
		<u>Grading</u> Attendance (20%), Home work (30%), Term Project (60%)					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	Introduction to LabVIEW						
2nd week	Modular Programming/ Repetition & Loops						
3rd week	Arrays/Clusters/Plotting Data/Decision Making in a VI						
4th week	Strings and File I/O/Data Acquisition & Waveforms						
5th week	Introduction to Instrument Control					Independent project (IP) proposal due	
6th week	GPIB Instrument Control						
7th week	RS232 Instrument Control						
8th week	Analog DAQ						
9th week	Analog DAQ					IP contract due	
10th week	Image acquisition/processing						
11th week	Image acquisition/processing						
12th week	Independent Project						
13th week	Independent Project						
14th week	Independent Project						
15th week	Independent Project Presentation						
16th week	Independent Project Presentation						

* If there will be

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

Instructor Sung Yang

Dept. Chair Lee Jong-Hyun

(seal)

SYLLABUS

Classification	Required	Course No	24506	Cr. Hrs.	3:0:3	Instructor	collaborative lecturers
Cours Title	Korean	의생명공학 개론					
	English	Introduction to Biomedical Engineering					
Course Outline The aim of this course is to provide an introduction to biomedical engineering for students who have various backgrounds. Course material will cover a wide range of biomedical engineering areas. Throughout semester, basics of biology and medicine to engineering principles applied to biomedical applications will be intensively covered. Due to diverse subjects that have to be discussed with, several instructors will contribute on lectures in serial fashion depending on topics.							
Prerequisite		Engineering Mathematics (Preferred)					
Textbook and References		Text and Reference Books 1. Introduction to biomedical engineering, 2nd ed, John Enderle et. al. 2. Medical devices and systems, Joseph D. Bronzino (editor) 3. Supplementary material will be distributed if it is necessary.					
		Grading Homework (20%), Mid term (40%), Final term (40%)					
		Weekly Course Schedule					
Calendar	Description					Remarks	
1st week	Course introduction A historical perspective/Moral and ethical issues					양성	
2nd week	Introduction to physiology					내/외부인	
3rd week	Introduction to molecular and cellular Biology					내/외부인	
4th week	Introduction to drug action and mechanism					김용철	
5th week	Nanoparticle-based imaging probes for biomedical applications					전상용	
6th week	Biomaterials and materials/body interactions					김영하	
7th week	Biomaterials and materials/body interactions					김영하	
8th week	Mid term exam					양성	
9th week	Micro/Nano technology for Biomedical engineering					양성	
10th week	Medical ultrasonics					이종현	
11th week	Biosignal processing					전성찬	
12th week	Introduction to Biomechanics					이연수	
13th week	Medical Robotics					류제하	
14th week	Medical Optics					이병하, 김덕영	
15th week	Medical Optics						
16th week	Final exam					양성	

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

Coordinator Sung Yang

(seal)

Dept. Chair Lee Jong-Hyun

(seal)

SYLLABUS

Classification	Elective	Course No.	24604	Cr. Hrs.	3:0:3	Instructor	Lee, Jong Hyun
Course Title	Korean	MEMS/NEMS 공정 및 응용					
	English	MEMS/NEMS process and applications					
<u>Course Outline</u> MEMS/NEMS devices are expected to be one of the key technologies for man-machine interface and ubiquitous sensor network in the 21st-century of information society. This course will deal with MEMS/NEMS (Micro/Nano Electro Mechanical Systems) material, micro/nano fabrication process, operational principles and applications as shown below. <ul style="list-style-type: none">- introduction to MEMS/NEMS devices and materials, semiconductor fundamentals- fabrication of 3D micro/nano structures, low-stress film, dry release, process integration- scaling effects, micro/nano electro-mechanics, optical MEMS and microfluidics- application examples of MEMS/NEMS devices for information and biomedical fields							
Prerequisite	None						
Textbook & References	<ul style="list-style-type: none">- N. Maluf, "An introduction to MEMS engineering," Artech House, 2000- S. M. Sze, "Semiconductor Sensors," John Wiley & Sons Inc., 1994- M. J. Madou, "Fundamentals of microfabrication," CRC press, 2002- B. G. Streetman et al., "Solid State Electronic Devices," 5th ed., Prentice-Hall, 2000- S. S. Saliterman, "Fundamentals of bioMEMS and medical microdevices," Wiley-Interscience, 2006						

Weekly Course Schedule		
Calendar	Description	Remarks
1 st week	Introduction to MEMS/NEMS	
2 nd week	Materials for MEMS/NEMS	
3 rd week	Basic fabrication process	
4 th week	Fundamentals of semiconductor physics	
5 th week	Micromachining process design I	
6 th week	Micromachining process design II	
7 th week	Bulk micromachining I	
8 th week	Mid-term exam	
9 th week	Bulk micromachining II	
10 th week	Surface micromachining	
11 th week	Process issues & nano fabrication	
12 th week	Micro-electro-mechanics	
13 th week	Optical MEMS & medical microdevices	
14 th week	Presentation I	
15 th week	Presentation II	
16 th week	Final exam	

Instructor Lee, Jong-Hyun (seal)

Dept. Chair Lee, Jong-Hyun (seal)

SYLLABUS

Classification	Elective	Course No.	24605	Cr. Hrs.	3:0:3	Instructor	이준지
Course Title	Korean	기초의학					
	English	Basic Medical Science					
<u>Course Outline</u> As a course for the one whose major is not life science, the contents of lecture are organized with essential and fundamental parts of the subject in the field of biochemistry, physiology, pathology and pharmacology.							
Prerequisite		Introduction to Biology					
Textbook and References		Medical Biochemistry at a glance. Basic Concepts in Physiology. Essentials of Rubin's Pathology. Principles of Pharmacology					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	Carbohydrates & Lipids						
2nd week	Proteins & Enzyme						
3rd week	Nucleotides & Nucleic acid						
4th week	Bioenergetics & Metabolism						
5th week	Cell - Structure, Regulation, Respiration, Metabolism Damage, Adaption						
6th week	Immune System, Diseases, Inflammation						
7th week	Digestive Physiology & pathology						
8th week	Respiratory Physiology & pathology						
9th week	Circulatory Physiology & pathology						
10th week	Nervous System						
11th week	Infectious & Parasitic Diseases						
12th week	Endocrinology						
13th week	Pharmacokinetics & Pharmacodynamics						
14th week	Autonomic Nervous system drug						
15th week	Anti-Cancer Drug						
16th week	Drugs-Organ system						

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

Instructor

(seal)

Dept. Chair

Lee, Jong-Hyun

(seal)



SYLLABUS

Classification	Elective	Course No	246 06	Cr. Hrs.	3	Instructor	Kangwook Kim
Course Title	Korean	전자파 복사 및 안테나					
	English	EM Radiation and Antennas					

Course Outline

The fundamentals of electromagnetic radiation and antennas are covered. These include the classical electromagnetism, radiation mechanism, basic principles and theorems, time-domain properties of antennas, and antenna arrays.

Prerequisite

None

Textbook and References

Constantine A. Balanis, "Antenna Theory: Analysis and Design," 3rd ed., Wiley-Interscience, 2005. ISBN:0-471-66782-X

Weekly Course Schedule

Calendar	Description	Remarks
1st week	Basic theory of electromagnetism	
2nd week	Electromagnetic plane waves in free space	
3rd week	Inhomogeneous plane waves and plane-wave spectrum	
4th week	Radiation from charges and current	
5th week	Radiation from a moving point charge	
6th week	Radiation integrals and auxiliary potential functions	
7th week	Fundamental theorems and principles	
8th week	Review and Midterm Exam	
9th week	Fundamentals parameters of antennas	
10th week	Radiation from dipole antennas	
11th week	Radiation from loop antennas	
12th week	Radiation from general wire antennas	
13th week	General time dependence of radiation	
14th week	Antenna Arrays and Synthesis	
15th week	Antennas in matter	
16th week	Review and Final Exam	

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

Instructor
Dept. Chair

Kim, Kangwook
Lee, Jong-Hyun

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(Signature)


SYLLABUS

Classification	Elective	Course No.	24607	Cr. Hrs.	3	Instructor	Lee, Yeon Soo
Course Title	Korean	생체역학					
	English	Biomechanics					
<u>Course Outline</u>							
Biomechanics is a mechanics to biology and physiology. This class provides fundamental musculoskeletal anatomy, mechanical interpretation of musculoskeletal issues, and cell mechanics. This class is designed for graduate students who want to expand their current knowledge to biomedical science, mechanobiology, rehabilitation, and sports engineering.							
Prerequisite		Engineering mathematics, Fundamental material mechanics					
Textbook and References		Home-made study material edited by Instructor Intro. to Biomedical Engineering, 2nd Edt, John Enderle et al., Elsevier, 2005 Ref.: Biomechanics, 2nd Edt. - Y.C. Fung, Springer					
Weekly Course Schedule							
Calendar	Description						Remarks
1st week	What is biomechanics?, Cellular Organization						
2nd week	Cellular biomechanics						
3rd week	Cellular biomechanics						
4th week	Application of statics to biomechanics						
5th week	Mechanics of hard tissue						
6th week	Mechanics of soft tissues						
7th week	Nano/Micro control for cell mechanics						
8th week	Mid term						
9th week	Introduction to Musculoskeletal biomechanics						
10th week	Upper extremity						
11th week	Spine						
12th week	Hip and knee						
13th week	Foot and ankle						
14th week	Teeth						
15th week	Biomechanical analysis of clinical problems						Exper. with Vicon
16th week	Final term						

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

Instructor
Dept. Chair

Lee, Yeon Soo
Lee, Jong-Hyun


(seal)

SYLLABUS

Classification	Elective	Course No.	24608	Cr. Hrs.	3	Instructor	Lee, Yong-Gu
Course Title	Korean	나노테크놀로지를 위한 시뮬레이션					
	English	Simulations for Nanotechnology					
<u>Course Outline</u> The goal of this course is to learn practices and the theory behind an instrument called optical tweezers for manipulating nanoscale objects and measuring the interplaying forces. Firstly, microscopy is covered as it is the foundation for building this instrument. Secondly, manipulating microscopic objects and measuring picoNewton forces are discussed. Lastly, numerical simulations of laser scattering for computing the trapping forces are covered							
<u>Prerequisite</u>							
<u>Textbook and References</u>		There is no official text.					

<i>Weekly Course Schedule</i>		
<i>Calendar</i>	<i>Description</i>	<i>Remarks</i>
1 st week	Introduction	
2 nd week	Light microscopy -basic light microscopy -phase contrast and darkfield microscopy	
3 rd week	-properties of polarized light and polarization microscopy - DIC, fluorescence, confocal microscopy Microstereolithography	
4 th week	Optical Tweezers Instrumentations Microstereolithography	
5 th week	Manipulations -Scanning laser optical tweezers scanning frequency	
6 th week	-Holographic optical tweezers	
7 th week	Force measurements -Particle tracking	
8 th week	-Optical Tweezers and Trap stiffness	
9 th week	Numerical simulations -Optical Tweezers simulation in the Rayleigh regime	
10 th week	-Optical Tweezers simulation through Ray-Optics	HW #1
11 th week	-Numerical representation of tightly focused beams	HW #2

Yong-Gu Lee, 08-12-10

12 th week	-Optical Tweezers simulation using the Finite Difference Time Difference method	
13 th week	-FDTD simulations for trapping metals	Term project out
14 th week	Final exam	
15 th week	Term project presentation	
16 th week	Term project presentation	

Instructor Lee, Yong-Gu
Dept. Chair Lee, Jong-Hyun



SYLLABUS

Classification	Elective	Course No	24609	Cr. Hrs.	3:0:3	Instructor	Dug Young Kim
Course Title	Korean	비선형 광학					
	English	Nonlinear Optics					

Course Outline

Basic concepts of nonlinear optics and their mathematical expressions will be covered. Applications such as second harmonic generation, electro-optic modulator, all-optical switching, and soliton propagation will be discussed.

Prerequisite	None
Textbook and References	Nonlinear Fiber Optics, G. P. Agrawal Nonlinear Optics, E.G. Sauter Nonlinear Optics, A.C. Newell, J.V. Moloney

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction to Nonlinear optics and its applications	
2nd week	Wave equations	
3rd week	Coupled mode equations for nonlinear optics	
4th week	Anharmonic oscillator model	
5th week	Second harmonic generation (SHG)	
6th week	Optical crystals and susceptibility tensors	
7th week	Parametric amplifiers	
8th week	Electro-optic modulator	
9th week	Third harmonic generation (THG)	
10th week	Optical Kerr effect and Self-phase modulation	
11th week	Cascaded effects	
12th week	Four-Wave-Mixing (FWM)	
13th week	All-optical switching devices	
14th week	Stimulated Raman Scattering (SRS)	
15th week	Stimulated Brillouin Scattering (SBS)	
16th week	Nonlinear pulse propagation	
17th week	Optical solitons	

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

Instructor Dug Young Kim
Dept. Chair Lee, Jong-Hyun



SYLLABUS

Classification	Elective	Course No.	24610	Cr. Hrs.	3	Instructor	Kim, Young Ha
Course Title	Korean	생체의료용 고분자					
	English	Biomedical Polymers					

Course Outline

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.

Prerequisite

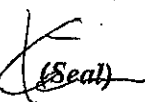
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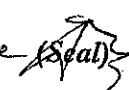
Textbook and References

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Definition and Criteria of Biomaterials	
2nd week	Classification of Materials	
3rd week	Natural Polymers	
4th week	Materials / Body Interactions and Biocompatibility	
5th week	Blood-material Interactions and Coagulation	
6th week	Cardiovascular Application and Blood Compatible Polymers	
7th week	Inflammation and Immune System	
8th week	Wound Healing	
9th week	Hard/Soft Tissue Replacements	
10th week	Surgical Application	
11th week	Ophthalmic Application	
12th week	Dental Application	
13th week	Biodegradable Polymers and Application	
14th week	Tissue Engineering	
15th week	Drug / Gene Delivery Systems	
16th week	Final exam	

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

Instructor Kim, Young Ha  (Seal)

Dept. Chair Jong Hyun Lee  (Seal)

SYLLABUS

Classification	Elective	Course No.	24611	Cr. Hrs.	3	Instructor	Sangyong Jon
Course Title	Korean	바이오크주게이트 화학 I					
	English	Bioconjugate Chemistry I					
Course Outline : Bioconjugate chemistry will be divided into two independent courses: I and II during spring and fall semester, respectively. The course I is intended for students who want to acquire essential knowledge of organic chemistry and reaction. There is no prerequisite for this course because it covers general organic chemistry with the undergraduate level learned in department of chemistry. On the other hand, the course II will cover the principles and actual examples of bioconjugation that has been used in a variety of biological study to date.							
Prerequisite		None					
Textbook and References		To be announced later					
Weekly Course Schedule							
Calendar	Description						Lecturers
1st week	Structure and Bonding : Acids and Bases						Sangyong Jon
2nd week	The Nature of Organic Compounds – Alkane						Sangyong Jon
3rd week	Alkenes and Alkynes						Sangyong Jon
4th week	Aromatic Compounds						Sangyong Jon
5th week	Stereochemistry						Sangyong Jon
6th week	Alkyl Halide						Sangyong Jon
7th week	Alcohols, Ethers, and Phenol						Sangyong Jon
8th week	Aldehydes and Ketones – Nucleophilic Addition Reactions						Sangyong Jon
9th week	Carboxylic Acids and Derivatives						Sangyong Jon
10th week	Amines						Sangyong Jon
11th week	Structure Determination						Sangyong Jon
12th week	Carbohydrate						Sangyong Jon
13th week	Amino Acids, Peptides, and Proteins						Sangyong Jon
14th week	Lipids and Nucleic Acids						Sangyong Jon
15th week	The Organic Chemistry of Metabolic Pathways						Sangyong Jon
16th week	Final Exam						Sangyong Jon

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

Coordinator Sangyong Jon
Dept. Chair Lee, Jong-Hyun



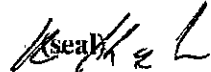
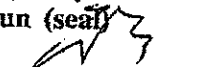
SYLLABUS

Classification	Elective	Course No.	24612	Cr. Hrs.	3:0:3	Instructor	Kangwook Kim
Course Title	Korean	의료시스템공학을 위한 전자공학 개론					
	English	Introduction to Electrical Engineering for Medical System Applications					
<u>Course Outline</u> Fundamentals of electric and electronic engineering for medical system engineers. AC and DC circuit analysis, electronic circuits, logic circuits, communications theory, and electrical safety.							
Prerequisite		None					
Textbook and References		W. H. Roadstrum and D. H. Wolaver, Electrical Engineering for All Engineers					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	Basic circuit concepts - voltage, current, resistance, etc.						
2nd week	DC circuit analysis I						
3rd week	DC circuit analysis II						
4th week	AC circuit analysis I						
5th week	AC circuit analysis II						
6th week	Review and Exam I						
7th week	Electronic circuit components						
8th week	Digital signals and logic I						
9th week	Digital signals and logic II						
10th week	Feedback control systems						
11th week	Communications I						
12th week	Communications II						
13th week	Operational amplifiers I						
14th week	Operational amplifiers II						
15th week	Electrical safety						
16th week	Review and final exam						

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

Instructor Kangwook Kim

Dept. Chair Lee Jong-Hyun

(seal) 
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SYLLABUS

Classification	Research	Course No.	24901	Cr. Hrs.	V	Instructor	academic advisor
Course Title	Korean	석사논문연구					
	English	Research for Master Thesis					
Course Outline Opportunity for advanced MS students to study independently in consultation with their academic advisor.							
Prerequisite		None					
Textbook and References		None					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	None					None	
2nd week							
3rd week							
4th week							
5th week							
6th week							
7th week							
8th week							
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13th week							
14th week							
15th week							
16th week							

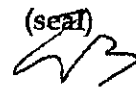
* If there will be experiments, mark it in the "Remarks".

Instructor

(seal)

Dept. Chair Lee Jong-hyun

(seal)



SYLLABUS

Classification	Research	Course No.	24906	Cr. Hrs.	V	Instructor	academic advisor
Course Title	Korean	박사논문연구					
	English	Research for Master Thesis					
Course Outline Opportunity for advanced PhD students to study independently in consultation with their academic advisor.							
Prerequisite		None					
Textbook and References		None					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	None					None	
2nd week							
3rd week							
4th week							
5th week							
6th week							
7th week							
8th week							
9th week							
10th week							
11th week							
12th week							
13th week							
14th week							
15th week							
16th week							

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

Instructor (seal)

Dept. Chair Lee Jong-hyun (seal)

