붙임 #2

SYLLABUS

Classification	Required	*Course No.*	11001	*Hrs.: E: Credits*	1 : 0: 0	*Instructor*	Dug Young Kim Hyunju Lee Sung Yang
Course Title	*Korean*	*정보기전 콜로퀴움*					
	English	*Information & Mechatronics Colloquium*					
Course Outline Inforormation & Mechatronics colloquium introduces a broad range of information and communication and mechatronics research to M.S. and Ph.D students. It is consisted of about 10 seminars by the expert in communication and computer network, photonics, semiconductor, signal processing, computer science.							
Prerequisite							
Textbook and References							

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week		
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 ***Dug Young Kim*** ***(Seal)***

Instructor ***Hyunju Lee*** ***(Seal)***

Instructor ***Sung Yang*** ***(Seal)***

Dept. Chair ***Se Myung Wang*** ***(Seal)***

SYLLABUS

Classification	elective	*Course No.*	11401	*Cr. Hrs.*	3:0:3	*Instructor*	Chang Soo Park
Course Title	*Korean*	광통신 네트워크					
	English	Optical Networks					

Course Outline The organization of this course is as follows: first, the basic information to understand optical technologies applicable to optical networks is introduced including optical fiber, transmission and switching systems, and signal modulation and demodulation. Then, information about network, optical design technologies will be presented with optical access networks of our concern.

Prerequisite	Fiber Optic Communication Systems, G. P. Agrawal
Textbook and References	Optical Networks, R. Ramaswami and K. Sivarajan WDM Optical Networks, C. Murtys and M. Gurusamy

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Introduction to optical networks	
2nd week	Propagations of signals in optical fiber	
3rd week	Optical components	
4th week	Modulation and demodulation	
5th week	Transmission system engineering	
6th week	Client layers of the optical layer	
7th week	WDM network elements	
8th week	Mid term exam	
9th week	WDM network design	
10th week	Control and management	
11th week	Network survivalibity	
12th week	Transport networks	
13th week	Access networks	
14th week	Photonic packet switching	
15th week	Development consideration	
16th week	Final term exam	

** If there will be experiments, describe them in the "Remarks".*

Instructor Chang Soo Park (seal)

Dept. Chair Byeong Ha Lee (seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11402	*Hrs.: E: Credits*	3:0:3	*Instructor*	Hyuk Lim
Course Title	*Korean*	*무선 네트워크*					
	English	*Wireless Networks*					
Course Outline Various topics in wireless networking research area will be covered. First it provides a brief introduction to wireless networking systems such as IEEE 802.11, 802.15, 802.16, wireless sensor networks, and wireless mesh networks. Then, the media access control, ad-hoc routing, and transport, and							
Prerequisite	*11635 컴퓨터 네트워킹 (Computer Networking)*						
Textbook and References	Course handouts will be provided.						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Course overview / network protocol stack	
2nd week	Physical layer discussion	
3rd week	Capacity analysis of wireless networks	
4th week	MAC: Basic/modified ALOHA	
5th week	MAC: Hidden/exposed terminal prob.	
6th week	MAC: P-persistent protocol IEEE 802.11 DCF	
7th week	MAC: Scheduling and fairness	Mid term exam
8th week	MAC: Power/rate/carrier sense control	
9th week	Routing: Proactive ad hoc routing	
10th week	Routing: Reactive ad hoc routing	
11th week	Routing for wireless mesh networks	
12th week	Transport in wireless networks	
13th week	Cross-layer approach	
14th week	Interference mitigation for mesh networks	
15th week	Power saving for wireless sensor networks	
16th week	Topology control for wireless sensor networks	Final term exam

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

Instructor ***Hyuk Lim*** ***(Seal)***

Dept. Chair ***Beyong Ha Lee*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	elective	*Course No.*	11407	*Hrs.: E: Credits*	3:0:3	*Instructor*	Hyunju Lee
Course Title	*Korean*	데이터베이스 시스템					
	English	Database Systems					

Course Outline Large scale data sets have been accumulated for decades and been rapidly increasing in various fields such as internet, biology and biomedicine. It requires advanced technologies in storing and retrieving them. Topics include basics such as data modeling, database query languages, data integrity, transactions and security as well as advanced issues in managing large-scale databases, integration of heterogeneous data sets, and development of tools for mining these databases. Students will be exposed to the construction of large-scale databases with the heterogeneous data sets upon the completion of the class.

Prerequisite	NA
Textbook and References	Silberschatz, Korth, and Sudarshan. ``Database System Concepts'', 5th ed., MacGraw Hill

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Introduction and Relational Model	
2nd week	Query Languages	
3rd week	SQL	
4th week	Entity-Relationship Model	
5th week	Database Schema and Design	
6th week	Storage and File Structure	
7th week	Indexing and Query Processing	
8th week	Query Optimization	Midterm exam
9th week	Transactions	
10th week	Concurrent Control	
11th week	Recovery System	
12th week	Object Oriented Database	
13th week	XML	
14th week	Information Retrieval	
15th week	Data Mining	
16th week	Oracle	

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

Instructor ***Hyunju Lee*** ***(Seal)***

Dept. Chair ***Byeong Ha Lee*** ***(Seal)***

SYLLABUS

Classification	Elective	Course No.	11408	Hrs.: E: Credits	3:0 : 3	Instructor	Young-Dahl Jho
Course Title	Korean	반도체 나노구조 광학					
	English	Optics of semiconductor nano-structures					

Course Outline This is an introductory-level course in the field of optical and optoelectronic properties of semiconductors and their nanostructures. It surveys the basic ideas of quantum mechanics as tools for the application-oriented studies in nano-engineered optoelectronics. Even though the major part of this class is devoted to the properties in conventional semiconductor nanostructures such as quantum wells and quantum dots, newly developed nano-materials (including Carbon nanotubes and graphene, and wide-gap-based nanostructrues) will be introduced as well. This course also contains a series of the presentations by students on the original research papers of their interests in the second half.

Prerequisite	양자역학 (Quantum physics for engineering) 고급 수학 (Advanced Calculus)
Textbook and References	Textbook: 1. Introduction to semiconductor optics- N. Peyghambarian et al. (Prentice-Hall, 1994) 2. Quantum Mechanics: Fundamentals & Applications to Technology-J. Singh (John Wiley & Sons, 1999). Uesful references: The physics of low-dimensional semiconductors: an introduction- J. H. Davies (Cambridge Univ. Press, 1997) Wave mechanics applied to semiconductor heterostructures- G. Bastard (John Wiley & Sons, 1990). Physics of Semiconductors and Their Heterostructures by J. Singh (McGraw-Hill, 1993).

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction and overview: from laser to nanophotonics for semiconductor nanostructures	Textbook 1, chap.2
2nd week	Review of basic concepts in crystals	Textbook 1, chap.3/14/15
3rd week	Optical response and methodologies	Textbook 2, chap.3
4th week	Confinement and density of states	
5th week	GaAs, GaN, and ZnO: the general properties and their related issues	Text1(2) chap.5/6(5)
6th week	Free carriers Vs Excitons	Text1, chap.8
7th week	Quantum wells and doped systems	Text1, chap.9/Mid-term exam
8th week	Quantum wires, nanorods, and quantum dots	Text2, chap. 11
9th week	Magnetic effects and spin-orbit coupling	
10th week	Emerging devices: Graphene	
11th week	Emerging devices: GaN-based LEDs	
12th week	Emerging devices: Solar cells	
13th week	Emerging devices: Photonic crystals	

14th week	Emerging devices: THz devices	presentation assignments
15th week	Student presentations I	
16th week	Student presentations II	

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

Instructor ***Young-Dahl Jho*** ***(Seal)***

Dept. Chair ***Byeongha Lee*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	Elective	Course No.	11409	Hrs.: E: Credits	3:0:3	Instructor	JSLEE
Course Title	Korean	RF 및 무선 시스템 설계					
	English	RF and Wireless System Design					

Course Outline : This is the wireless system design course dedicated for RF IC designers and system level engineers in mobile communications. The analysis method and fundamental theories for wireless system design will be addressed and also some practical examples for the commercial wireless systems are given during the course.

Prerequisite	None
Textbook and References	RF System design of transceivers for wireless communications by Qizheng Gu (Springer)

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction to wireless system	
2nd week	Digital communication standards	
3rd week	Fundamentals – linear and nonlinear system	
4th week	Fundamentals – Noise	
5th week	Fundamentals – Digital modulation	
6th week	Radio Architecture – Superheterodyne	
7th week	Radio Architecture – Zero IF	
8th week	Receiver System – Sensitivity, NF, IMD	
9th week	Midterm exam	
10th week	Receiver System – IP3, Linearity	
11th week	Receiver System – system design	
12th week	Transmitter System – EVM, Linearity, Power	
13th week	Application	
14th week	Special topics – class compensation	
15th week	Special topics – class compensation	
16th week	Final exam	

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

Instructor Jongsoo Lee ***(Seal)***

Dept. Chair Byeong Ha Lee ***(Seal)***

붙임 #2

SYLLABUS

Classification	selective	*Course No.*	11411	*Hrs.: E: Credits*	3:0:3	*Instructor*	Jun, Sung Chan
Course Title	*Korean*	*수치 최적화*					
	English	*Numerical Optimization*					
Course Outline The course aims to provide the students with various numerical optimization techniques and its applications which frequently arise in science and engineering. Solid mathematical approaches as well as numerical algorithm implementation are deeply discussed.							
Prerequisite		Multivariate calculus and basic linear algebra background are required.					
Textbook and References		Numerical Optimization by Jorge Nocedal and Stephen Wright					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Introduction : Classification of Problems, Optimality Conditions	
2nd week	Univariate Optimization : Bisection, Golden Section Search, Fibonacci Search	Quiz
3rd week	Univariate Optimization : Interpolation Methods	
4th week	Unconstrained Optimization : Non-smooth Functions, Gradient Based Methods	Quiz
5th week	Unconstrained Optimization : Second Derivative Methods, Least Squares	
6th week	Constrained Optimization : Lagrange multipliers	Quiz
7th week	Constrained Optimization : Lagrange multipliers	
8th week	Constrained Optimization : Linear Programming	Quiz
9th week	Constrained Optimization : Linear Programming	
10th week	Constrained Optimization : Quadratic Programming	Quiz
11th week	Constrained Optimization : Interior point method	Term Project
12th week	Constrained Optimization : Convex Programming	Quiz
13th week	Global Optimization : Genetic Algorithm	
14th week	Global Optimization : Genetic Algorithm	Quiz
15th week	Wrap-up, Project Presentations by Students	
16th week	Project Presentations by Students	Final Exam

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

Instructor ***Sung Chan Jun*** ***(Seal)***

Dept. Chair ***Byeong Ha Lee*** ***(Seal)***

SYLLABUS

Classification	Elective	*Course No.*	11414	*Cr. Hrs.*	3:0:3	*Instructor*	Jong-In Song
Course Title	*Korean*	고급 아나로그 집적회로 설계					
	English	Advanced Analog Integrated Circuit Design					
Course Outline : This course covers advanced analog integrated circuit design issues including feedback, stability and compensation, nonlinear integrated circuits, fully differential operational amplifier, noise in integrated circuits.							
Prerequisite		Analog integrated circuit design (11627) or equivalent, Basic semiconductor device physics					
Textbook and References		P. Gray, Analysis and design of analog integrated circuits, 3rd ed. John Wiley & Sons, Inc.					

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Design and analysis of feedback circuits	
2nd week	Design and analysis of feedback circuits	
3rd week	Design and analysis of feedback circuits	
4th week	Design and analysis of feedback circuits	
5th week	Stability and compensation of integrated circuits	
6th week	Stability and compensation of integrated circuits	
7th week	Stability and compensation of integrated circuits	
8th week	Design and analysis of nonlinear integrated circuits	Midterm Exam
9th week	Design and analysis of nonlinear integrated circuits	
10th week	Design and analysis of nonlinear integrated circuits	
11th week	Design and analysis of nonlinear integrated circuits	
12th week	Design and analysis of fully differential operational amplifiers	
13th week	Design and analysis of fully differential operational amplifiers	*
14th week	Noise in integrated circuits	*
15th week	Noise in integrated circuits	*
16th week	Noise in integrated circuits	Final Exam

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

Instructor Jong-In Song (seal)

Dept. Chair Byeong Ha Lee (seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11415	*Hrs.: E: Credits*	3:0:3	*Instructor*	Un-Chul Paek
Course Title	*Korean*	*고급공업해석학*					
	English	*Advanced Engineering Analysis*					
Course Outline Review for ordinary differential equations. Fourier analysis and study on partial differential equations. Bessel, Legendre functions and the theory of complex functions are dealt with their applications to the solutions of partial differential equations. The emphasis of the course is primarily							
Prerequisite							
Textbook and References	Textbook: Advanced Calculus for Applications (2nd edition), by F.B. Hildebrand, Prentice Hall. Reference:1) Introduction to Bessel functions, by Bowman, Dover.						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Review of Ordinary Differential Equations	
2nd week	Review of Ordinary Differential Equations	
3rd week	Laplace Transform and Applications to Partial Diff. Eqs.	
4th week	Fourier Transform and Applications to Partial Diff. Eqs.	
5th week	Separation of Variables-Solution of PDE	
6th week	Solution of Laplace Equation	
7th week	Solution of Wave Equation	
8th week	Midterm Exam	
9th week	Solution of Diffusion Equation	
10th week	Bessel Functions	
11th week	Bessel Equations	
12th week	Legengre Polynomials	
13th week	Analyticity of Complex Functions	
14th week	Theory of Residues	
15th week	Contour Integration Applied for Inverse Laplace Transform	
16th week	Final Exam	

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

Instructor ***Un-Chul Paek*** ***(Seal)***

Dept. Chair ***Byeongha Lee*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11419	*Hrs.: E: Credits*	3:0:3	*Instructor*	S. Nooshabadi
Course Title	*Korean*	*임베디드 시스템 설계*					
	English	*Embedded Systems Design*					
Course Outline An introduction to programmer model of computer organization using assembly and machine language. Process of translation from high level language to machine instructions. Number representation, computer arithmetic, instruction sets, I/O interfacing, I/O interrupts, and programming interrupts. Laboratory							
Prerequisite		*Basic Computer programming, Computing Basics*					
Textbook and References		Steve Furber: ARM System On-Chip; 2nd Ed, Addison-Wesley, 2000, ISBN: 0-201-67519-6. We use chapters 2, 3, 5, 6, 8 and 10. Further Text(s) and Reference(s):					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	*Introduction, Course details*	
2nd week	C- language Overview	
3rd week	Programmer View of Computer Architecture	
4th week	Number System	
5th week	C/ASM Operations, Arithmetic, Logical, Shift, Multiply	
6th week	C/ASM Mem Access. Decisions, if, goto, while, case	
7th week	C/ASM Procedures: Conventions, Stack	
8th week	Mid Sem Exam	
9th week	Compiler, Assembler, Linker and Loader, Instruction Decoding	
10th week	Pointers & Arrays	
11th week	Floating Point and Fixed Point Fractions Numbers	
12th week	I/O Interfacing, Exceptions and Interrupts	
13th week	Memory and Bus Organization	
14th week	Cache Memory	
15th week	Virtual Memory	
16th week	Final Examination	

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

Instructor ***Saeidn Nooshabadi*** ***(Seal)***

Dept. Chair ***Byeong Ha Lee*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	Electrive	*Course No.*	11423	*Hrs.: E: Credits*	3:0: 3	*Instructor*	G. Hugh Song
Course Title	*Korean*	수리 물리					
	English	*Mathematical Methods for Physics*					
Course Outline Introduces various topics in the mathematical physics. Emphasis has been placed on the fundamental principles rather than exercise problem solving.							
Prerequisites		*None*					
Textbook and References		*G. H. Song, Principle of Photonics Appendix, G. B. Arfken and Weber*					

Calendar	*Description*	**Remarks*
1st week	Physical units, constants, SI and Gauss systems	
2nd week	Functions and transforms for analsysis	
3rd week	Linear space and scalar product	
4th week	Vector calculus in a flat geometry	
5th week	Traditional orthogonal curvilinear coordinate systems	
6th week	Divergence and curl	
7th week	Green function in electromagnetics	
8th week	Reciprocity & Laplacian operator for Radiative systems	
9th week	Linear second-order differential equations	
10th week	Valid boundary conditions for partial-diff equations of the three types	
11th week	Bessel functions	
12th week	Variational method and Hamilton's principle	
13th week	Euler-Lagrange equations, method of Lagrange multipliers	
14th week	Eigenvalue equations for the Sturm--Liouville system	
15th week	self-adjointness, completeness, Green-function solutions	
16th week	Eigenfunction expansion of Green functions	

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

Instructor *G. Hugh Song* (Seal)

Dept. Chair *Byeong Ha Lee* (Seal)

SYLLABUS

Classification	Elective	*Course No.*	11607	*Cr. Hrs.*	3:0:3	*Instructor*	Dongsoo Har
Course Title	*Korean*	무선통신채널의 해석 및 응용					
	English	Wireless link analysis in modern communication systems					

Course Outline Use of wireless handset for personal communications has been wide spread nowadays. Communication environments for such use of wireless terminals fundamentally determine characteristics of received signal. In order to leverage wave propagation characteristics, practical design for wireless systems is heavily dependent on site specific link analysis. This course will provide tools for wireless link analysis in various real situations and give insights for efficient wireless system design in virtually all type of modern communication environments.

Prerequisite	Electromagnetics related course
Textbook and References	-H.L Bertoni, "Radio Propagation for Modern Wireless Systems" -C.A.Balanis, "Advanced Engineering Electromagnetics"

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Introduction of Wave Propagation in Cellular Environments : Outdoor and Indoor communication channel	
2nd week	Wave propagation characteristics in Line-Of-Sight(LOS) communication channel	
3rd week	Effect of wave propagation modeling on LOS cellular system design	
4th week	Reflection, Transmission and Diffraction Theory of Wave Propagation in Cellular Environments	
5th week	"	
6th week	"	
7th week	2-D and 3-D Wave Propagation Analysis in Dense Urban Environments	
8th week	Midterm Exam	
9th week	Signal Level Prediction with Terrain and Morphology	
10th week	Path Loss Prediction Models for Cellular System Design	
11th week	Effect of Wave Propagation Modeling on Non-LOS Cellular System Design	
12th week	Wave Propagation Characteristics in Indoor Environments : Scattering, Reflection, Transmission, and Diffraction	
13th week	"	
14th week	Wideband Signal Propagation in Indoor Environments and Application of Wave Propagation for Indoor Communication System Design	
15th week	Practice for Predicting Path Loss in Real World	
16th week	Final Exam	

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

Instructor Dongsoo Har (seal)

Dept. Chair Byeong Ha Lee (seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11609	*Hrs.: E: Credits*	3:0:3	*Instructor*	Heung-No Lee
Course Title	*Korean*	*정보 및 부호화 이론*					
	English	*Information and Coding Theory*					
Course Outline *Introduction to advanced information theory; topics covered include entropy, mutual information, data compression, capacity of noisy channels, channel coding theorem, and network information theory. Application of the fundamental information theoretic ideas to multiple antenna communication systems.*							
Prerequisite	*An introductory course on stochastic processes, random variables and probability*						
Textbook and References	*Elements of Information Theory, by Cover and Thomas, Wiley, New York, 2006.*						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	*Introduction to Information Theory, Entropy*	
2nd week	Entropy, Relative Entropy and Mutual Information	
3rd week	Entropy, Relative Entropy and Mutual Information	
4th week	Asymptotic Equipartition Property	
5th week	Asymptotic Equipartition Property/Entropy Rates of a Stochastic Process	
6th week	Entropy rates of Markove Chain	Midterm 1
7th week	Data compression	
8th week	Channel capacity	
9th week	Channel capacity theorems/forward/reverse	
10th week	Differential entropy	
11th week	Gaussian channel capacity	
12th week	MIMO channel capacity theorem	Midterm 2
13th week	Multiple access channel capacity theorem	
14th week	Slepian Wolf	
15th week	Network information theory	
16th week	Network information theory	

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

Instructor ***Heung-No Lee*** (Seal)

Dept. Chair ***Byeong Ha Lee*** (Seal)

SYLLABUS

Classification	Elective	*Course No.*	11611	*Cr. Hrs.*	3:0:3	*Instructor*	Kiseon Kim
Course Title	*Korean*	디지털통신시스템					
	English	Digital Communication Systems					

Course Outline : Introduction of modern digital communication systems and comparison of digital and analog communication systems. Digital source coding, data, voice and image. Hypothetical decision problems to detect, equalize and synchronize digital signals.

Prerequisite	Random Process (11637)
Textbook and References	B. Sklar, Digital communications, 1988, Prentice-Hall Inc.

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Signal and system	
2nd week	Correlation and Spectrum	
3rd week	Linear Systems	
4th week	Communication parameters	
5th week	Midterm Exam	
6th week	Decision and detection	
7th week	Digital Modulation	
8th week	Coherent detection	
9th week	Noncoherent detection	
10th week	Midterm Exam	
11th week	Performance Analysis	
12th week	Synchronization	
13th week	Linear codes	
14th week	Block codes	
15th week	Convolutional code	
16th week	Final Exam	

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

Instructor Kiseon Kim (seal)

Dept. Chair Byeong Ha Lee (seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11617	*Hrs.: E: Credits*	3:0:3	*Instructor*	Kuk-Jin Yoon
Course Title	*Korean*	디지털 영상신호 처리					
	English	*Digital Image Processing*					
Course Outline The course will provide basic concepts, mathematical foundations, and practical techniques for digital image manipulation. It will cover a wide scope of low- and high-level image processing; image formation/acquisition, image models, data structures for image analysis, image representation, pre-processing, image enhancement/restoration, segmentation, shape representation,							
Prerequisite	Elementary Probability / Linear Algebra / Rudimentary Programming						
Textbook and References	Digital Image Processing, 3rd Edition, by Gonzalez and Woods, Prentice Hall Image Processing, Analysis, and Machine Vision, 3rd Edition, by Milan Sonka, Vaclav Hlavac, and Roger Boyle, Thomson Engineering						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Introduction	
2nd week	Digital Image Fundamentals	
3rd week	Transformations and Filtering	
4th week	Image Restoration and Reconstruction	Project Proposal & Presentation
5th week	Color Image Processing	
6th week	Color Image Processing	
7th week	Midterm Exam	
8th week	Representation and Description	
9th week	Image Compression	
10th week	Morphological Image Processing	Interim presentation
11th week	Object Recognition	
12th week	3D Vision and Its Applications	
13th week	Motion Analysis	
14th week	Selected Advance Topics	
15th week	Final Exam	
16th week	Applications: Project Presentation	Presentation & Demo

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

Instructor *Kuk-Jin Yoon* (Seal)

Dept. Chair *Byeong Ha Lee* (Seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11653	*Hrs.: E: Credits*	3:0:3	*Instructor*	Yong-Tak Lee Kamal Alameh
Course Title	*Korean*	*광전자공학*					
	English	*Optoelectronics*					

Course Outline Optical processes in semiconductor, heterojunction, LED, laser diode operation theory and structures, laser diode modulation, photodetectors, optical amplifier, optoelectronic modulation and switching devices, OEICs.

Prerequisite	Semiconductor Physics (11648)
Textbook and References	1. Class Note 2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall, 1994. 3. Selected papers

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Fundamentals of compound semiconductors	
2nd week	Optical processes in semiconductors	
3rd week	Heterojunctions	
4th week	Light emitting diodes	
5th week	Laser diode : Operation theory	
6th week	Laser diode structures	
7th week	Advanced laser diode structure	
8th week	Mid-term Exam	
9th week	Modulation of laser diode	
10th week	Photodiodes : Principle and structure	
11th week	High speed detection techniques	
12th week	Optoelectronic modulator	
13th week	Optical amplifier	
14th week	Optical switch and logic devices	
15th week	Optoelectronic integrated circuits	
16th week	Final Exam	

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

Instructor *Yong-Tak Lee* *(Seal)*

Instructor *Kamal Alameh* *(Seal)*

Dept. Chair *Byeong Ha Lee* *(Seal)*

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11663	*Hrs.: E: Credits*	3:0:3	*Instructor*	Dong-Seon Lee
Course Title	*Korean*	반도체 소자 이론					
	English	*Theory of Semiconductor Devices*					

Course Outline Based on the basic theories of semiconductor physics, advanced dynamic theories associated with various semiconductor device operations will be described in detail. Devices presented in the lecture include the p-n junction diode, heterojuction bipolar transistor, Schottky diode, MESFET, MOSFET, PIN diode, LED, laser diode, HEMT, QW device and etc. Basic principles of essential manufacturing

Prerequisite	Semiconductor Physics (11648)
Textbook and References	Textbook: Class note: References: "Physiscs of Semiconductor Devices" by Michael Shur, "Advanced Theory of Semiconductor Devices" by Karl Hess

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Review of Quantum Physics for Electrons	
2nd week	Band theory for solid-state crystals	Homework (1)
3rd week	Band theory (continued)	
4th week	Band theory (continued)	Homework (2)
5th week	p-n junction diodes	
6th week	Electron transport	
7th week	Electron transport	Homework (3)
8th week	Bipolar junction transistors	Midterm Exam
9th week	MOSFET	
10th week	HEMT/QW Device	Homework (4)
11th week	Device Equations/Simulations	
12th week	Laser Diode	
13th week	Electro-optic interaction	Homework (5)
14th week	CCD/DRAM	
15th week	TFT/LCD	Homework (6)
16th week	Future Devices	Final Exam

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

Instructor ***Dong-Seon Lee*** (Seal)

Dept. Chair ***Byeong Ha Lee*** (Seal)

SYLLABUS

Classification	Elective	*Course No.*	11686	*Cr. Hrs.*	3:0:3	*Instructor*	Dug Young Kim
Course Title	*Korean*	푸리에 광학					
	English	Fourier Optics and Adaptive Optics					

Course Outline : Applications of the Fourier transform and linear systems theory to the analysis of optical systems such as wave propagation, diffraction, coherent and incoherent and incoherent imaging, pattern recognition and holography. Computational work will be emphasized.

Prerequisite	Graduate standing (Any level of graduate student may attend the course)
Textbook and References	Text : Goodman, Introduction to Fourier Optics, McGraw-Hill Referencess : -R.G.Wilson, Fourier Series and Optical Transform Techniques in Contemporary Optics, John Wiley & Sons -B.Bradley, Signal Processing using Optics, Oxford Univ. Press

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Groundwork	
2nd week	Groundwork	
3rd week	Fourier Transformation	
4th week	Fourier Transformation	
5th week	Linear Systems	
6th week	Linear Systems	
7th week	Linear Filters	
8th week	Phasor Representation of Monochromatic Waves	Midterm Exam
9th week	Diffraction	
10th week	Lenses	
11th week	Coherent Image Formation	
12th week	Coherent Image Formation	
13th week	Incoherent Image Formation	
14th week	Incoherent Image Formation	
15th week	Holography and Wavefront Reconstruction	
16th week	Final Exam	

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

Instructor Dug Young Kim (seal)

Dept. Chair Byeong Ha Lee (seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	11694	*Hrs.: E: Credits*	3:0:3	*Instructor*	Woo, Woontack
Course Title	*Korean*	*편재 및 착용형 컴퓨팅*					
	English	*Ubiquitous & Wearable Computing*					
Course Outline A primary goal of this class is to introduce students to research issues in ubiquitous/wearable computing. This class will cover key issues in the areas of ubiquitous/wearble computing, which will be pervasive elements of future computing environment. Basically, we will study the							
Prerequisite	* *Strong interests in smart computing environment* * *Knowledge on AI, HCI, IP/CV/CGAVR, computer network or equivalent will be*						
Textbook and References	There are no text books for this class. We will read topical research papers to supplement class lectures. The readings will be primarily journal articles from the fields of UbiComp, Wearable Computing, HCI, CV, VR/MR(AR & AV), etc.						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Class Overview & Introduction	
2nd week	Context modeling	Preliminary Project Proposal
3rd week	UCAM and beyond	Team Assembly
4th week	Pervasive Sensing & Fusion	
5th week	Midterm I: Discussion on projects	Project Proposal & presentation
6th week	u-Networking & u-Software	
7th week	Multimodal UI & Tangible Bits	
8th week	Context-awareness	
9th week	Social-awareness	
10th week	Midterm II: Discussion on projects	Interim Result Presentation
11th week	Evaluation of ubiComp/WearComp	
12th week	Privacy & Mediation	
13th week	CAMAR in ubiComp	
14th week	The Future of ubiComp/WearComp	
15th week	Possible Examples: Term Project Presentation	Final presentation & demo
16th week	Final Exam	Final report

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

Instructor ***Woontack Woo*** ***(Seal)***

Dept. Chair ***Byeong Ha Lee*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	15400	*Hrs.: E: Credits*	3:0:3	*Instructor*	Yo-Sung Ho
Course Title	*Korean*	*신호처리공학 특론 I : 고급 비디오 부호화 이론과 실습*					
	English	*Special Topics on Signal Processing & Systems I : Advanced Video Coding - Theory and Practice*					
Course Outline This course covers advanced video coding techniques for multimedia applications. After analyzing currently available international video coding standards, including MPEG-4 and H.264/AVC, we are going to discuss new ideas to improve coding efficiency further, especially for multi-view video and ultra-high definition video signals. By implementing all the new ideas in C/C++ codes, we will compare							
Prerequisite	Digital Image Processing, Data Compression, C/C++ Language						
Textbook and References	1. H.264 and MPEG-4 Video Compression (by I. Richardson) 2. Recently published journal papers and MPEG contributions						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Review of Video Coding Basics	
2nd week	H.264/AVC: Main Operations	
3rd week	H.264/AVC: JM Code Analysis	
4th week	Scalable Video Coding	
5th week	Ultra-high Definition Video	
6th week	New Prediction and Transform Methods	
7th week	Adaptive Quantization Methods	
8th week	Video Coding Standards	Midterm Exam
9th week	Multi-view Video Coding	
10th week	Spatio-Temporal Prediction Structure	
11th week	MVC Tools	
12th week	Free View-point TV	
13th week	Depth Map Estimation	
14th week	Virtual View Synthesis	
15th week	JMVC Code Analysis	
16th week	Next Generation Codecs	Final Exam

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

Instructor ***Yo-Sung Ho*** ***(Seal)***

Dept. Chair ***Byeong Ha Lee*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	Elective	Course No.	15401	Hrs.: E: Credits	3:0:3	Instructor	Moongu Jeon
Course Title	Korean	컴퓨터과학 및 공학 특론 I : 영상에 기반한 물체인식					
	English	Special topics on computer science and engineering I: Image-based Object Recognition					
Course Outline	Object recognition is the task of finding a given object in an image or video sequence, and its importance is growing in any field which utilizes computer vision techniques such as mobile robots, video surveillance system, medical diagnostics, and so forth. The main concerns of this course are extracting objects from background, selection features which have discriminative power, and we discuss						
Prerequisite	Image processing, Machine learning						
Textbook and References	1. no textbook is required 2. Pattern Classification, R. O. Duda, P.E. Hart and D.G.Stork, Wiley 3. Published research papers						

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction	
2nd week	Edge detection	
3rd week	Edge detection	
4th week	Segmentation	
5th week	Segmentation	
6th week	Moment	
7th week	Moment	
8th week	Shape context	
9th week	Shape context	
10th week	knn, k-mean, k-medoid	
11th week	SIFT	
12th week	SIFT	
13th week	Students presentation	
14th week	Students presentation	
15th week	Students presentation	
16th week	Students presentation	

** Evaluation Criteria*

For evaluation purposes, the course will comprise

- 5 assignments will be worth 30% of the final mark.

- One term project will be worth 40% of the final mark.

- A midterm exam. will be worth 30% of the final mark.

Instructor ***Moongu Jeon*** (Seal)

Dept. Chair ***Byeong Ha Lee*** (Seal)

SYLLABUS

Classification	optional	Course No.	15403	Cr. Hrs.	3:0:3	Instructor	김강욱
Course Title	Korean	안테나 공학					
	English	Antenna Engineering					

Course Outline

Operation mechanisms of basic antenna types, e.g., linear antennas, aperture antennas, and printed antennas, and their applications. Numerical modeling technique is introduced for antenna design.

Prerequisite	None
Textbook and References	[1] C. A. Balanis, Antenna Theory: Analysis and Design, John Wiley & Sons, Inc. [2] G. Smith, "An Introduction to Classical Electromagnetic Radiation

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Maxwell's equations	
2nd	Electromagnetic planewaves	
3rd	Electromagnetic analogues of some optical principles	
4th	Radiation from charge and current	
5th	Dipole radiation	
6th	Radiation from wire antennas	
7th	Introduction to antenna arrays	
8th	Midterm exam	
9th	Log periodic arrays and Uda-Yagi arrays	
10th	Self and mutual impedances	
11th	Matching techniques	
12th	Horn antennas	
13th	Reflector antennas	
14th	Patch antennas	
15th	Numerical models	
16th	Final exam	

* If there will be experiments, describe them in the "Remarks".

김강욱 (seal)

SYLLABUS

Classification	optional	Course No.	15404	Cr. Hrs. 3:0:3	Instructor	고광희
Course Title	Korean	고급기하 모델링 및 그래픽스를 위한 물리기반 모델링				
	English	Advanced Topics in Geometric and Physics-based Modeling for Graphics				

Course Outline

The goal of this course is to cover advanced topics in geometric modeling and physics-based modeling for computer graphics. First, mathematics for geometric modeling is introduced and various robustness issues in geometric modeling are discussed. The second part of the course deals with modeling and simulation of natural phenomena using physics-based modeling techniques, including oceans, landscapes, clouds, snows, plants, cloths, smoke, fires, etc.

Prerequisite	Computer Programming (C and C++), CAD/CAM, Computer Graphics, Numerical Methods, Calculus, Physics
Textbook and References	Lecture notes and reference papers

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Differential Geometry I	
2nd	Differential Geometry II	
3rd	Arithmetic Systems I	
4th	Arithmetic Systems II	
5th	Robustness in Numerical Computation I	
6th	Robustness in Numerical Computation II	
7th	Robustness in Geometric Modeling I	
8th	Robustness in Geometric Modeling II	
9th	Robustness in Geometric Modeling III	
10th	Physics-based Modeling: Introduction	
11th	Modeling of Oceans and Landscapes	
12th	Modeling of Clouds and Snows	
13th	Modeling of Plants and Cloths	
14th	Modeling of Fracture and Smoke	
15th	Modeling of Explosion and Fire	
16th	Modeling of Water and Smoothed Particle Hydrodynamics	

* If there will be experiments, describe them in the "Remarks".

그래픽스

(seal)

SYLLABUS

Classification	optional	Course No.	15421	Cr. Hrs.	3:0:3	Instructor	양승
Course Title	Korean	BioMEMS/BioNEMS 응용을 위한 미세유체역학					
	English	Microfluidics for BioMEMS/BioNEMS applications					

Course Outline

Microfluidics is the study of flow phenomena at small length scales with characteristic channel dimensions typically less than the diameter of a human hair. Small length scale effects become important as surface forces such as viscous drag and surface tension govern flow behavior rather than body forces (inertia) as seen in macroscale fluid mechanics. Miniaturization of fluid handling systems also allows the development of micro Total Analysis Systems (μTAS) or so called "lab on a chip" which combines biological sample preparation, separation and analysis in a single device. Topics explored in this class include: Basic Concepts in Microfluidics, Governing equations for Microfluidics/Basic Flow solutions, Hydraulic Resistance and Compliance, Diffusion, Time-dependent Flow, Capillary Effects, Electrohydrodynamics, Electroosmosis, Dielectrophoresis, Magnetophoresis, Thermal Transfer, Two-phase Flow, Optofluidics, Nanofluidics. As a final step of this class, students will conduct their ow

Prerequisite	Engineering Mathematics (Preferred), Fundamentals of Fluid Mechanics (Preferred), General Biology (preferred)
Textbook and References	Text and Reference Books 1. "Theoretical Microfluidics," Henrik Bruus, Oxford University Press, 2008. 2. "Transport Phenomena in Biological Systems", George A. Truskey, Fan Yuan, and David F. Katz, Pearson Prentice Hall Bioengineering, 2004. 3. "Transport Phenomena," Revised 2nd edition, R

Weekly Course Schedule

Calendar	Description	Remarks
1st	Basic Concepts in Microfluidics	
2nd	Governing equations for Microfluidics/Basic Flow solutions	
3rd	Hydraulic Resistance and Compliance	
4th	Diffusion	
5th	Time-dependent Flow	
6th	Capillary Effects	
7th	Mid-term Exam	
8th	Electrohydrodynamics	
9th	Electroosmosis	
10th	Dielectrophoresis	
11th	Magnetophoresis	
12th	Thermal Transfer	
13th	Two-phase Flow	
14th	Optofluidics	
15th	Nanofluidics	
16th	Term Paper Presentation/ Final Exam	

* If there will be experiments, describe them in the "Remarks".

(seal)

붙임 #2

SYLLABUS

Classification	Elective	Course No.	1545	Hrs.: E: Credits	3:0:3	Instructor	Sohee Kim
Course Title	Korean	유한요소해석					
	English	Finite Element Analysis and Simulations					

Course Outline *The finite element method to solve differential equations for engineering problems is introduced. Theoretical basis and concepts of FEM are covered with 1-D and 2-D problems. Practical approaches to FE analysis of structural, thermal, mechanical as well as multiphysics problems are covered. Element types, boundary conditions, mesh generation, and modeling considerations are discussed by using commercial finite element software.*

Prerequisite	
Textbook and	Introduction to Finite Element Analysis and Design, Kim & Sankar

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction to FEM	
2nd week	Theoretical background of FEM	
3rd week	FE analysis of 1-D problems	
4th week	FE analysis of 1-D problems	
5th week	FE analysis of 2-D problems	
6th week	Weak form and discretization	
7th week	FE matrix equation and solver	
8th week	Mid-term exam	
9th week	FE analysis of beams and frames	
10th week	FE analysis of heat conduction	
11th week	FE analysis of heat convection	
12th week	FE analysis of plane solids	
13th week	FE procedures and modeling	Lab practice
14th week	FE procedures and modeling	Lab practice
15th week	Multiphysics FE analysis	
16th week	Presentation and final exam	

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

Instructor Sohee Kim ***(Seal)***

Dept. Chair Wang, Se-Myung ***(Seal)***

SYLLABUS

Classification	optional	Course No.	15617	Cr. Hrs.	3:0:3	Instructor	이 용구
Course Title	Korean	소프트웨어 엔지니어링					
	English	Software Engineering					

Course Outline

The methodology for developing successful industry strength application software including: requirement analysis, design, prototype development, implementation, testing, evolution will be covered. MS-Visual Studio 2008 Team Suite/Team Foundation Server will be used for course term project.

Prerequisite	Basic understanding of computer programming.Important: You should not have taken Software Engineering course previously as an undergraduate or equival
Textbook and References	Professional Visual Studio 2005 Team System, Jean-Luc David et al, Wiley Publishing, 2006 Professional Team Foundation Server, Jean-Luc David et al, Wiley Publishing Inc 2007 Software Engineering (8th edition), Ian Sommerville, Addison-Wesley, 2007

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Software processes	
2nd	Project management - Team foundation architecture	
3rd	- Working with VM from Host PC- Users and groups permissions setting- Project management tools	
4th	- Team reportingConfiguration management- Team foundation version control- Team build	
5th	Software requirements - UML-Use Cases - UML-Sequence Diagrams	
6th	Object-Oriented Design - UML-Class Diagram	
7th	- Class diagramming with Visual Studio	Term project proposal
8th	Mid exam	
9th	Verification and validation- Application verifier	
10th	- Refactoring and Code Snippets	
11th	- Profiling and performance	
12th	Software testing - Test case management- Unit testing	Term project progress report
13th	- Manual testing- Generic testing	
14th	Rational rose for visual studio	
15th	Final exam	
16th	Term project presentation	

* If there will be experiments, describe them in the "Remarks".

이용구 과장

(seal)

SYLLABUS

Classification	Elective	Course No.	15620	Hrs.: E: Credits	3:0:3	Instructor	Park, Kyi Hwan
Course Title	Korean	센서 및 액츄에이터					
	English	Sensor & Actuator					

Course Outline This course covers principles of different transducer and integration with actuator. The main topics are : theory of transducers, actuators and measurement methods of mechanical, electrical, optical quantities. The principle and design of sensor systems like laser, radiometer, mm-wave radar is also covered.

Prerequisite	None
Textbook and References	Handout Mechatronics by D.A. Bradley, Chapman & Hall

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Transducer Fundamentals	
2nd week	Solid-mechanical sensor & measurement	
3rd week	〃	
4th week	Fluid-mechanical sensor & measurement	
5th week	〃	
6th week	Electrical and magnetic sensor	
7th week	Optical sensor & measurement	
8th week	Thermal sensor	
9th week	Interference and noise	
10th week	Actuator & driver	
11th week	Linear system	
12th week	Rotational drives	
13th week	Motion converters	
14th week	Systems & design	
15th week	〃	
16th week	Final Exam	

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

Instructor Park, Kyi Hwan (Seal)

Dept. Chair Wang, Se-Myung (Seal)

SYLLABUS

Classification	elective	Course No.	15622	Cr. Hrs.	3.0	Instructor	Ryu, Je Ha
Course Title	Korean	디지털 제어 시스템					
	English	Digital Control System					

Course Outline

This course focuses on basic theory about the analysis and design of digital control systems as well as on the use of digital computers in the real-time control of dynamic systems. Major topics include review of continuous control, discrete systems analysis, sampled-data systems, digital controller design, sample rate selection, system identification, and microcomputer and PC implementation

Prerequisite	Automatic Control
Textbook and References	1)Digital Control of Dynamic Systems, 3rd Ed., Addison-Wesley, 1998, by Gene F. Franklin, J. David Powell, and Michael L. Workman 2)Digital Control Systems: Theory, Hardware, Software, 2nd Ed., McGraw-Hill, 1992, by Constantine H. Houpis and G. B. Lamont 3)Control System Design using MATLAB, Pren

Weekly Course Schedule

Calendar	Weekly Course Schedule	*Remarks
1st week	Review of Continuous Control	
2nd week	Review of Continuous Control	
3rd week	Introductory Digital Control	
4th week	Discrete Systems Analysis	
5th week	Discrete Systems Analysis	
6th week	Sampled-Data Systems	
7th week	Sampled-Data Systems	
8th week	Discrete Equivalents	
9th week	Mid Term Exam	
10th week	Design Using Transform Techniques	
11th week	Design Using Transform Techniques	
12th week	Sample Rate Selection	
13th week	Sample Rate Selection	
14th week	System Identification	
15th week	Computer Implementation Lab	
16th week	Final Exam	

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

Instructor Ryu, Je Ha (Seal)

Dept. Chair Wang, Se Myung (Seal)

SYLLABUS

Classification	Elective	*Course No.*	15628	*Hrs.: E: Credits*	3:0:3	*Instructor*	Shin Vladimir
Course Title	*Korean*	*다이나믹 시스템의 통계 분석*					
	English	*Statistical Analysis of Dynamic Systems*					

Course Outline *The course is designed for MS engineering students and postgraduates of universities. It may be also useful for engineers in the field of communication, control theory, and applied mechanics studying the dynamic systems subjected to random disturbances (noise input).*

Prerequisite	*Basic MS courses of «Linear and Matrix Algebra», and «Probability Theory»*
Textbook and References	*(1) Wong, E. (1983). Introduction to Random Processes. Springer-Verlag, NY.* *(2) Peyton Z. Peebles (2001). Probability, Random Variables, and Random Signals Principles. McGraw-Hill, Inc.* *(3) Soong, T.T. (1973). Random Differential Equations in Science and Engineering. Academic Press, NY.* *(4) Pugachev, V.S. and Sinitsyn, I.N. (1987). Stochastic Differential Systems. John Wiley & Sons Ltd.*

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	*Introduction to the course. The random process (r.p) concept. Correlation functions. Finite-dimensional distributions. Moments of a r.p.*	Examples
2nd week	Gaussian and Poisson random processes. Orthogonal expansions of finite-dimensional densities of r.p. White noise. Integrals containing white noise. Derivatives of a white noise.	Examples
3rd week	Stationary r.p. Characteristics of stationary r.p. Spectral theory of stationary r.p. Linear operations on stationary r.p.	Examples
4th week	Introduction to statistical analysis of dynamic systems. Analysis of linear stochastic systems.	Examples
5th week	Analysis of linear stochastic systems (continue).	Examples
6th week	Analysis of linear stochastic systems with nonwhite noise	Examples
7th week	Nonlinear stochastic systems. Fokker-Plank equation. Probability of achievement of boundary.	Examples
8th week	Exact solutions of Fokker-Plank equation. Noise-free systems with random initial value.	Examples
9th week	9th week Moments and cumulants of the state vector. Equations for moments and cumulants.	Examples
10th week	Normal approximation method	Examples
11th week	Statistical linearization method and its generalizations	Examples
12th week	Parametrization of distributions. Method of moments.	Examples

13th week	Reliability of stochastic systems. Evaluation of probability of reliability.	Examples
14th week	Stochastic stability of dynamic systems	Examples
15th week	Simulation of dynamic systems with random noises.	Examples
16th week	Numerical solution of stochastic differential equations. Monte-Carlo method.	Examples

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

Instructor ***Shin Vladimir*** ***(Seal)***

Dept. Chair ***Wang, Se-Myung*** ***(Seal)***

SYLLABUS

Classification	elective	Course No.	15643	Hrs.: E: Credits	3:0:3	Instructor	Kwang Mong Sim
Course Title	Korean	인공지능과 응용					
	English	Artificial Intelligence and applications					

Course Outline *This course will cover fundamental topics in Artificial Intelligence (AI) and AI applications to engineering problems. Major AI topics covered include logic and search techniques, planning, learning methods, knowledge representation schemes, and expert systems. Application of AI techniques to engineering problems such as AI based design and natural language understanding will be addressed. Students will also learn AI languages, and will be exposed to a broad background in Artificial Intelligence as well as hands on experience in using AI tools*

Prerequisite	Background on computer programming languages
Textbook and References	1. Winston. P. H. Artificial Intelligence. 4th Edition. Addison Wesley, 1998. 2. E. Rich & K. Knight. Artificial Intelligence, 2/e, McGraw Hill, 1991.

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Overview	
2nd week	Logics	
3rd week	Search Techniques (I)	
4th week	Search Techniques (II)	
5th week	Rule-based Systems	
6th week	Knowledge representation, Frames, and their applications	
7th week	AI langauge (I)	
8th week	AI langauge (II)	
9th week	AI langauge (III)	
10th week	AI langauge (IV)	
11th week	Logic and Theorem Proving	
12th week	Learning	
13th week	Natural Language Understanding	
14th week	Planning	
15th week	Student presentation	
16th week	Exam	

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

Instructor ***Kwang-Mong Sim***

Dept. Chair ***Byeongha Lee***

SYLLABUS

Classification	optional	Course No.	15671	Hrs.:E.:Crs	3 : 0 : 3	Instructor	김용욱
Course Title	Korean	UWB 레이더시스템 신호					
	English	UWB Radaer System & Signal					

Course Outline

UWB system uses many areas like radar, communication and medical instrument to get extreme high resoulution and high data communication. In this lecture, introduce the Ultra-wideband system and the characteristics of UWB signal and its application. The advantages of UWB signal to get very high resolution imaging and the method of imaging radar system.

Prerequisite	Signal processing, Electromagnetics
Textbook and References	1. High Resolution Radar, D.R.Wehner, 2nd Ed, Artech 2. Understanding Ultra Wide Band: Radio Fundamental, Maria Gabriella, PreticeHall 3. Introduction to Ultra-Wideband Radar Systems, J. Tayler, CRC

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Ultra Wideband Radio Definition, Properties of UWB Signal	
2nd	Generation of UWB Waveforms	
3rd	PSD of UWB Signals	
4th	UWB Radar System	
5th	High Resolution Radar	
6th	Transmitter Signature and Target Signature of Radar Signal	
7th	UWB Channel Receivers	
8th	UWB Ranging and High Resolution Radar System	Mid term exam
9th	High Resolution Radar Design	Start term Project
10th	Matched Filter and Ambiguity Function	
11th	High Range Resolution Wave Form	Radar imaging experiment
12th	Chirp pulse compression	
13th	Signal Processing of Ultra-wideband Signal for High Resolution	
14th	Synthetic High-Range Resolution	
15th	Extension of Signal Bandwidth for High Resolution: Frequency Hopping	Present term project
16th	Semester Exam	

* If there will be experiments, describe them in the "Remarks".

Instructor (seal)

Dept. Chair (seal)

SYLLABUS

Classification	Elective	*Course No.*	15674	*Hrs.: E: Credits*	3:0:3	*Instructor*	Ahn, Hyo-Sung
Course Title	*Korean*	지능제어이론					
	English	*Intelligent Control Theory*					

Course Outline *In this course we study intelligent control systems. Intelligent control is a control system that makes use of conventional control methodologies to solve lower level control problems. Intelligent control attempts to build upon and enhance the conventional control methodologies to solve new challenging control problems (from report of the Task Force on Intelligent Control, IEEE control systems society). There is no common definition for intelligent control; however it is widely accepted that intelligent control includes neural network, fuzzy logic, computational intelligence, evolutionary algorithms, and learning. In this course, we study core ideas of these intelligent control methodologies, and apply these theories to actual mobile robotics applications in a control perspective.*

Prerequisite	*Undergraduate-level Control Courses (Required), Graduate-level linear systems (Preferred)*
Textbook and References	*TextBook* *1. "Computational intelligence Principles, Techniques and Appl.", Amit Konar, Springer, 2005* *2. "Neural networks: A classroom approach", Satish Kumar, McGraw Hill, 2005* *3. "Introduction to Fuzzy Logic using MATLAB", S. N. Sivanandam, S. Sumathi, and S. N. Deepa, Springer, 2006* *Grading* *Weekly Homework Assignment (20%), Midterm Exam (20%), Final Exam (20%), Project 1 (10%), Project 2 (10%), Project 3 (20%)*

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Introduction: Definitions, motivations, challenges in control systems	
2nd week	Neural networks: Supervised learning	
3rd week	Neural networks: Supervised learning	Submission Due of Project Proposal
4th week	Neural networks: Un-supervised learning	
5th week	Neural networks: Self-organizing	
6th week	Reinforcement learning	
7th week	1-st project presentations & mid-exam	
8th week	Fuzzy sets & relations	
9th week	Membership functions & Fuzzy control systems	
10th week	Fuzzy control applications	
11th week	2-nd project presentations	
12th week	Evolutionary computation	

13th week	Evolutionary computation	
14th week	Computational intelligence in mobile robotics	
15th week	Learning control	
16th week	Final project presentations & final exam	

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

Instructor Ahn, Hyo-Sung (Seal)

Dept. Chair Wang, Se-Myung (Seal)

SYLLABUS

Classification	elective	Course No.	15678	Cr. Hrs.	3.0	Instructor	Choi, Tae Sun
Course Title	Korean	로봇 비젼					
	English	Robot Vision					

Course Outline

The Principles of the Machine/Robot Vision are introduced. It covers image formation, pattern classification, motion, and optical effect for object recognition. Also, the design technology of the Robot Vision System with optical device is studied.

Prerequisite	Digital Signal Processing, Image Processing
Textbook and References	1. Robot Vision, B.K.P. Horn, MIT Press 2. Computer Vision, Dana Ballard and Christopher Brown, Prentice Hall

Weekly Course Schedule

Calendar	Weekly Course Schedule	*Remarks
1st week	Image Formation & Image Sensing	
2nd week	Binary Images : Geometrical Properties	
3rd week	Binary Images : Topological Properties	
4th week	Regions & Image Segmentation	
5th week	Image Processing : Continuous Images	
6th week	Image Processing : Discrete Images	
7th week	Edges & Edge Finding	
8th week	Lightness & Color	
9th week	Reflectance Map : Photometric Stereo	
10th week	Reflectance : Shape from Shading	
11th week	Motion Field & Optical Flow	
12th week	Photogrammetry & Stereo	
13th week	Pattern Classification	
14th week	Polyhedral Objects	
15th week	Extended Gaussian Images	
16th week	Passive Navigation & Structure from Motion	

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

Instructor Choi, Tae Sun (Seal)

Dept. Chair Wang, Se Myung (Seal)

SYLLABUS

Classification	elective	Course No.	03604	Cr. Hrs.	3.0	Instructor	Park, Ji-woong
Course Title	Korean	고분자 형태학					
	English	The Morphology of Polymers					

Course Outline

Structure of noncrystalline, crystalline and liquid crystalline polymers, including polymer blends and block polymers. Texture development from processing operations, mechanical deformation, and applied electric and magnetic fields. Hybrid organic -inorganic nano and microcomposites. Phase transformations, including classical nucleation theory and spinodal decomposition. Use of morphological characterization methods such as wide- and small angle x-ray scattering and scanning, transmission and stomic force microscopy are also covered.

Prerequisite	N/A
Textbook and References	'The structure of materials', S. M. Allen, E. L. Thomas,

Weekly Course Schedule

Calendar	Weekly Course Schedule	*Remarks
1st week	The structure of materials: Overview	
2nd week	Noncrystalline state-I	
3rd week	Noncrystalline state-II	
4th week	The crystallography of two dimensions	
5th week	The crystallography of two dimensions	
6th week	The crystallography of three dimensions	
7th week	The crystallography of three dimensions	
8th week	Mid-term exam.	
9th week	Liquid crystalline state-I	
10th week	Liquid crystalline state-II	
11th week	Homopolymers, Conformation, Configuration	
12th week	Polymer blends, Mixing and Unmixing	
13th week	Self assembly of copolymers	
14th week	"Characterization of polymer morphology(AFM, TEM, SEM, X-ray scattering)"	
15th week	"Characterization of polymer morphology(AFM, TEM, SEM, X-ray scattering)"	
16th week	"Characterization of polymer morphology(AFM, TEM, SEM, X-ray scattering)"	

if there will be experiments, mark it in the *Remarks

Instructor Park, Ji-woong (Seal)

Dept. Chair Cho, Beong Ki (Seal)

SYLLABUS

Classification	optional	Course No.	03612	Cr. Hrs. 3:0:3	Instructor	김영하
Course Title	Korean	생체적합성				
	English	Biocompatibility				

Course Outline

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	Introduction for biomaterials and biocompatibility	
2nd	Proteins	
3rd	Proteins-surface interactions	
4th	Blood	
5th	Blood coagulation	
6th	Blood coagulation	
7th	Inflammation?	
8th	infection	Mid-term Exam
9th	Immune reaction	
10th	Immune reaction	
11th	Complement activation	
12th	Wound healing	
13th	Tissue response	
14th	Cellular response to polymers	
15th	Surface and Physiological Environment	
16th	Final Exam	

*** If there will be experiments, describe them in the "Remarks".**

Kim, Young-Ha ~~(seal)~~

(seal)

SYLLABUS

Classification	elective	Course No.	03619	Cr. Hrs.	3.0	Instructor	Tae, Giyoong
Course Title	Korean	생화학특론					
	English	Biochemistry					

Course Outline

This course is to provide the key concepts of biochemistry, covering physical chemistry concepts in biological molecules, and structures and functions of biological molecules (proteins and genetic materials)

Prerequisite	None
Textbook and References	Biochemistry (Stryer et al.) Molecular Biology of the Cell (Alberts et al.) Evaluation: Midterm(20%), Final(30%), Quiz(30%), and Term Paper(20%)

Weekly Course Schedule

Calendar	Weekly Course Schedule	*Remarks
1st week	Introduction and basic cell structure	
2nd week	Amino acids and proteins	
3rd week	Enzymes	
4th week	Nucleic acids and genetic flow	
5th week	Lipids and membrane transports	
6th week	Ion Channel & Pump	
7th week	Signal transduction	
8th week	Mid-term exam	
9th week	Sensory system & molecular motors	
10th week	Immune systems	
11th week	Carbohydrates & metabolism	
12th week	Glycolysis	
13th week	Cytric acid cycles	
14th week	Electron transport and oxidative phosphorylation	
15th week	Topic presentation	
16th week	Final exam	

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

Instructor Tae, Giyoong (Seal)

Dept. Chair Cho, Beong Ki (Seal)

SYLLABUS

Classification	optional	Course No.	03623	Cr. Hrs.	3:0:3	Instructor	Lee, Kwanghee
Course Title	Korean	유기물광전자 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	Introduction to Organic Electronics	
2nd	Electrical Properties of Semiconducting Organic Materials	
3rd	Optical Properties of Semiconducting Organic Materials	QUIZ 1
4th	Semiconducting Device Physics I : Basics	
5th	Semiconducting Device Physics II : P-N Junction Theory	
6th	Semiconducting Device Physics III : Organic Electronics	QUIZ 2
7th	Organic Light-Emitting Devices I	
8th	Organic Light-Emitting Devices II	MIDTERM
9th	Organic Solar Cells I	
10th	Organic Solar Cells II	
11th	Organic Field-Effect Transistor I	
12th	Organic Field-Effect Transistor II	QUIZ 3
13th	Organic Circuit I	
14th	Organic Circuit II	
15th	Organic Memory Devices	
16th	Organic Photonics Materials: Lasers and NLO	FINAL

*** If there will be experiments, describe them in the "Remarks".**

Lee, Kwanghee (seal) Kwanghee Lee

(seal)

붙임 #2

SYLLABUS

Classification	Optional	Course No.	03643	Hrs.: E: Credits	3:0:3	Instructor	Park, Seong-Ju
Course Title	Korean	박막제조공정					
	English	Thin Film Technology					

Course Outline The subject of this lecture is the study of the vacuum technology, preparation and etching of thin films, and their mechanisms. Growth/etching mechanisms and properties of thin films based on the thermodynamics and molecular theory will be lectured. Following topics will be included: vacuum technology, preparation and etching of thin films, mechanisms of film formation and plasma etching, characterization of thin films, properties of thin films, epitaxy, applications of thin films.

Prerequisite	None
Textbook and	Materials Science of Thin Films, Milton Ohring, Academic Press, 2002

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Vacuum Science and Technology	
2nd week	Vacuum Science and Technology	
3rd week	Thin-Film Evaporation Processes	
4th week	Discharges, Plasma, and Ion-Surface Interactions	
5th week	Plasma and Ion Beam Processing of Thin Films(deposition/etching)	
6th week	Plasma and Ion Beam Processing of Thin Films(deposition/etching)	
7th week	Plasma and Ion Beam Processing of Thin Films(deposition/etching)	
8th week	Chemical Vapor Deposition	Midterm exam
9th week	Chemical Vapor Deposition	
10th week	Substrate Surfaces and Thin-Film Nucleation	
11th week	Epitaxy	
12th week	Epitaxy	
13th week	Film Structure	
14th week	Characterization of Thin Films and Surfaces	
15th week	Characterization of Thin Films and Surfaces	
16th week	Characterization of Thin Films and Surfaces	Final exam

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

Seong-Ju Park Seongju Park (Seal)

(Seal)

SYLLABUS

Classification	optional	Course No.	03644	Cr. Hrs.	3:0:3	Instructor	장윤희
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 (67%) + lab report / homework / class participation (33%)

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	Kick-off meeting + Introduction	
2nd	Quantum postulates and the Schr?dinger equation	
3rd	Particle in a box and Tunneling	
4th	Harmonic oscillator and Vibrations	
5th	Particle on a sphere and Rotations	
6th	The hydrogen atom and hydrogen-like atoms	Computer lab
7th	Spins and Antisymmetry	Mid-term exam
8th	Many-electron atoms and Hartree-Fock method	Computer lab
9th	LCAO-MO method and Basis sets	Computer lab
10th	Chemical bonding in diatomic molecules	Computer lab
11th	Chemical bonding in polyatomic molecules	Computer lab
12th	Density functional theory (DFT)	Final Exam
13th	Calculation: Molecular structures	Computer lab / Project
14th	Calculation: Vibrational frequencies and IR/Raman	Computer lab / Project
15th	Calculation: Relative energies and thermochemistry	Computer lab / Project
16th	Calculation: Chemical reactivity	Computer lab / Project

*** If there will be experiments, describe them in the "Remarks".**

Jang, Yun-Hee ~~(seal)~~

(seal)

SYLLABUS

Classification	elective	Course No.	03648	Cr. Hrs.	3.0	Instructor	Noh, Do Young
Course Title	Korean	고급 X-ray 회절론					
	English	Modern X-ray Diffraction					

Course Outline

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. Jens Als-Nielsen, Element of Modern X-ray physics 2. B. E. Warren X-ray Diffraction 3. B. D. Cullity Elements of X-ray Diffraction

Weekly Course Schedule

Calendar	Weekly Course Schedule	*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 (Seal)

Dept. Chair Cho, Beong Ki (Seal)

SYLLABUS

Classification	optional	Course No.	03683	Cr. Hrs.	3:0:3	Instructor	이 탁희
Course Title	Korean	나노전자학					
	English	Nanoelectronics					

Course Outline

Electronic properties of quantum nanostructures will be studied in this lecture. Nanofabrication and measurement techniques of nanostructuers 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 Heinzel, Ref: Nanoelectronics and Information Technology, edited by Rainer Waser

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Nanoelectronics: Introduction	
2nd	Mesoscopic transport: Overview, key issues	
3rd	Experimental techniques: Fabrications	
4th	Experimental techniques: Measurements	
5th	Quantum Electronic Effects: Heterostructures	
6th	Quantum Electronic Effects: Surfaces, interfaces	
7th	2-dim quantum films: Deposition methods	
8th	2-dim quantum films: Quantum wells	
9th	2-dim quantum films: Magnetotransport	
10th	1-dim quamtum wires: Ballistic transport	
11th	1-dim quamtum wires: Landuaer formalism	
12th	1-dim quamtum wires: Nanowires, Nanotubes	
13th	1-dim quamtum wires: Organic wires	
14th	0-dim quantum dot: Fabrication, overview	
15th	0-dim quantum dot: Single electron tunneling	
16th	Final exam	

*** If there will be experiments, describe them in the "Remarks".**

Lee Takchee (seal)

(seal)

SYLLABUS

Classification	elective	Course No.	03684	Cr. Hrs.	3.0	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 Microelectonic Fabrication", edited by Stephen A. Campbell "Handbook of VLSI Microlithography", edited by Glendinning

Weekly Course Schedule

Calendar	Weekly Course Schedule	*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,	
10th week	Self-assembly lithography	
11th week	Immersion lithography, Dip-pen lithography	
12th week	Ion-beam lithography, Interference lithography	
13th week	Wet etching process	
14th week	Wet etching process, Dry-etching process	
15th week	Dry-etching process, Selective etching process	
16th week	Overview of current silicon technology development	

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

Instructor Jung, Gun Young (Seal)

Dept. Chair Cho, Beong Ki (Seal)

SYLLABUS

Classification	optional	Course No.	03687	Cr. Hrs.	3:0:3	Instructor	김동유
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	Introduction of organic materials for electronics	
2nd	and optoelectronics	
3rd	Organic molecules - Conducting polymers	
4th	Semiconducting materials for OLED, OTFT and OSC	
5th	Hole transport materials for OLED	
6th	Electron transport materials for OLED	
7th	Emitting materials for OLED I	
8th	Emitting materials for OLED II	
9th	Emitting materials for OLED III	
10th	Mid-term Exam	
11th	Host-guest molecules	
12th	P-type small molecule materials for OTFT	
13th	P-type polymers for OTFT	
14th	N-type materials for OTFT	
15th	Semiconductors for bulkheterojunctionn OSC	
16th	Donor and acceptor materials for bulkheterojunctionn OSC	

*** If there will be experiments, describe them in the "Remarks".**

Kim, Dong-Yu (seal)

SYLLABUS

Classification	Elective	*Course No.*	03689	*Hrs.: E: Credits*	3:0:3	*Instructor*	Hwang, Hyunsang, Alex Ignatiev
Course Title	Korean	반도체 메모리 소자					
	English	Semiconductor memory device					

Course Outline - Introduction of semiconductor memory devices (DRAM/FLASH) technology and scaling issues
- Device physics of various new memory devices (SONOS, ReRAM, PRAM, MRAM)
- Study on patents map of memory devices and processes

Prerequisite	N/A
Textbook and References	W.D. Brown & J.E. Brewer, ""Nonvolatile Semiconductor Memory Technology,"" IEEE Press (1998)

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	memory technology overview	
2nd week	DRAM device technology	
3rd week	DRAM scaling issue-1	
4th week	DRAM scaling issue-2	
5th week	FLASH device technology	
6th week	FLASH scaling issue-1	
7th week	FLASH scaling issue-2	
8th week	Future memory overview & Mid-term Exam	
9th week	Patent analysis and Patent Map-1	
10th week	Patent analysis and Patent Map-2	
11th week	SONOS/Nano-dot FLASH	
12th week	ReRAM-1	
13th week	ReRAM-2	
14th week	PRAM	
15th week	MRAM	
16th week	Patent Map & Final Exam	

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

Instructor *H. Hwang* (Seal)
Alex Ignatiev (Seal)

Dept. Chair (Seal)

붙임 #2

SYLLABUS

Classification	Elective	*Course No.*	03690	*Hrs.: E: Credits*	3:0:3	*Instructor*	Ko, Heung Cho
Course Title	Korean	플렉시블 전기전자 재료 및 응용					
	English	Flexible Electronics: Materials and Applications					
Course Outline	- Introduction of flexible electronic devices. - Study on inorganic/organic materials for flexible devices. - Application of flexible electronic devices.						
Prerequisite	N/A						
Textbook and References	Flexible Electronics: Materials and Applications by William S. Wong, Alberto Salleo						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Overview of Flexible Electronics Technology	
2nd week	Mechanical Theory of the Film-on-Substrate	
3rd week	Silicon-based Thin-film Transistors	
4th week	Amorphous Silicon: Flexible Backplane and Display Application	
5th week	Flexible Transition Metal Oxide Electronics and Imprint Lithography	
6th week	Materials and Novel Patterning Methods for Flexible Electronics	
7th week	Sheet-type Sensors and Actuators	
8th week	Mid-term Exam	
9th week	Organic and Polymeric TFTs for Flexible Display and Circuits	
10th week	Semiconducting Polythiophenes for Flexible FET	
11th week	Solution Cast Films of Carbon Nanotube for Transparent Conductors and Thin-Film Transistors	
12th week	Physics and Materials Issues of Organic Photovoltaics	
13th week	Bulk heterojunction Solar Cells for Large-Area PV Fabrication on Flexible Substrates	
14th week	Substrates and Thin-Film Barrier Technology for Flexible Electronics	
15th week	Special Topics	
16th week	Final Exam	

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

Instructor ***Heung Cho Ko*** ***(Seal)***

Dept. Chair Cho, Beong K (Seal)

SYLLABUS

Classification	Required	Course No.	07502	Cr. Hrs.	3:0:3	Instructor	Prof. Joon Ha Kim
Course Title	Korean	환경전문가 역량 함양 교육					
	English	Environmental Professionals Capacity Building					

Course Outline :

Students may become a technical professional, perhaps a engineer, or scientist in the near future. They are not a professional speaker, but communication is part of their job (proposals, lab reports, technical presentations, data sheets, manuscripts for journal, and so on).

This course offers students technical communication skills for how to transfer their ideas & confidence to clear, coherent and structured expressions.
The course covers from technical writing, communication etiquette, professional presentation skill, paper structuring & formating for journal, interview practice for jobs, dealing with patent & government information, etc.

Prerequisite	English Communication

Expectations from the course

After completing this course, you should be able to:

- Use active voice to communicate with confidence and authority
- Identify and explain the roles professionals play in the workplace
- Understand your audience and target your speech content appropriately
- Learn how to write & speak for an international audience
- Learn how to integrate documentation development into the best engineering practices
- Make your documents and presentations clearer and more compelling
- Organize information to meet the needs, goals, and interests of your audience
- Develop winning research, proposals, manuscripts for journal

Coordinator 김 준 하 (Seal)

Dept. Chair 조 재 원 (Seal)

SYLLABUS

Classification	required	Course No.	07506	Cr. Hrs.	1.0	Instructor	Mueller, Detlef
Course Title	Korean	환경공학 세미나					
	English	Environmental Engineering Seminar					

Course Outline

Invitede speakers and visiting lecturers give talks in current issues of Environmental Engineering.

Prerequisite	
Textbook and References	

Weekly Course Schedule

Calendar	Weekly Course Schedule	*Remarks
1st week		
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 Mueller, Detlef (Seal)

Dept. Chair Kim, Sang Don (Seal)

SYLLABUS

Classification	optional	Course No.	07402	Cr. Hrs. 3:0:3	Instructor	허호길 외 2명
Course Title	Korean	환경미생물 생태학				
	English	Environmental Microbial Ecology				

Course Outline

Studying influences of microorganisms on biogeochemical cycling of organic and inorganic compounds, methodologies to evaluate in situ microbial activities, and microbial applications for environmental biotechnology and engineering

Prerequisite	Environmental Microbiology
Textbook and References	Microbial Ecology by Atlas and Bartha

Weekly Course Schedule

Calendar	Description	Remarks
1st	Microbial evolution and biodiversity	
2nd	Interactions among microbial populations	
3rd	Interactions between microorganisms and plants	
4th	Development of microbial communities	
5th	Quantitative ecology	
6th	Physiological ecology of microorganisms	
7th	Microorganisms in natural habitats	
8th	Midterm Exam	
9th	Biogeochemical cycling: Carbon, Hydrogen, and Oxygen	
10th	Biogeochemical cycling: Nitrogen, Sulfur, Phosphorous, and Fe	
11th	Ecological aspects of biodeterioration control, and soil, waste, and water management	
12th	Microbial interactions with xenobiotics	
13th	Microbial interactions with inorganic pollutants	
14th	Microorganisms in mineral and energy recovery	
15th	Microorganisms in fuel and biomass production	
16th	Microbial control of disease-causing populations	

* If there will be experiments, describe them in the "Remarks".

허호길 (seal)

붙임 #2

SYLLABUS

Classification	전공선택	Course No.	7403	Hrs.: E: Credits	3:0: 3	Instructor	박기홍
Course Title	Korean	에어로졸 측정 및 실습					
	English	Aerosol Measurement					

Course Outline :

Physical principles of aerosol measurement techniques to determine chemical and physical properties of atmospheric aerosols will be theoretically studied, and their experimental operations will be conducted in the laboratory..

Prerequistite	< 영문기준 300글자 이내로 작성요망 >
Textbook and	< 영문기준 300글자 이내로 작성요망 >

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction1	
2nd week	Introduction2	
3rd week	Atmospheric sampling devices1 (Filter sampler)	
4th week	Atmospheric sampling devices2 (Cascade sampler)	
5th week	Aerosol generation1 (Atomizer)	
6th week	Aerosol generation2 (VOAG)	
7th week	Aerosol generation3 (Powder dispenser)	
8th week	Particle size distribution measurement1 (OPC)	
9th week	Particle size distribution measurement2 (APS)	
10th week	Particle size distribution measurement3 (SMPS)	
11th week	Particle size distribution measurement4 (NanoSMPS)	
12th week	Sampling and transport efficiency	
13th week	Particle structure and morphology1 (TEM)	
14th week	Particle structure and morphology2 (EDS)	
15th week	Particle structure and morphology3 (AFM)	
16th week	Oral presentation	
17th week	Final Exam	

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

Instructor 박기홍 ***(Seal)***

Dept. Chair ***(Seal)***

SYLLABUS

Classification	elective	Course No.	07407	Cr. Hrs.	3:0:3	Instructor	Yang, Mo or Kihong Park
Course Title	Korean	환경오염물질기기분석					
	English	Instrumental analysis on environmental pollutants					

Course Outline : 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 기계위원

붙임 #2

SYLLABUS

Classification	Elective	Course No.	07410	Hrs.: E: Credits	3:0:3	Instructor	Detlef Mueller
Course Title	Korean	대기에어로졸 원격탐사					
	English	Remote Sensing of Atmospheric Aerosols					

Course Outline: In the past 10 years remote sensing technology made significant progress with regard to the observation and description of atmospheric particulate pollution and its impact on global and regional climate. This lecture will focus on a comprehensive description of remote sensing techniques that are currently used for characterizing aerosol particle pollution in the atmosphere. The technical aspects of different instrument types and the theoretical principles that stand behind these techniques will be presented. Results on aerosol characterization carried out in the frame of large-scale field missions, and current research give an overview on our present knowledge on particulate pollution, and the gaps that need to be filled in future.

Prerequisite	
Textbook and References	Useful literature for further studying: Aerosol forcing of climate (R. J. Charlson and J. Heintzenberg); Physical Principles of Remote Sensing (W. G. Rees); Lidar: Range-Resolved Optical Remote Sensing of the Atmosphere (C. Weitkamp, Springer);

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction	
2nd week	Radiation 1: Radiometric quantities, Black body	
3rd week	Radiation 2: Main radiation laws, Sun	
4th week	Composition of the Earth's atmosphere; basic properties of gases, aerosols, clouds;	
5th week	Light-scattering, 1	
6th week	Light scattering, 2	
7th week	midterm	
8th week	Light-scattering, 3	
9th week	Introduction, Aerosols and climate, remote sensing	
10th week	Aerosol LIDAR, Data Inversion, examples	
11th week	Passive Remote Sensing, 1 (sun, starphotometer)	
12th week	Passive Remote Sensing, 2 (satellites)	
13th week	Outlook: the future of aerosol characterization	
14th week	Literature, 1: recent research on aerosols; ORAL presentations	
15th week	Literature, 2: recent research on aerosols; ORAL presentations	
16th week	Literature, 3: recent research on aerosols; ORAL presentations	

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

Instructor Detlef Mueller (Seal)

Dept. Chair 김상도 (Seal)

SYLLABUS

Classification	optional	Course No.	07409	Cr. Hrs. 3:0:3	Instructor	한 등희 교수
Course Title	Korean	연안 생지화학				
	English	Coastal and Estuarine Biogeochemistry				

Course Outline

Coastal and estuarine biogeochemistry is a study of chemistry and biology in costal and estuarine systems. It deals with transport, reaction, and cycling of elements, in coastal/estuarine water and sediments. The main subjects include interactions between macroorganim, and the biogeochemistry and microbiology of water and sediments.

Prerequisite	
Textbook and References	Biogeochemistry of Estuaries (Thomas S Bianchi) Chemical Oceanography (Frank J Millero, Taylor and Francis) Coastal and Estuarine Studies (E Kristensen, RR Haese, and JE Kostka, American Geophysical Union)

Weekly Course Schedule

Calendar	Description	Remarks
1st	Ion-water interactions in seawater?	
2nd	Use of chemical tracers in coastal biogeochemistry	
3rd	The redox chemistry of seawater	
4th	The chemistry of coastal sediments	
5th	Micronutrient in coastal water	
6th	Primary production in coastal water	
7th	Plant-microorganism-sediment interactions1	
8th	Plant-microorganism-sediment interactions2	
9th	Animal-microorganism-sediment interactions1	
10th	Animal-microorganism-sediment interactions2	
11th	Benthic communities	
12th	Coastal and estuarine pollution1	
13th	Coastal and estuarine pollution2	
14th	Final Exam	
15th		
16th		

* If there will be experiments, describe them in the "Remarks".

한 등희 (seal)

Classification		Course No.	7622	Cr. Hrs.	3:0:3	Instructor	조 재 원 Jaeweon Cho
Course Title	Korean	환경유기화학 및 표면화학					
	English	**Environmental Organic and Surface Chemistry**					

Course Outline

환경유기화학은 환경공학분야에서 다루는 환경유기화학물질의 특성과 거동현상의 이론을 공부하는 과목으로서, 자연계에 노출된 환경유기화학물질의 화학적 변화, 이동 및 변환특성 등을 다룬다.

Characteristics, fate, and related theories of environmentally-important organics will be studied through this course.

Prerequisite	환경화학 (Environmental Chemistry)
Textbook and References	Environmental Organic Chemistry, John Wiley & Sosn, Inc., 2nd

Weekly Course Schedule

Calendar	Description	Remarks
1st week	Introduction to Organic Chemicals, Thermodynamics	
2nd week	Thermodynamics, Vapor Pressure	
3rd week	Thermodynamics, Solubility	
4th week	Air-Water Partitioning	
5th week	Organic Solvent-Water Partitioning	
6th week	Organic Acid Acidity, Diffusion of Organics	
7th week	Air-Water Exchange Kinetics, Sorption of Organics: Mechanisms	
8th week	Sorption of Organic Chemicals: Hydrophobic & Ionized	
9th week	Chemical Transformation: Kinetics	
10th week	Hydrolysis of Organic Chemicals	
11th week	Oxidation-Reduction of Organic Chemicals	
12th week	Photochemical Transformations	
13th week	Biological Transformation, Biodegradation	
14th week	Natural, effluent, and soil organic matters chemistry	
15th week	Organics in wetland	
16th week	Field investigation	

Instructor 조 재 원

Jaeweon Cho

SYLLABUS

Classification	optional	Course No.	07651	Cr. Hrs.	3:0:3	Instructor	송철
Course Title	Korean	대기오염모델링					
	English	Air Pollution Modelling					

Course Outline

First, various physical & chemical processes in the atmosphere will be theoretically taught. Based on the theoretical knowledge taught, students will develop their own 1-D photochemical model, using FORTRAN. With the 1-D photo-chemical model developed during this class, students will explore various aspects and episodes of air pollution & atmospheric chemistry.

Prerequisite	- Air Pollution Chemistry I & II - Environmental Chemistry(7503)
Textbook and References	Fundamentals of Atmospheric Modeling (by Mark Z. Jacobson)

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Introduction	Chul H. Song
2nd	Atmospheric Composition & Structure	
3rd	Modeling Lab 1	
4th	Radiative Energy Transfer 1	
5th	Modeling Lab 2	
6th	Radiative Energy Transfer 2	
7th	Modeling Lab 3	
8th	Stratospheric Chemistry & ODE Solvers	
9th	Modeling Lab 4	
10th	Tropospheric Chemistry & ODE Solvers	
11th	Modeling Lab 5	
12th	Aerosol Chemistry	
13th	Modeling Lab	
14th	Seminar I (Episode studies)	
15th	Seminar II (Episode studies)	
16th	Final Exam	

* If there will be experiments, describe them in the "Remarks".

송철한 (seal) 이종태 (seal)

SYLLABUS

Classification	optional	Course No.	07676	Cr. Hrs. 3	Instructor	김 영 경 교수
Course Title	Korean	토양오염 제어공학				
	English	Subsurface Remediation Engineering				

Course Outline

The introduction of harmful substances into the environment has been shown to have many adverse effects on human health, agricultural productivity and natural ecosystems. It is therefore very important to understand the extent of pollution, its causes, the substances involved, their biological and environmental effects, and method of controlling contaminati

Prerequisite	None
Textbook and References	Adriano, D.C. (1986) Trace Elements in the Terrestrial Environment. Brady, N.C. (1990) The Nature and Properties of Soils. Chambers, C.D. (1991) In Situ Treatment of Hazardous Waste -Contaminated Soils. Daniel, D.E. (1993) Geotechnical Practice for Waste Disposal.

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Introduction	
2nd	Origin, Nature, Classification and Soil Formation	
3rd	Physical Properties of Soils and Soil Water	
4th	Water and Properties of Aquifers	
5th	Water Chemistry and Groundwater Contamination	
6th	Biogeochemical Cycle and Geochemistry	
7th	Contaminant Transport and Strategies for Remediation	
8th	Mid-term Exam	
9th	Geophysical Techniques and Soil Exploration	
10th	Soil Flushing and Solidification & Stabilization	
11th	Degradation and Control of Volatile Materials	
12th	Chemical & Physical Separation and Risk Assessment	
13th	Computer-Assisted Characterization and ESP	
14th	Case Study: Soil Washing	
15th	Term Report	
16th	Final Exam	

* If there will be experiments, describe them in the "Remarks".

(seal)

(seal)

SYLLABUS

Classification	optional	Course No.	07687	Cr. Hrs. 3:0:3	Instructor	강 경 하 교수
Course Title	Korean	환경시스템공학				
	English	Enviromental System Engineering				

Course Outline

The primary objective of the course is to present the latest computational approaches avaliable for solving complex optimization problems, to students of environmental engineering and practicing engineers. The course will consist of a series of lectures on fundamental concepts of optimization theory as applied to environmental engineering related problems. The students and engineers will have the opportunity to model, simulate, and optimize environmental engineering systems.

Prerequisite	Engineering Mathematics, Environmental Data Analysis & Modeling, Environmental Transport Phenomena, Bioprocess Engineering
Textbook and References	The course instructor will tell about the materials at the classroom.

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Mathematical Review (Differential & Integral Calculus)	
2nd	Mathematical Review (Linear Algebra & Laplace Transform)	
3rd	Mathematical Models (Algebraic Equations)	
4th	Mathematical Models (Initial Value Problems)	
5th	Mathematical Models (Boundary Value Problems)	
6th	What is "System"?	
7th	What is "Optimum Principle"?	
8th	Mid-term	
9th	Batch, Continuous Flow, Fed-batch Reactors	
10th	Variational Calculus I	
11th	Variational Calculus II	
12th	Change Your Insight to Environmental Aspect	
13th	Problem Based Learning I	
14th	Problem Based Learning II	
15th	Problem Based Learning III	
16th	Final Exam	

* If there will be experiments, describe them in the "Remarks".

강경하 (seal) 강경하 (seal)

SYLLABUS

Classification	optional	Course No.	07695	Cr. Hrs. 3:0:3	Instructor	정 회 정 교수
Course Title	Korean	환경나노기술				
	English	Environmental Nanotechnology				

Course Outline

Properties, characterizations, and fabrication of reactive nano-size particles, their specific environmental applications will be discussed. Surface morphology, chemical and physical reactivity and reaction mechanism to organic pollutants will be included in the discussion

Prerequisite	Surface chemistry, Physical and chemical treatment
Textbook and References	Class notes and handout (will be determined if necessary)

Weekly Course Schedule

Calendar	Description	Remarks
1st	General Introduction	
2nd	Synthesis of nanoparticles	
3rd	"	
4th	Characterization of nanoparticles	
5th	Optical properties of nanoparticles	
6th	Eletrical properties of nanoparticles	
7th	Measurement of surface morphology	
8th	Mid-term exam.	
9th	Catalytic properties of nanoparticles	
10th	Nanoparticle application to water and wastewater treatment	
11th	Nanoparticle application to air pollution control	
12th	Quantum size effect in environmental applicaiton	
13th	Particle size effect in advanced oxidation processes	
14th	Presentation	
15th	Presentation	
16th	Final Exam	

* If there will be experiments, describe them in the "Remarks".

(seal)

SYLLABUS

Classification	optional	Course No.	07698	Cr. Hrs. 3:0:3	Instructor	강인성 교수
Course Title	Korean	바이오에너지기술				
	English	Bioenergy Technology				

Course Outline

The course presents the fundamental aspects of the technology to produce energy and energy source using biotechnology. This course also deals with microbes and their physiological characteristics as biocatalyst in the bioenergy production process. They are ranging from anaerobic/aerobic fermentation to anaerobic respiration. After this course the participants will have gained an understanding of the energy production system that can convert (waste)biomass into energy, such as bioethanol, biogas, bioelectricity and biochemical feedstocks.

Prerequisite	
Textbook and References	Lecture materials will be delivered

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Course introduction	
2nd	A general overview of bioenergy as an alternative energy	
3rd	What is a biomass? and Why biomass?	
4th	(Its potential for the alternative energy source)	
5th	Bioehanol production	
6th	(Yeast fermentation as one of the oldest technology but..)	
7th	How we can gain the Ethanol Economy?	
8th	(Not only classical way but also new technologies)	
9th	Other liquid biofuel production systems	
10th	(Biodiesl production and ABE production by clostridia)	
11th	Biogas production I	
12th	(Biohydrogen production using anaerobic fermentation)	
13th	Biogas production II	
14th	(Methanogenic bacteria and biomethane production)	
15th	Mid exam	
16th	Novel bioenergy technology	

* If there will be experiments, describe them in the "Remarks".

IN SEOP CHANG (seal)

(seal)

SYLLABUS

Classification	elective	Course No.	07699	Cr. Hrs.	3.0	Instructor	
Course Title	Korean	전기화학공학					
	English	Electrochemical Technology					

Course Outline

The objective of this course is the discussion of the many diverse roles of electrochemical technology in industry. Cathodic electroplating in semiconductor industry, corrosion and its control, wastewater treatment and water disinfection using electrocatalysis, future energy systems (fuel cells) and current energy storage system (battery) will be presented

Prerequisite	
Textbook and References	Lecture materials will be delivered

Weekly Course Schedule

Calendar	Weekly Course Schedule	*Remarks
1st week	Course introduction	
2nd week	Basic understanding of electrochemistry	
3rd week	The chlor-alkali process	
4th week	Energy conversion systems I	
5th week	Energy conversion systems II	
6th week	Energy storage systems	
7th week	Electrochemical treatment of (Waste)water	
8th week	Electroremediation	
9th week	Mid exam	
10th week	Electrdeposition of conducting metal oxides	
11th week	Electroplating in semiconductor industry	
12th week	Corrosion and its control	
13th week	Anodization: Ordered nano-template	
14th week	Hydrogen generation by water electrolysis	
15th week	Final exam	
16th week		

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

Instructor (Seal)

Dept. Chair (Seal)

SYLLABUS

Classification	Required	Course No.	9501	Hrs.: E: Credits	4	Instructor	Jooyoung Lee
Course Title	Korean	고급분자생물학					
	English	Advanced Molecular Biology					

Course Outline Diverse aspects of eucaryotic cells at the molecular level will be discussed in this course. Especially the course will focus on the principles by which cells function and thus lead students to understanding of current molecular and cellular biology

Prerequisite	
Textbook and References	Molecular Biology of the Cell, 5th ed. (by Alberts et al)

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	(9/2) Course introduction	Lee JY
2nd week	(9/8, 9/10) Ch 10 Membrane structure	Kim DH
3rd week	(9/15, 9/17) Ch 12 Intracellular compartments and protein sorting	Song MR
4th week	(9/22, 9/24) Ch 13 Intracellular vesicular traffic	Park WJ
5th week	(9/29, 10/1) Ch 15 Mechanisms of Cell communication	Park WJ
6th week	(10/6, 10/8) Ch 16 The cytoskeleton	Song WK
7th week	(10/15) 10th International Congress on Cell Biology	Lee JY
8th week	(10/22) Midterm Exam	Lee JY
9th week	(10/27, 10/29) Ch 19 Cell junctions, cell adhesion, and the ECM	Song MR
10th week	(11/3, 11/5) Ch 21 Sexual reproduction: Meiosis, germ cells, and fertilization	Cho C
11th week	(11/10, 11/12) Ch 22 Development of multicellular organisms	Cho C
12th week	(11/17, 11/19) Ch 17, 18 The cell cycle and Apoptosis	Lee JY
13th week	(11/24, 11/26) Ch 20 Cancer	Lee JY
14th week	(12/1, 12/3) Ch 24 Pathogens, infection, and innate immunity	Jun CD
15th week	(12/8, 12/10) Ch 25 The adaptive immune system	Jun CD
16th week	(12/17) Final Exam	Lee JY

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

Instructor Jooyoung Lee (Seal)

Dept. Chair Chul Seung Park (Seal)

* 담당교원 : 이주영, 김도한, 송미령, 박우진, 송우근, 조정희, 전창덕 교수

SYLLABUS

Classification	Elective	*Course No.*	9604	*Hrs.: E: Credits*	3	*Instructor*	Chunghee Cho
Course Title	Korean	발생학 2					
	English	Development Biology 2					

Course Outline Molecular and cellular aspects of development of multicellular organisms from a single cell will be discussed. The course will focus on mammalian fertilization, early embryogenesis and organogenesis.

Prerequisite	< 영문기준 300글자 이내로 작성요망 >
Textbook and References	Principles of Development (Lewis Wolpert) / Developmental Biology (Scott Gilbert)

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Course Introduction	C. Cho
2nd week	Germ Cells I	C. Cho
3rd week	Germ cells II	C. Cho
4th week	Fertilization I	C. Cho
5th week	Fertilization II	C. Cho
6th week	Early Embryogenesis I	C. Cho
7th week	Early Embryogenesis II	C. Cho
8th week	Midterm Exam	C. Cho
9th week	Late Embryogenesis I	C. Cho
10th week	Late Embryogenesis II	C. Cho
11th week	Current Topics of Development I	C. Cho
12th week	Current Topics of Development II	C. Cho
13th week	Current Topics of Development III	C. Cho
14th week	Current Topics of Development IV	C. Cho
15th week	Current Topics of Development V	C. Cho
16th week	Final Exam	C. Cho

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

Instructor Chunghee Cho  ***(Seal)***

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9613	*Hrs.: E: Credits*	3	*Instructor*	Yung Joon Yoo
Course Title	Korean	단백질생화학					
	English	Protein Biochemistry					

Course Outline

1. Recent advances in protein biochemistry
2. Post-translational modification of proteins
3. Relationship between structure and function of proteins
4. Tools for separation, purification, and characterization of proteins

Prerequisite	Advanced Biochemistry
Textbook and References	Annual Review of Biochemistry

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Recent advance in protein biochemistry (I)	
2nd week	Recent advance in protein biochemistry (II)	
3rd week	Recent advance in protein biochemistry (III)	
4th week	Recent advance in protein biochemistry (IV)	
5th week	Recent advance in protein biochemistry (V)	
6th week	Post-translational modification (I)	
7th week	Post-translational modification (II)	
8th week	Post-translational modification (III)	
9th week	Midterm exam	
10th week	Protein structure-function relationship (I)	
11th week	Protein structure-function relationship (II)	
12th week	Tools for protein separation	
13th week	Tools for protein purification	
14th week	Tools for protein characterization	
15th week	Pharmaceutical application	
16th week	Final exam	

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

Instructor Yung Joon Yoo (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9622	*Hrs.: E: Credits*	3	*Instructor*	Sin-Hyeog Im
Course Title	Korean	고급 면역학					
	English	Advanced Immunology					

Course Outline This is an advanced course in immunology as it covers all aspects of innate and acquired immune response in the mammalian system. Major emphasis is placed on the cellular and molecular aspects of the development and function of diverse immune response such as lymphocyte development, immunity and tolerance and regulation of immune response at the cellular and molecular levels. Immune disorders including autoimmune disorders, cancer and their immunotherapy issues will be also covered. Seminar format with students participating. Each class session will consist of a lecture based on a textbook followed by paper presentations by the students.

Prerequisite	This course is intended for students who have had prior exposure to immunology on the undergraduate level. In the absence of such exposure, students MUST obtain the permission by the instructor.
Textbook and References	Immunoloogy, J.Kuby (Freeman), Immunobiology, C.Janeway (Pub. Inc)

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Course Introduction	
2nd week	Antigens, immunogens and antigen recognition	
3rd week	Generation of Antigen receptors: Antibody and TCR diversity	
4th week	Antigen processing and presentation	
5th week	Signaling through immune system receptors	
6th week	Lymphocyte development : B cell and T cell development	
7th week	T cell-mediated immunity: APC and effector T cells	
8th week	Humoral immunity: B cell activation and Ab function	
9th week	Mid-term Exam	
10th week	Adaptive immunity to infection	
11th week	Failure of host defense mechanism	
12th week	Allergy and hypersensitivity	
13th week	Autoimmunity: types, mechanims and immunotherapy	
14th week	Autoimmune disorders	
15th week	Tumor immunity	
16th week	Immunomodulation of immune disorders	
17th week	Final Exam	

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

Instructor Sin-Hyeog Im

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9626	*Hrs.: E: Credits*	3	*Instructor*	Do Han Kim
Course Title	Korean	분자시스템생물학					
	English	Molecular Systems Biology					

Course Outline The course will study the molecular components of various biological systems and the interactions between them. The stability and robustness of the biological systems will also be discussed through the careful examination of recent public

Prerequisite	
Textbook and References	recent papers

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	The typical "omics" technology	Do Han Kim
2nd week	〃	Do Han Kim
3rd week	〃	Do Han Kim
4th week	Investigation of network structure	Do Han Kim
5th week	〃	Do Han Kim
6th week	〃	Do Han Kim
7th week	Midterm exam	Do Han Kim
8th week	Analysis of biological network	Do Han Kim
9th week	〃	Do Han Kim
10th week	〃	Do Han Kim
11th week	Cell modeling and analysis	Do Han Kim
12th week	〃	Do Han Kim
13th week	〃	Do Han Kim
14th week	Technology development	Do Han Kim
15th week	〃	Do Han Kim
16th week	Final Exam	Do Han Kim

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

Instructor Do Han Kim (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9627	*Hrs.: E: Credits*	3	*Instructor*	Woo Keun Song
Course Title	Korean	세포상호작용론					
	English	Cell interaction					
Course Outline This course will be focused on actin-related cellular functions and associated proteins							
Prerequisite							
Textbook and References		Recent Papers					

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	General functions of Actin	Woo Keun Song
2nd week	Cell Migration	Woo Keun Song
3rd week	Cell Adhesion	Woo Keun Song
4th week	Cancer and Actin	Woo Keun Song
5th week	Lamellipodia Formation	Woo Keun Song
6th week	Filopodia Formation	Woo Keun Song
7th week	Endocytosis	Woo Keun Song
8th week	Vesicle Traffiking	Woo Keun Song
9th week	Exam I	Woo Keun Song
10th week	Vesicle Recycle	Woo Keun Song
11th week	Actin binding proteins & Endocytosis	Woo Keun Song
12th week	Post Synaptic Density (PSD) and Actin	Woo Keun Song
13th week	Spine Morphogenesis and Functions	Woo Keun Song
14th week	Spine Morphogenesis and Disease	Woo Keun Song
15th week	Actin in human disease	Woo Keun Song
16th week	Final Exam	Woo Keun Song

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

Instructor Woo Keun Song (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9635	*Hrs.: E: Credits*	3	*Instructor*	Yong Chul Kim
Course Title	Korean	의약화학 2					
	English	Medicinal Chemistry 2					
Course Outline Current and historical drug target proteins such as receptors and the mechanism of action including structure activity relationships of small molecule ligands or drugs will be reviewed.							
Prerequisite							
Textbook and References	An Introduction to Medicinal Chemistry (by L. Patrick) Principles of Medicinal Chemistry (by W. O. Foye)						

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction	Yong-Chul Kim
2nd week	Antibacterial Agents	Yong-Chul Kim
3rd week	"	Yong-Chul Kim
4th week	Cholinergics, Anticholinergics, and Anticholinesterases	Yong-Chul Kim
5th week	"	Yong-Chul Kim
6th week	"	Yong-Chul Kim
7th week	The Adrenergic Nervous System	Yong-Chul Kim
8th week	"	Yong-Chul Kim
9th week	Mid-Term Exam	Yong-Chul Kim
10th week	The Opium Analgesics	Yong-Chul Kim
11th week	"	Yong-Chul Kim
12th week	H2-receptor Antagonists (Cimetidine)	Yong-Chul Kim
13th week	"	Yong-Chul Kim
14th week	Cancer Chemotherapy	Yong-Chul Kim
15th week	"	Yong-Chul Kim
16th week	Final Exam	Yong-Chul Kim

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

Instructor Yong-Chul Kim  ***(Seal)***

Dept. Chair Chul Seung Park  ***(Seal)***

SYLLABUS

Classification	Elective	*Course No.*	9653	*Hrs.: E: Credits*	3	*Instructor*	Zee-Yong Park
Course Title	Korean	질량분석기의 생물학적 응용					
	English	Biological Applications of Mass Spectrometry					
Course Outline Fundamentals of biological mass spectrometry, especially two major ionization technigues. MALDI and ESI will be discussed. Also principles behind protein identification, post translational modification analysis by mass spectrometry will be covered.							
Prerequisite							
Textbook and References	Principles and Practice of Biological Mass Spectrometry by CHHABILL DASS						

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction to mass Spectrometry	Zee-Yong Park
2nd week	Ionization Technigues	Zee-Yong Park
3rd week	Mass Analyzers	Zee-Yong Park
4th week	Ion Detectors	Zee-Yong Park
5th week	Tandem Mass Spectrometry	Zee-Yong Park
6th week	Qualitative Analysis	Zee-Yong Park
7th week	Quantitative Analysis	Zee-Yong Park
8th week	Mid Term Exam	Zee-Yong Park
9th week	Protein Identification	Zee-Yong Park
10th week	Posttranslational Modification Analysis	Zee-Yong Park
11th week	Structural Analysis by Mass Spectrometry	Zee-Yong Park
12th week	Noncovaleut Interaction Study	Zee-Yong Park
13th week	Olige nucleotide Analysis	Zee-Yong Park
14th week	Carbohydrate Analysis	Zee-Yong Park
15th week	Analysis of Microorganisms	Zee-Yong Park
16th week	Final Exam	Zee-Yong Park

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

Instructor Zee Yong Park (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9664	*Hrs.: E: Credits*	3	*Instructor*	Woo Jin Park
Course Title	Korean	심장병 생리학					
	English	Pathophysiology of heart disease					
Course Outline	This class provides fundamental knowledge on the structure and function of heart, diagnostic tools, and pathophysiological background of a variety of heart disease.						
Prerequisite							
Textbook and References							

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction	Woo Jin Park
2nd week	Basic cardiac structure and function	Woo Jin Park
3rd week	Diagnostic Imaging and catherization	Woo Jin Park
4th week	Atherosclerosis	Woo Jin Park
5th week	"	Woo Jin Park
6th week	Ischemic heart disease	Woo Jin Park
7th week	"	Woo Jin Park
8th week	Mid-term Exam	Woo Jin Park
9th week	Heart failure	Woo Jin Park
10th week	"	Woo Jin Park
11th week	Cardiomyopathies	Woo Jin Park
12th week	"	Woo Jin Park
13th week	Cardiac Arrhythmias	Woo Jin Park
14th week	"	Woo Jin Park
15th week	Cardiovascular Drugs	Woo Jin Park
16th week	Final Exam	Woo Jin Park

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

Instructor Woo Jin Park 

Dept. Chair Chul Seung Park (Seal) 

SYLLABUS

Classification	Elective	*Course No.*	9667	*Hrs.: E: Credits*	3	*Instructor*	Joo Young Lee
Course Title	Korean	고급세포면역생물학					
	English	Advanced Cellular Immunobiology					

Course Outline To learn the history of the development of research regarding innate and adaptive immunity with emphasis on the regulation of immune receptors and intracellular signaling pathways. This course will enhance our knowledge as to how the modulation of immune receptors is related to the development and progress of chronic diseases.

Prerequisite	n/a
Textbook and References	Immunology, Immunobiology, Handbook of Cell signaling, published articles

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	An introduction	Joo Young Lee
2nd week	Development of immunity	Joo Young Lee
3rd week	Innate immunity	Joo Young Lee
4th week	Adaptive immune responses	Joo Young Lee
5th week	T-cell mediated immunity	Joo Young Lee
6th week	Humoral immune response	Joo Young Lee
7th week	Infection and immunity	Joo Young Lee
8th week	Mid-term Exam	Joo Young Lee
9th week	Immune system in health and disease	Joo Young Lee
10th week	Failure of host defense systems	Joo Young Lee
11th week	Allergy, asthma and hypersensitivity	Joo Young Lee
12th week	Autoimmune diseases	Joo Young Lee
13th week	Graft rejection and transplantation	Joo Young Lee
14th week	Cancer and immunity	Joo Young Lee
15th week	Modulation of immune system	Joo Young Lee
16th week	Final Exam	Joo Young Lee

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

Instructor Joo Young Lee 

Dept. Chair Chul Seung Park (Seal) 

SYLLABUS

Classification	Elective	*Course No.*	9669	*Hrs.: E: Credits*	3	*Instructor*	Chang-Duk Jun
Course Title	Korean	면역 시냅스 연구					
	English	The immunological synapse					

Course Outline The adaptive immune response is initiated by the interaction of T cell antigen receptors with major histocompatibility complex molecule-peptide complexes in the nanometer scale gap between a T cell and an antigen-presenting cell, referred to as an immunological synapse. In this course, we are going to understand the molecular nature of immunological synapse in immunity

Prerequisite	Immunology
Textbook and References	Immunology, fifth edition, Richard A Goldsby

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Historical perspective	Chang-Duk Jun
2nd week	Molecules in immune synapse	Chang-Duk Jun
3rd week	TCR and MHC	Chang-Duk Jun
4th week	CD28 and costimulators	Chang-Duk Jun
5th week	Adhesion molecules and Integrins	Chang-Duk Jun
6th week	Cytoskeletal dynamics in IS I	Chang-Duk Jun
7th week	Cytoskeletal dynamics in IS II	Chang-Duk Jun
8th week	Mid-term Exam	Chang-Duk Jun
9th week	Signaling molecules in IS I	Chang-Duk Jun
10th week	Signaling molecules in IS II	Chang-Duk Jun
11th week	Lipid rafts I	Chang-Duk Jun
12th week	Lipid rafts II	Chang-Duk Jun
13th week	Methods for IS study	Chang-Duk Jun
14th week	Molecular imaging of Immune synapse I	Chang-Duk Jun
15th week	Molecular imaging of Immune synapse II	Chang-Duk Jun
16th week	Final Exam	Chang-Duk Jun

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

Instructor Chang-Duk Jun (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	Course No.	9672	Hrs.: E: Credits	3	Instructor	Haihong Shen
Course Title	Korean	암 생물학					
	English	Cancer Biology					
Course Outline The course systematically describes tumorigenesis, development, metastasis and cancer therapy.							
Prerequisite							
Textbook and References	The biology of cancer. (Robert A. Weinberg, Garland Science)						

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Chapter 1 the biology and genetics of cells and organisms Chapter 2 the nature of cancer	Haihong Shen
2nd week	Chapter 3 tumor viruses	Hark-Soo Chung
3rd week	Chapter 4 cellular oncogenes	Haihong Shen
4th week	Chapter 5 growth factors and their receptor	Haihong Shen
5th week	Chapter 6 cytoplasmic signaling circuitry programs many of the traits of cancer	Haihong Shen
6th week	Chapter 7 tumor suppressor genes Chapter 8 pRb and control of the cell cycle clock	Haihong Shen
7th week	Chapter 9 p53 and apoptosis: master guardian and executione	Haihong Shen
8th week	mid-term exam.	Haihong Shen
9th week	Chapter 10 eternal life: cell immortalization and tumorigenesis	Haihong Shen
10th week	Chapter 11 multistep tumorigenesis	Haihong Shen
11th week	Chapter 12 maintenance of genomic integrity and the development of cancer	Haihong Shen
12th week	Chapter 13 dialogue replaces monologue: heterotypic interactions and the biology of angiogenesis	Haihong Shen
13th week	Chapter 14 moving out: invasion and metastasis	Haihong Shen
14th week	Chapter 15crowd control: tumor immunology and immunotherap	Haihong Shen
15th week	the rational treatment of cancer	Hark-Soo Chung
16th week	final exam	Haihong Shen

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

Instructor Haihong Shen (Seal)

Dept. Chair Chul-Seung Park (Seal)

SYLLABUS

Classification	Elective	Course No.	9673	Hrs.: E: Credits	3	Instructor	Mi-Ryoung Song
Course Title	Korean	신경생물학 2					
	English	Neurobiology 2					

Course Outline This course covers basic principles of neuroanatomy, neural development, and learning & memory, providing both an overview of the subject and a foundation for advanced courses. Students are recommended to take neurobiology course ahead.

Prerequisite	No
Textbook and References	No

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction	M. R. Song
2nd week	Organization of Nervous Systems I	M. R. Song
3rd week	Organization of Nervous Systems II	M. R. Song
4th week	Cellular Components of Nervous Tissue	M. R. Song
5th week	Neural induction	M. R. Song
6th week	Pattern formation	M. R. Song
7th week	Neurogenesis and Migration	M. R. Song
8th week	Mid Exam	M. R. Song
9th week	Cellular Determination	M. R. Song
10th week	Axon pathfinding	M. R. Song
11th week	Synapse Formation I	M. R. Song
12th week	Neurotrophic factors	M. R. Song
13th week	Early Experience and Critical Periods	M. R. Song
14th week	Neural Plasticity	M. R. Song
15th week	Learning & Memory	M. R. Song
16th week	Final Exam	M. R. Song

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

Instructor Mi-Ryoung Song ***(Seal)***

Dept. Chair Chul-Seung Park ***(Seal)***

SYLLABUS

Classification	Elective	*Course No.*	9690	*Hrs.: E: Credits*	3	*Instructor*	Soo Hyun Eom
Course Title	Korean	생체막수용체 및 리간드구조특론 1					
	English	Structural Topics on membrane receptor & ligand interaction 1					
Course Outline This course will cover recent advances in the field of structural and functional researches on membrane proteins							
Prerequisite							
Textbook and References		Cell, Nature, Science, Nature structural biology, etc.					

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction - Membrane proteins	Soo Hyun Eom
2nd week	Photosynthetic reaction center	Soo Hyun Eom
3rd week	〃	Soo Hyun Eom
4th week	Transporters	Soo Hyun Eom
5th week	〃	Soo Hyun Eom
6th week	Porins	Soo Hyun Eom
7th week	〃	Soo Hyun Eom
8th week	Midterm Exam	Soo Hyun Eom
9th week	Calcium ATPase	Soo Hyun Eom
10th week	〃	Soo Hyun Eom
11th week	Water/glycerol channels	Soo Hyun Eom
12th week	〃	Soo Hyun Eom
13th week	Ion channels	Soo Hyun Eom
14th week	〃	Soo Hyun Eom
15th week	〃	Soo Hyun Eom
16th week	Final Exam	Soo Hyun Eom

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

Instructor Soo Hyun Eom (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	Elective	*Course No.*	9691	*Hrs.: E: Credits*	3	*Instructor*	Jae Il Kim
Course Title	Korean	생체막수용체 및 리간드구조특론 II					
	English	Structural Topics on membrane receptor & ligand interaction II					

Course Outline This course will cover significant recent advances in the study of peptide structure in solution, structure-activity relationship of peptide, and peptide therapeutics

Prerequisite	
Textbook and References	Nature, Science, and Nature Structural Biology etc.

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Structural Basis for Bio-active Peptides	Jae Il Kim
2nd week	Structural Classification of Peptides	Jae Il Kim
3rd week	〃	Jae Il Kim
4th week	Functional Classification of Peptides	Jae Il Kim
5th week	〃	Jae Il Kim
6th week	Structure-Activity Relationship of Peptides	Jae Il Kim
7th week	Examples of Structure-Activity Relationship	Jae Il Kim
8th week	Midterm Exam	Jae Il Kim
9th week	Antimicrobial Peptides	Jae Il Kim
10th week	〃	Jae Il Kim
11th week	Ion-channel Targeting Peptides	Jae Il Kim
12th week	〃	Jae Il Kim
13th week	Peptide Therapeutics	Jae Il Kim
14th week	〃	Jae Il Kim
15th week	Examples of Peptide Therapeutics	Jae Il Kim
16th week	Final Exam	Jae Il Kim

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

Instructor Jae Il Kim

Dept. Chair Chul Seung Park

SYLLABUS

Classification	Elective	*Course No.*	9694	*Hrs.: E: Credits*	3	*Instructor*	Sangyong Jon
Course Title	Korean	바이오콘쥬게이트 화학 2					
	English	Bioconjugate Chemistry II					
Course Outline	Bioconjugate chemistry is about themethods of how to conjugate bioactive ligands or nanomaterials to biomolecules such as proteins and DNAs. This course will cover the principles and actual examples of bioconjugation that has been used in current nano-biotechnology as well as for biological study to date. There is no pre-requisite for this class.						
Prerequisite	Permission of Instructo						
Textbook and References							

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction & Principles of Bioconjugate Chemistry	Sangyong Jon
2nd week	Functional Targets	Sangyong Jon
3rd week	The Chemistry of Reactive Group	Sangyong Jon
4th week	Cross Linkers Zero Length, Homo- or Hetero-bifunctional	Sangyong Jon
5th week	Cleavable Reagents System	Sangyong Jon
6th week	Tags and Probes	Sangyong Jon
7th week	Antibody Modification and Conjugation	Sangyong Jon
8th week	Liposome Conjugates and Derivatives	Sangyong Jon
9th week	Avidin-Biotin Systems	Sangyong Jon
10th week	Colloidal Gold-Labeled Proteins	Sangyong Jon
11th week	Modification with Synthetic Polymers	Sangyong Jon
12th week	Nucleic Acid and Oligonucleotide Modification and Conjugation	Sangyong Jon
13th week	Model Study Using Actual Examples in Recent Papers	Sangyong Jon
14th week	Model Study Using Actual Examples in Recent Papers	Sangyong Jon
15th week	Model Study Using Actual Examples in Recent Papers	Sangyong Jon
16th week	Model Study Using Actual Examples in Recent Papers	Sangyong Jon
17th week	Final Exam	Sangyong Jon

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

Instructor Sangyong Jon (Seal)

Dept. Chair Chul Seung Park (Seal)

SYLLABUS

Classification	elective	Course No.	02602	Hrs.: E: Credits	3:0:3	Instructor	Hiroyuki Nishide
Course Title	Korean	나노화학 기능성 고분자					
	English	Advanced Polymers for Nano-Chemical Functions					
Course Outline	This class covers molecular designing, synthetic procedures, characterization, and outcomes of functional polymers, in viewpoints of both nano-scale organic chemistry and polymeric materials leading to advanced technologies.						
Prerequisite	Polymer Chemistry						
Textbook and References							

Weekly Course Schedule

Week	Description	*Remarks
1st week	Introduction/ Nano-Scale Designing of Functional Polymers	
2nd week	Biopolymer-Inspired Functional Materials	
3rd week	Chemistry of Hemoglobin and Porphyrins	
4th week	Oxygen-Carrying Polymers: Artificial Blood and Air Separation	
5th week	Syntheses of Functional Polymers (1)	
6th week	Syntheses of Functional Polymers (2)	
7th week	Mid-term Exam.	
8th week	Beyond Conjugated Polymers	
9th week	Magnetically Responsive Polymers	
10th week	Polymer Memories	
11th week	Electrode-Active Polymers: Rechargeable Batteries	
12th week	Characterization of Electron-Transport and Storage	
13th week	Charge Separation in Polymers: Solar Cells	
14th week	Proton-Conducting Polymers: Fuel Cells	
15th week	Polymers for Flexible Energy and Printable Power	
16th week	Final Exam.	

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

Instructor: ***Hiroyuki Nishide*** ***(Signature)***

Dept. Chair: ***Kurt E. Geckeler*** ***(Signature)***

SYLLABUS

Classification	elective	Course No.	02603	Hrs.: E: Credits	3:0:3	Instructor	Luigi Pantisano
Course Title	Korean	고급재료 및 기술특론 -신뢰성및 결점의 기초학					
	English	Fundamentals of Reliability and defects –basics and selected topics for advanced materials and technologies					

Course Outline

Reliability is a very valuable skill in any industry that focuses on product quality as key driver for profits. This course offers an introduction to the basics together with in-depth seminars on key reliability concerns for modern technologies from a material perspective. The first part looks into the main reliability models, failure mechanisms and yield, trying to link the basics with the defects and materials. Trap generation (i.e., failure) mechanisms for CMOS device and its impact on reliability projection will be discussed in details, together with some of the advanced techniques needed for these studies. The second part is seminar-like, with a broad overview of topics important for today's fast-moving nanotechnology field. The choice of seminars is for both fundamental mechanisms (i.e., radiation effects) as well as more applicative (e.g., ESD).

Prerequisite	*Solid understanding of materials for nanotechnology, good investigative spirit, devices and lab instruments and practices.*
Textbook and References	*Handouts from the course will be given together with a set of references.*

Weekly Course Schedule

Week	*Description*	**Remarks*
1st week	What is reliability? (evaluation, failure analysis, failure mechanisms)	
2nd week	Reliability and failures – a statistical approach	
3rd week	Basic elements of Yield	
4th week	Failure mechanisms - Defects and reliability – devices (I)	
5th week	Failure mechanisms - Defects and reliability – devices (II)	
6th week	Advanced techniques i - defect characterization	
7th week	Advanced techniques II - failure analysis	
8th week	Mid Term exam and catch-up	
9th week	Topic: Advanced reliability analysis in SiO2 devices	
10th week	Topic: Radiation effects and its impact on space operations	
11th week	Topic: High-k materials reliability for logic	
12th week	Topic: High-k materials reliability for memories	
13th week	Topic: MEMS reliability issues	
14th week	Topic: The "dark art" of Electrostatic Discharge	

15th week	Term presentation (TBC)	
16th week	Exam due	

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

Instructor: *Luigi Pantisano* *(Signature)*

Dept. Chair: *Kurt E. Geckeler* *(Signature)*

SYLLABUS

Classification	elective	*Course No.*	02-604	***Cr. Hrs.***	3	*Instructor*	Peter-Viktor Nickles
Course Title	*Korean*	비선형 광학 – 기초와 응용					
	English	Nonlinear Optics- Basics and Applications					

Course Outline The class deals with the interaction of light with matter. Classical phenomenology and Maxwell's equations in media are used to describe the nonlinear interaction and propagation. Frequency conversion and intensity dependent refractive index as well as scattering processes are described. Nonlinear processes important for modern lasers and diagnostics like optical Kerr effect and correlation methods are explained. Finally, the present day high field nonlinear optics will be highlighted on the action of free electrons in a strong laser field.

Prerequisite	Knowledge of optics and basics of lasers
Textbook and References	R.W. Boyd, Nonlinear Optics, Academic Press J.C. Diels, W. Rudolph, Ultrashort Laser Pulse Phenomena, Academic Press Y.R. Shen, The principles of nonlinear Optics, Wiley and Sons E. Hecht, Optics R.W. Boyd,JAP **39**,1968, famous article on parametric interaction with Gaussian beams P.B. Corkum, PRL **71**,1994

Weekly Course Schedule

Week	*Description*	**Remarks*
1st week	Introduction, description of NLO	
2nd week	Nonlinear susceptibility, Millers Rule, oscillator model	
3rd week	Wave equation description of nonlinear optical interaction, Manley-Rowe relation	
4th week	Phase matching, 3 wave interaction;, anistropic propagation and walk off, difference frequency, parametrics	
5th week	second harmonics generation,with focused beams Intensity dependent refractive index, nonlinearities of media	
6th week		
7th week	Frequency mixing, difference frequency, optical parametric amplification	
8th week	Selffocusing of light	
9th week	Stimulated Light scattering	
10th week	Electrooptic effects, Pockelscell, modulators	
11th week	Optically induced damage	
12th week	Nonlinear techniques in laser physics	

13th week	Selected measurement techniques, Intensity and interferometric correlations	
14th week	High field nonlinear optics, free electron in strong laser field	
15th week	Term project presentation	
16th week	Final Exam	

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

P. Nickles

Instructor: Peter-Viktor Nickles

Dept. Chair: Kurt E. Geckeler ***(Signature)***

붙임 #2

SYLLABUS

Classification	electives	*Course No.*	0260	*Hrs.: E: Credits*	3:0:3	*Instructor*	Byoung Hun Lee
Course Title	Korean	Post CMOS 복합전자소자기술					
	English	Post CMOS Hybrid Device Technology					
Course Outline	This class covers basic operation principles and recent research status of advanced electronic devices for post CMOS era. The student will obtain basic knowledge on the forefront research in semiconductor material and device technology through this class.						
Prerequisite	Semiconductor device physics						
Textbook and References	Reference papers will be assigned						

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Introduction - End of roadmap	
2nd week	CMOS power management	
3rd week	NEMS - basic theory	
4th week	NEMS - process	
5th week	NEMS - device/ circuit	
6th week	NEMS - device/ circuit	
7th week	Reconfigurable logic and its applications	
8th week	Midterm exam and catch up	
9th week	Novel memory devices	
10th week	Novel logic devices	
11th week	Multi valued logic and devices	
12th week	Cross bar devices	
13th week	Bionic/Neuron Devices	
14th week	Neuromorphic computing	
15th week	Term project presentation	
16th week	Final Exam	

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

Instructor Byoung Hun Lee (Seal)

Dept. Chair Kurt E. Geckeler (Seal)

SYLLABUS

Classification	Elective	*Course No.*	02606	*Hrs.: E: Credits*	3	*Instructor*	Tu, Charles
Course Title	*Korean*	반도체 재료 및 소자 특론					
	English	Semiconductor Devices on Single Crystalline and Unconventional Substrates					

Course Outline This class covers the basics of semiconductor materials, inorganic and organic, and device physics of the most important devices, fabricated on single-crystalline and flexible substrates. After taking this class, the students will be able to explore different device structures.

Prerequisite	Fundamentals of physics
Textbook and References	Text: *An Introduction to Semiconductor Devices*, D.A. Neamen, McGraw-Hill (2006) Reference: *Flexible Electronics 2004 – Materials and Device Technology*, Editors, N. Fruehauf, B.R. Chalamala, B.E. Gnade, and J. Jang, Materials Research Society Symp. Proc. Vol. 814 (2004).

Weekly Course Schedule

Week	*Description*	**Remarks*
1st week	The Crystal Structure of Solids; Theory of Solids	
2nd week	The Semiconductor in Equilibrium	
3rd week	Carrier Transport and Excess Carrier Phenomena	
4th week	The p-n Junction	
5th week	Fundamentals of the MOSFET	
6th week	Nonequilibrium Excess Carriers in Semiconductors	
7th week	The Bipolar Transistor	
8th week	Midterm and catchup	
9th week	Interaction of Light and Matter	
10th week	Light Emitting Diodes, Lasers	
11th week	Semiconductor heterostructures and quantum confinement	
12th week	Nanowire formation	
13th week	Organic Semiconductors	
14th week	Flexible Electronics	
15th week	Flexible Optoelectronics	
16th week	Final Exam	

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

Instructor: *(Signature)*

Dept. Chair: *Kurt E. Geckeler* *(Signature)*

WCU Course Syllabus

02607 **(Autumn 2009)**

Introduction to Nanofabrication and Nanomanufacturing

Prerequisites: graduate student standing or permission of instructor

Course Objectives:

1. Students will learn the fundamentals of nano-fabrication and manufacturing technologies.
2. Students will be exposed to the instrumentation and equipment for nanoscale device processing and characterization.
3. Students will develop basic understanding of integration of nanoscale devices and systems for biomedical applications.

Textbook: None, Selected book chapters, journal papers, and handouts.

Instructor: Prof. Wu Lu, lu@ece.osu.edu

Office Hours: by appointment

Topics and Number of Lectures

Introduction to nanotechnology (1)
Optical lithography (2)
Electron beam lithography (2)
X-ray lithography and LIGA (2)
Nanoimprinting and Dip-pen lithography (2)
Scanning Probe Microscopy (1)
Self-assembly and self-organization (2)
Thin film deposition (2)
Dry etching technologies (3)
Bulk and surface micromachining techniques for the fabrication of master molds (2)
Polymer processing for biomedical applications (3)
Near-field optical techniques for nanoscale fabrication and characterization (2)
Integration of nanoscale biomedical devices and systems (3)

References (supplemental reading):

1). "Introduction to Nanoscale Science and Technology", Edited by Massimiliano Di Ventra, Stephane Evoy, and James R. Heflin Jr. , Springer, 2004.

2). "Nanotechnology: Basic Science and Emerging Technologies", by Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, and Burkhard Raguse, CRC Press, 2002.

3). "Microfabrication and Nanomanufacturing", by Mark J. Jackson, CRC Press, 2005

Grading Policy

Homework	30%
Midterm Exam	20%
Exam paper	35%
Presentation	15%

Homework will be assigned in class. Late homework will be accepted but a time-weighted penalty will be assessed.

Midterm Exam: The midterm exam will be open notes.

Final Exam: The final review papers will be due at the end of semester. Review exam papers will be graded separately for undergraduate and graduate students. Graduate students are expected to give more insightful information and discussion in the review papers.

Presentations: Presentations will be arranged at the end of the semester.

Homework, Exam Review Papers, and Presentations

1. For homework assignments, each student must submit one homework for each assignment. Students are encouraged to work the assignment independently but it is OK to work together with your classmates.
2. The review paper should be either on processing and manufacturing technologies or on the integration of devices for biomedical applications. Graduate students are encouraged to select topics which are close to their research fields but must be relevant to this course. It is suggested that students consult the instructor to select the topics.
3. The presentation topics can be on either processing technologies or device integration, based on the exam review papers. Each student will have 20 minutes including few minutes for questions and discussion.

SYLLABUS

Classification	Elective	*Course No.*	02613	*Cr. Hrs.*	3	*Instructor*	Kim, Young Ha
Course Title	*Korean*	생체적합성					
	English	Biocompatibility					

Course Outline

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 K. E. Geckeler (Seal)

SYLLABUS

Classification	Elective	**Course No.**	02615	*Cr. Hrs.*	3	*Instructor*	Tae, Giyoong
Course Title	*Korean*	생화학특론					
	English	Biochemistry					

Course Outline

This course is to provide the key concepts of biochemistry, covering structures and functions of biological molecules, energy metabolism and synthesis, and gene expression

Prerequisite	
Textbook and References	

Weekly Course Schedule

Calendar	*Desciption*	*Remarks
1st week	Introduction and basic cell structure	
2nd week	Amino acids and proteins	
3rd week	Enzymes	
4th week	Nucleic acids and genetic flow	
5th week	Lipids and membrane transports	
6th week	Carbohydrates	
7th week	Signal transduction	
8th week	Mid-term exam	
9th week	Cytric acid cycles	
10th week	Electron transport and oxidative phosphorylation	
11th week	Photosynthesis, glycogen and gluconeogenesis	
12th week	Biosynthesis of amino acids and nucleotides	
13th week	Biosynthesis of proteins	
14th week	Regulation of gene expression	
15th week	Recombinant DNA technology	
16th week	Final exam	

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

Instructor *Tae, Giyoong* (Seal)

Dept. Chair *K. E. Geckeler* (Seal)

SYLLABUS

Classification	Elective	*Course No.*	0261	*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* (Seal)

Dept. Chair *K. E. Geckeler* (Seal)

SYLLABUS

Classification	Elective	Course No.	03636	Cr. Hrs.	3	Instructor	Park, Seong-Ju
Course Title	Korean	박막제조공정					
	English	Thin Film Technology					

Course Outline

Study of the vacuum technology, methods of preparation of crystalline thin films, and mechanisms. Growth mechanism and properties of thin films based on the thermodynamics and molecular theory will be lectured. Covers vacuum technology, methods of preparation of thin films, mechanisms of film formation, characterization of thin films, properties of thin films, epitaxy, applications of thin films.

Prerequisite	None
Textbook and References	1. The materials Science of Thin Films, Milton Ohring, Academic Press, 1992

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Vacuum - introduction	
2nd week	Vacuum - gas and fluid	
3rd week	Vacuum - vacuum pump and measurement	
4th week	Vacuum - materials and system for vacuum	
5th week	Growth of Thin film - vacuum deposition	
6th week	Growth of Thin film - sputtering, and ion beam deposition	
7th week	Growth of Thin film - chemical deposition	
8th week	Growth of Thin film - epitaxy	Midterm exam
9th week	Growth of Thin film - thin film growth mechanism	
10th week	Thin film properties - mechanical property	
11th week	Thin film properties - electrical property	
12th week	Thin film properties - dielectric, and magnetic property	
13th week	Analytical techniques for thin films - surface, and structural analysis	
14th week	Analytical techniques for thin films - chemical, electrical, and optical analysis	
15th week	Application of thin film	
16th week	Application of thin film	Final examination

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

Instructor Park, Seong-Ju (Seal)

Dept. Chair K. E. Geckeler (Seal)

SYLLABUS

Classification	Elective	*Course No.*	0261	*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* (Seal)

Dept. Chair *K. E. Geckeler* (Seal)

SYLLABUS

Classification	Elective	***Course No.***	02635	***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 nanostructuers 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 Heinzel, Ref: Nanoelectronics and Information Technology, edited by Rainer Waser

Weekly Course Schedule

Calendar	***Desciption***	****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 quamtum wires: Ballistic transport	
11th week	1-dim quamtum wires: Landuaer formalism	
12th week	1-dim quamtum wires: Nanowires, Nanotubes	
13th week	1-dim quamtum 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*** (Seal)

Dept. Chair ***K. E. Geckeler*** (Seal)

SYLLABUS

Classification	Elective	*Course No.* 0637	*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	*Desciption*	**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* (Seal)

Dept. Chair *K. E. Geckeler* (Seal)

SYLLABUS

Classification	Elective	*Course No.*	02639	*Cr. Hrs.*	3	*Instructor*	Hwang, Hyunsang
Course Title	*Korean*	반도체 메모리 소자					
	English	Semiconductor memory device					

Course Outline

- Introduction of semiconductor memory devices (DRAM/FLASH) technology and scaling issues
- Device physics of various new memory devices (SONOS, ReRAM, PRAM, MRAM)
- Study on patents map of memory devices and processes

Prerequisite	N/A
Textbook and References	W.D. Brown & J.E. Brewer, ""Nonvolatile Semiconductor Memory Technology,"" IEEE Press (1998)

Weekly Course Schedule

Calendar	*Desciption*	**Remarks*
1st week	memory technology overview	
2nd week	DRAM device technology	
3rd week	DRAM scaling issue-1	
4th week	DRAM scaling issue-2	
5th week	FLASH device technology	
6th week	FLASH scaling issue-1	
7th week	FLASH scaling issue-2	
8th week	Future memory overview & Mid-term Exam	
9th week	Patent analysis and Patent Map-1	
10th week	Patent analysis and Patent Map-2	
11th week	SONOS/Nano-dot FLASH	
12th week	ReRAM-1	
13th week	ReRAM-1	
14th week	PRAM	
15th week	MRAM	
16th week	Patent Map & Final Exam	

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

Instructor *H. Hwang* *(Seal)*

Dept. Chair *K. E. Geckeler* *(Seal)*

SYLLABUS

Classification	Elective	*Course No.*	0642	*Cr. Hrs.*	3:0:3	*Instructor*	Jong-In Song
Course Title	*Korean*	고급 아나로그 집적회로 설계					
	English	Advanced Analog Integrated Circuit Design					
Course Outline : This course covers advanced analog integrated circuit design issues including feedback, stability and compensation, nonlinear integrated circuits, fully differential operational amplifier, noise in integrated circuits.							
Prerequisite		Analog integrated circuit design (11627) or equivalent, Basic semiconductor device physics					
Textbook and References		P. Gray, Analysis and design of analog integrated circuits, 3rd ed. John Wiley & Sons, Inc.					

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Design and analysis of feedback circuits	
2nd week	Design and analysis of feedback circuits	
3rd week	Design and analysis of feedback circuits	
4th week	Design and analysis of feedback circuits	
5th week	Stability and compensation of integrated circuits	
6th week	Stability and compensation of integrated circuits	
7th week	Stability and compensation of integrated circuits	
8th week	Design and analysis of nonlinear integrated circuits	Midterm Exam
9th week	Design and analysis of nonlinear integrated circuits	
10th week	Design and analysis of nonlinear integrated circuits	
11th week	Design and analysis of nonlinear integrated circuits	
12th week	Design and analysis of fully differential operational amplifiers	
13th week	Design and analysis of fully differential operational amplifiers	*
14th week	Noise in integrated circuits	*
15th week	Noise in integrated circuits	*
16th week	Noise in integrated circuits	Final Exam

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

Instructor Jong-In Song (seal)

Dept. Chair K. E. Geckeler (seal)

SYLLABUS

Classification	Elective	*Course No.*	02648	*Cr. Hrs.*	3:0:3	*Instructor*	Kiseon Kim
Course Title	*Korean*	디지털통신시스템					
	English	Digital Communication Systems					

Course Outline : Introduction of modern digital communication systems and comparison of digital and analog communication systems. Digital source coding, data, voice and image. Hypothetical decision problems to detect, equalize and synchronize digital signals.

Prerequisite	Random Process (11637)
Textbook and References	B. Sklar, Digital communications, 1988, Prentice-Hall Inc.

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Signal and system	
2nd week	Correlation and Spectrum	
3rd week	Linear Systems	
4th week	Communication parameters	
5th week	Midterm Exam	
6th week	Dicision and detection	
7th week	Digital Modulation	
8th week	Coherent detection	
9th week	Noncoherent detection	
10th week	Midterm Exam	
11th week	Performance Analysis	
12th week	Synchronization	
13th week	Linear codes	
14th week	Block codes	
15th week	Convolutional code	
16th week	Final Exam	

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

Instructor **Kiseon Kim** (sign)

Dept. Chair **K. E. Geckeler** (seal)

붙임 #2

SYLLABUS

Classificatio	Elective	*Course No.*	02649	*Hrs.: E: Credits*	3:0:3	*Instructor*	Hyuk Lim
Course Title	*Korean*	무선 네트워크					
	English	*Wireless Networks*					
Course Outline Various topics in wireless networking research area will be covered. First it provides a brief introduction to wireless networking systems such as IEEE 802.11, 802.15, 802.16, wireless sensor networks, and wireless mesh networks. Then, the media access control, ad-hoc routing, and transport,							
Prerequisite		*11635 컴퓨터 네트워킹 (Computer Networking)*					
Textbook and References		Course handouts will be provided.					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Course overview / network protocol stack	
2nd week	Physical layer discussion	
3rd week	Capacity analysis of wireless networks	
4th week	MAC: Basic/modified ALOHA	
5th week	MAC: Hidden/exposed terminal prob.	
6th week	MAC: P-persistent protocol IEEE 802.11 DCF	
7th week	MAC: Scheduling and fairness	Mid term exam
8th week	MAC: Power/rate/carrier sense control	
9th week	Routing: Proactive ad hoc routing	
10th week	Routing: Reactive ad hoc routing	
11th week	Routing for wireless mesh networks	
12th week	Transport in wireless networks	
13th week	Cross-layer approach	
14th week	Interference mitigation for mesh networks	
15th week	Power saving for wireless sensor networks	
16th week	Topology control for wireless sensor networks	Final term exam

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

Instructor ***Hyuk Lim*** ***(Seal)***

Dept. Chair ***K. E. Geckeler*** ***(Seal)***

SYLLABUS

Classification	elective	*Course No.*	034523	*Cr. Hrs.*	3:0:3	*Instructor*	Yang, Sung
Course Title	*Korean*	BioMEMS/BioNEMS 응용을 위한 미세유체역학					
	English	Microfluidics for BioMEMS/BioNEMS applications					

Course Outline

Microfluidics is the study of flow phenomena at small length scales with characteristic channel dimensions typically less than the diameter of a human hair. Small length scale effects become important as surface forces such as viscous drag and surface tension govern flow behavior rather than body forces (inertia) as seen in macroscale fluid mechanics. Miniaturization of fluid handling systems also allows the development of micro Total Analysis Systems (μTAS) or so called "lab on a chip" which combines biological sample preparation, separation and analysis in a single device. Topics explored in this class include: Basic Concepts in Microfluidics, Governing equations for Microfluidics/Basic Flow solutions, Hydraulic Resistance and Compliance, Diffusion, Time-dependent Flow, Capillary Effects, Electrohydrodynamics, Electroosmosis, Dielectrophoresis, Magnetophoresis, Thermal Transfer, Two-phase Flow, Optofluidics, Nanofluidics. As a final step of this class, students will conduct their own term projects related with the material covered in the class.

Prerequisite	Engineering Mathematics (Preferred), Fundamentals of Fluid Mechanics (Preferred), General Biology (preferred)
Textbook and References	*Text and Reference Books* 1. "Theoretical Microfluidics," Henrik Bruus, Oxford University Press, 2008. 2. "Transport Phenomena in Biological Systems", George A. Truskey, Fan Yuan, and David F. Katz, Pearson Prentice Hall Bioengineering, 2004. 3. "Transport Phenomena," Revised 2nd edition, R. Byron Bird, Warren E. Steward, Edwin N. Lightfoot, John Wiley & Sons, Inc., 2007. 4. "Fluid Mechanics," 4th edition, Pijush K. Kundu, Ira M. Cohen, Academic Press, 2007. *Grading* Attendance (10%), Mid Term Exam (20%), Final Exam (20%), Term Project (40%), ETC (10%)

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st week	Basic Concepts in Microfluidics	
2nd week	Governing equations for Microfluidics/Basic Flow solutions	
3rd week	Hydraulic Resistance and Compliance	
4th week	Diffusion	
5th week	Time-dependent Flow	
6th week	Capillary Effects	
7th week	Mid-term Exam	
8th week	Electrohydrodynamics	
9th week	Electroosmosis	
10th week	Dielectrophoresis	
11th week	Magnetophoresis	
12th week	Thermal Transfer	
13th week	Two-phase Flow	
14th week	Optofluidics	
15th week	Nanofluidics	
16th week	Term Paper Presentation/ Final Exam	

* The above lecture schedule is tentative and might be changed depending on lecture status.

Instructor *Yang, Sung* (seal)

Dept. Chair *K. E. Geckeler* (seal)

SYLLABUS

Classification	elective	*Course No.*	02655	*Hrs.: E: Credits*	3:0:3	*Instructor*	H. Fuchs, K. E. Geckeler
Course Title	*Korean*	나노재료학					
	English	*Nanomaterials*					

Course Outline *This course deals with the concepts of self- assembly and selforganization of nanomaterials . The course includes physical, chemical and biological concepts of nanostructures materials and examples for their application.*

Prerequisite	*Basic knowledge of material science*
Textbook and References	*articles will be supplied during the course.*

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Introduction	
2nd week	Methods of self-assembly	
3rd week	Langmuir-Blodgett films	
4th week	Generation of self assembly films (SAMs)	
5th week	UHV deposition of self assembled films	
6th week	Self organization in Biology	
7th week	Lipid layers	
8th week	Tight junctions	
9th week	Analysis of lung surfactants.	
10th week	Molecular motors: Basics	
11th week	Linear Motors	
12th week	Rotary Motors	
13th week	Self cleaning surfaces	
14th week	Quantum materials	
15th week	Novel optical materials	
16th week	Materials for molecular electronics	

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

Instructor *H. Fuchs, K.E. Geckeler (Seal)*

Dept. Chair *K.E. Geckeler (Seal)*

붙임 #2

SYLLABUS

Classification	optional	Course No.	22604	Hrs.: E: Credits	3:0:3	Instructor	Yong Tak Lee, Kamal Alameh
Course Title	Korean	광전자공학					
	English	Optoelectronics					

Course Outline This course is designed to provide graduate students with understanding of the fundamental properties of and optoelectronic materials and devices, and their use in a wide range of applications, including Information and Communication Technology, Health, Biomedical Technology and Environmental. Course starts at the basic understanding of semiconductors and light propagation, generation, detection, modulation devices and their applications in various fields

Prerequisite	Basic knowledge in semiconductors and photonics
Textbook and References	• Electronic and optoelectronic properties of semiconductor structures/ ed. by J. Singh (Cambridge Press), 2003. • J. Piprek, Semiconductor optoelectronic devices. Introduction to physics and simulation/ Academic Press, 2003, 279p. • Physics of optoelectronic devices/ ed. by S.L. Chuang, (Wiley series in pure and applied optics), 1995, 717p. • Semiconductor lasers/ G.P. Agrawal and N.K. Dutta. -2nd ed., 1993, 616p

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Fundamentals of semiconductors(1)	
2nd week	Fundamentals of semiconductors(2)	
3rd week	Heterostructure and Quantum wells	
4th week	Light propagation in various media	
5th week	Generation of light	
6th week	Light Emitting Diodes (LEDs)	
7th week	Semiconductor lasers	
8th week	Midterm exam	
9th week	Vertical Cavity Surface Emitting Lasers (VCSELs	
10th week	VCSEL applications-Optical Interconnects, Optical Sensors	
11th week	Modulation of Light	
12th week	Liquid crystal & Opto-VLSI processors	
13th week	Single-mode and tunable lasers	
14th week	Optical amplifiers and photodetectors	
15th week	Application of Optoelectronic Devices	
16th week	Final exam	

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

Instructor ***Yong Tak Lee/Kamal Alameh*** ***(Seal)***

Program Director ***Do-Kyeong Ko*** ***(Seal)***

붙임 #2

SYLLABUS

Classification	optional	Course No.	22607	Hrs.: E: Credits	3:0:3	Instructor	Dong-Seon Lee
Course Title	Korean	반도체 소자 이론					
	English	Theory of Semiconductor Devices					

Course Outline Based on the basic theories of semiconductor physics, advanced dynamic theories associated with various semiconductor device operations will be describes in details. Devices presented in the lecture include the p-n junction diode, heterojuction bipolar transistor, Schottky diode, MESFET, MOSFET, PIN diode, LED, laser diode, HEMT, QW device and etc. Basic principles of essential manufacturing technologies such as modeling and epitaxy will be described.

Prerequisite	
Textbook and References	Text book: class note References: "Advanced Theory of Semiconductor devices" by karl Hess "Physical Properties of Semiconductors" by Wolfe, Holonyak and Stillman, "Physics of Semiconductor Devices" by Sze

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Review of Quantum Physics	
2nd week	Crystal Properties	
3rd week	Band theory for solid-stste crystals	Homework(1)
4th week	Band theory (continued)	
5th week	Band theory (continued)	
6th week	p-n juction diodes	Homework(2)
7th week	Electron transport	
8th week	Electron transport (continued)	**Midterm Exam**
9th week	Bipolar junction transistors	
10th week	MOSFET	Homework(3)
11th week	CCD/DRAM	
12th week	HEMT/QW Device	
13th week	LED	Homework(4)
14th week	Laser Diode	
15th week	Solar Cell	
16th week	Future Devices	**Final Exam**

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

Instructor ***Dong-Seon Lee*** (Seal)

Program Derector ***Do-kyeong Ko*** (Seal)

SYLLABUS

Classification	optional	Course No.	22613	Cr. Hrs. 3:0:3	Instructor	강 석 영
Course Title	Korean	푸리에 광학				
	English	Fourier Optics and Adaptive Optics				

Course Outline

Applications of the Fourier transform and linear systems theory to the analysis of optical systems such as wave propagation, diffraction, coherent and incoherent and incoherent imaging, pattern recognition and holography. Computational work will be emphasized.

Prerequisite	Graduate standing (Any level of graduate student may attend the course)
Textbook and References	Text : Goodman, Introduction to Fourier Optics, McGraw-Hill References : -R.G.Wilson, Fourier Series and Optical Transform Techniques in Contemporary Optics, John Wiley & Sons -B.Bradley, Signal Processing using Optics, Oxford Univ. Press

Weekly Course Schedule

Calendar	Description	Remarks
1st	Groundwork	
2nd	Groundwork	
3rd	Fourier Transformation	
4th	Fourier Transformation	
5th	Linear Systems	
6th	Linear Systems	
7th	Linear Filters	
8th	Phasor Representation of Monochromatic Waves	
9th	Diffraction	Midterm Exam
10th	Lenses	
11th	Coherent Image Formation	
12th	Coherent Image Formation	
13th	Incoherent Image Formation	
14th	Incoherent Image Formation	
15th	Holography and Wavefront Reconstruction	
16th	Final Exam	

* If there will be experiments, describe them in the "Remarks".

강 석 영 (seal)

붙임 #2

SYLLABUS

Classification	optional	Course No.	22620	Hrs.: E: Credits	3:0:3	Instructor	Noh, Do Young
Course Title	Korean	고급 X-ray 회절론					
	English	Modern X-ray Diffraction					

Course Outline 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. Jens Als-Nielsen, Element of modern x-ray physics 2. B. E. Warren X-ray Diffraction 3. 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 (Seal)

Program Derector Do-Kyeong Ko (Seal)

SYLLABUS

Classification	optional	Course No.	22629	Hrs.:E.:Crs	3 : 0 : 3	Instructor	Hyyong Suk
Course Title	Korean	플라즈마 기초 및 광응용					
	English	Introduction to plasma physics and optical applications					

Course Outline

This is an advanced course that requires undergraduate-level electromagnetics knowledge. It covers basic plasma physics phenomena, laser-plasmas and their applications.

Prerequisite	undergraduate-level electromagnetics
Textbook and References	Introduction to Plasma Physics and Controlled Fusion : Vol. 1 Plasma Physics by Francis F. Chen and other materials

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	introduction and plasma productions	
2nd	single particle motion	
3rd	"	
4th	plasmas as fluids	
5th	"	
6th	waves in plasmas	
7th	"	
8th	mid-term exam	
9th	diffusion and resistivity	
10th	"	
11th	equilibrium and stability	
12th	kinetic theory	
13th	laser-produced plasmas and their applications	
14th	"	
15th	"	
16th	final exam	

* If there will be experiments, describe them in the "Remarks".

Instructor (seal)

Program Director (seal)

SYLLABUS

Classification	optional	Course No.	22630	Hrs.:E.:Crs	3 : 0 : 3	Instructor	최 상욱
Course Title	Korean	기초 양자 광학					
	English	Elements of Quantum Optics					

Course Outline

1. Review of quantum mechanics for laser 2. Atom field interaction 3. Coherent transients 4. Single mode laser theory 5. special topics (Quantum computation, EIT, and etc)

Prerequisite	Basic level of quantum mechanics, Electrodynamics, Laser theory
Textbook and References	"Elements of quantum optics," Meystre, Sargent "Laser Physics" Sargent, Scully, Lamb "Quantum Computation and Quantum Information," Isaac L. Chuang, Michael A. Nielsen

Weekly Course Schedule

Calendar	Description	Remarks
1st	Quantum mechanics review	
2nd	Quantum mechanics review	
3rd	Atom field interaction (Fermi golden rule)	
4th	Atom field interaction (Rabi oscillation, dispersion relation)	
5th	State vector (various representations)	
6th	Density Matrix (Pure and mixed states)	
7th	Atomic line width (T1 and T2 broadening)	
8th	Mid term exam.	
9th	Semiclassical Laser theory	
10th	Semiclassical Laser theory	
11th	Coherent transient (optical nutation, free induction decay)	
12th	Coherent transient (photon echo)	
13th	Special topics (electromagnetically induced transparency)	
14th	Special topics (quantum gates)	
15th	Special topics (quantum algorithm)	
16th	Final exam.	

* If there will be experiments, describe them in the "Remarks".

Instructor 2/5 (Seal)

Program Director (Seal)

붙임 #2

SYLLABUS

Classification	optional	Course No.	22634	Hrs.: E: Credits	3:0:3	Instructor	Pramod R. Watekar
Course Title	Korean	광과학기술 특론 I : 광섬유 특성평가 및 측정시스템					
	English	Special Topics in Photonics I : Fiber Optic Measurements and Systems					

Course Outline This course is specifically intended to study the latest measurement techniques and systems related to optical fibers. It includes fundamental attenuation to Link budgeting. Simulation techniques needed to study the characteristics will be discussed and used.

Prerequisite	Although helpful, no fundamental knowledge of fiber optics is expected.
Textbook and References	1. G P Agrawal, Nonlinear Fiber Optics, Academic Press, NY USA, 1995 2. G. Cancellieri, Single mode optical fiber measurement, Artech House, Boston USA, 1993 3. D. Derickson, Fiber optic test and measurement, Prentice Hall PTR USA, 1998.

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Basic fiber optic parameters: (a) Propagation constant, (b) Attenuation, (c) Splice loss, (d) Gain, (e) Noise figure	
2nd week	Chromatic dispersion-1: (a) Group velocity, (b) Material dispersion	
3rd week	Chromatic dispersion-2: (c) waveguide dispersion, (d) Polarization mode dispersion- statistical method	
4th week	Bendings in optical fibers: (a) Cutoff wavelength, (b) Bending loss, (c) Special techniques for bend-insensitive fibers	
5th week	Mode fields-1: (a) Near field, (b) Far field, (c) Gaussian mode field	
6th week	Mode fields-2: (d) Petermann spot sizes, (e) Transverse offset technique	
7th week	Measurement of refractive index: (a) Transmitted near field technique, (b) Refracted near field technique	
8th week	Mid Term Examination	
9th week	Birefringence measurement (a) Rayleigh scattering method, (b) Magneto-optic method, (c) Prism coupling method	
10th week	Nonlinear refractive index measurement: (a) LPG method, (b) Longitudinal Kerr method, (c) z-scan	
11th week	Miscellaneous properties: (a) Strength, stress, strain, (b) Ellipticity, (c) Diffusion of dopants	
12th week	Measurement systems-1: (a) OTDR, (b) OSA	
13th week	Measurement systems-2: (c) sensors, FP, FBG/LPG, sensor schemes	
14th week	Communication links-1: SNR, BER, MER, FDR	
15th week	Communication links-2: Link budget analysis: installation, power penalty, various aspects	
16th week	End Term Examination	

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

Instructor Pramod R Watekar (Seal)

Program Derector Do-Kyeong Ko (Seal)

SYLLABUS

Classification	optional	Course No.	22365	Hrs.: E: Credits	3:0:3	Instructor	G. Hugh Song
Course Title	Korean	수리 물리					
	English	Mathematical methods for Physics					

Course Outline Introduces various topics in the mathematical physics. Emphasis has been placed on the fundamental principles rather than exercise problem solving.

Prerequisites	none
Textbook and References	G. H. Song, Principle of Photonics Appendix, G. B. Arfken and Weber

Calendar	Description	*Remarks
1st week	Physical units, constants, SI and Gauss systems	
2nd week	Functions and transforms for analsysis	
3rd week	Linear space and scalar product	
4th week	Vector calculus in a flat geometry	
5th week	traditional orthogonal curvilinear coordinate systems	
6th week	Divergence and curl	
7th week	Green function in electromagnetics	
8th week	Reciprocity & Laplacian operator for Radiative systems	
9th week	Linear second-order differential equations	
10th week	valid boundary conditions for partial-diff equations of the three types	
11th week	Bessel functions	
12th week	Variational method and Hamilton's principle	
13th week	Euler-Lagrange equations, method of Lagrange multipliers	
14th week	Eigenvalue equations for the Sturm--Liouville system	
15th week	self-adjointness, completeness, Green-function solutions	
16th week	Eigenfunction expansion of Green functions	

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

Instructor ***G. Hugh Song*** (Seal)

Program Director ***Do Kyeong Ko*** (Seal)

붙임 #2

SYLLABUS

Classification	optional	Course No.	22636	Hrs.: E: Credits	3:0:3	Instructor	K.A.Janulewicz
Course Title	Korean	파동광학					
	English	Wave optics					

Course Outline The main goal of the course is to deliver students comprehensive and homogeneous theory of wave optics. This kind of optics constitutes physical (experimental and theoretical) foundations of modern optics-oriented technological fields such as photonics, noninvasive diagnostics, computer vision, optical metrology etc. The fundamental physical processes being a basis of these and other applications are analysed in detail under the point of view of their applicability in practice.

Prerequisite	
Textbook and References	M. Born E. Wolf "Principles of Optics", E. Hecht "Optics" (4th ed.) E. Wolf, L. Mandel "Coherence and Quantum Optics"

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Basic elements of classic description of electromagnetic field	
2nd week	Electromagnetic interpretation of selected light phenomena	
3rd week	Propagation of beams	
4th week	Interference	
5th week	Diffraction theory I	
6th week	Diffraction theory II	
7th week	Scattering of light	
8th week	Midterm exam	
9th week	Introduction to statistical optics	
10th week	Coherence	
11th week	Speckle	
12th week	Elements of nonlinear optics	
13th week	Elements of crystalline optics	
14th week	Physical backgrounds of holography	
15th week	Approximation of geometrical optics	
16th week	Final exam	

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

Instructor K.A.Janulewicz (Seal)

Program Derector Do-Kyeong Ko (Seal)

SYLLABUS

Classification	Required	Course No.	24504	Hrs.: E: Credits	1:0:1	Instructor	Hyuk-Sang Kwon
Course Title	Korean	콜로퀴움II					
	English	Medical Engineering Colloquium II					

Course Outline

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. All students are required to attend; PhD students must register at least once during their thesis research. All students registered must present their research achivements 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	Medical Engineering Colloquium I
Textbook and References	None

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Seminar schedule will be regularly announced through a board in	All registered students are supposed to submit
2nd week	http://gmse.gist.ac.kr	and abstract for their presentations 4 weeks
3rd week		advance of their presentation day.
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 *Hyuk-Sang Kwon* (Seal)

Dept. Chair *Jong Hyun, Lee* (Seal)

SYLLABUS

Classification	Elective	*Course No.*	24603	*Hrs.: E: Credits*	3:0:3	*Instructor*	Young Ha, Kim
Course Title	*Korean*	*생체적합성*					
	English	*Biocompatibility*					

Course Outline

This course covers the basic biochemistry and the physiological reactions between implaned 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	Complement activation	
11th week	Wound healing	
12th week	Tissue response	
13th week	Cellular response to polymers	
14th week	Surface and Physiological Environment	
15th week	Final Exam	
16th week		

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

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

Dept. Chair *Jong Hyun Lee* *(Seal)*

SYLLABUS

Classification	Elective	Course No.	24615	Hrs.: E: Credits	3:0:3	Instructor	Hyuk-Sang Kwon
Course Title	Korean	정밀 의료기구 설계					
	English	Precision Medical Device Design					

Course Outline

This course offers mechanical/electrical engineering principles and skills which are needed at some stage during the conception, design, development, and manufacture of medical devices. Students will explore medical field as well as learn how to incorporate appropriate new technologies and refine their design using leading-edge modeling, simulation, and experimental methods.

Prerequisite	Physics, and College-level Mathematics
Textbook and References	Will announce

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction of medical device design	
2nd week	Fundamental principles & Mechanical measurements : Reciprocity, impedance, source of load, Accuracy, repeatability, reliability, sensors	
3rd week	Bearing and mechanisms & Power transmission : Linkages, structures, leadscrews, gears, etc	
4th week	Deterministic design & Exact constraint design : Project planning tool development & Kinematic coupling, Hertz contact, Elastic averaging	
5th week	Electronics basics & Signal processing : Power Supplies and Prior Art Search, PCB design and soldering, Op-amps, Microprocessors and diode circuit, Noise,	
6th week	Interesting mechanism : Mechanical Movements	
7th week	Student proposal	
8th week	Medical devices for Hand & arm	
9th week	Medical devices for Foot & legs	
10th week	Medical devices for dental work	
11th week	Medical devices for Ear	
12th week	Medical devices for Eye : glasses	
13th week	Devices to aid life of the young	
14th week	Devices to aid life of the elder	
15th week	Devices to aid fitness	
16th week	Student presentation	

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

Instructor ***Hyuk-Sang Kwon*** (Seal)

Dept. Chair ***Jong Hyun, Lee*** (Seal)

SYLLABUS

Classification	Elective	Course No.	24616	Hrs.: E: Credits	3:0:3	Instructor	Hyuk-Sang Kwon
Course Title	Korean	GMSE 전공자를 위한 필요 수학					
	English	Essential mathematics for GMSE					

Course Outline

This course provides an introduction to probability and statistics with applications as well as ordinary differential equation, and partial differential equation. Students will learn how to solve mathematical problems whose solution is fundamental to many contemporary science and engineering by both analytical and practical manner

Prerequisite	College-level Mathematics
Textbook and References	Will announce

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	basic probability models : Properties of Probability	Vladimir I. Shin
2nd week	Random Variables : Functions of Random Variables, Convolution	Vladimir I. Shin
3rd week	Properties of Expectation, Variance, Standard Deviation : Covariance and Correlation, Cauchy-Schwartz Inequality	Vladimir I. Shin
4th week	discrete and continuous probability distributions : Cumulative & Marginal Distributions, Poisson Distribution & Normal Distribution	Vladimir I. Shin
5th week	statistical estimation : Estimation Theory, Bayes' Estimators Maximum Likelihood Estimators	Vladimir I. Shin
6th week	Hypotheses Testing : Chi-square Distribution, t-distribution, Confidence Intervals for Parameters of Normal Distribution t-test	Vladimir I. Shin
7th week	Hypotheses Testing (continued)	Vladimir I. Shin
8th week	Midterm	Vladimir I. Shin
9th week	Linear ODE's : Second Order with Constant Coefficients	권혁상
10th week	Matrix and First-order Linear Systems : Eigenvalues and Eigenvectors	권혁상
11th week	Non-linear Autonomous Systems : Critical Point Analysis and Phase Plane Diagrams	권혁상
12th week	Introduction and basic facts about PDE's : First-order linear PDE's & PDE's from physics Initial and boundary values problems	권혁상
13th week	Types of PDE's Distributions	권혁상
14th week	The wave/ heat/diffusion equation	권혁상
15th week	Inhomogeneous problems	권혁상
16th week	Final exam : understanding, constructing, solving, and interpreting differential equations	권혁상

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

Instructor *Hyuk-Sang Kwon* *(Seal)*

Dept. Chair *Jong Hyun, Lee* *(Seal)*

SYLLABUS

Classification	Elective	Course No.	24619	Hrs.: E: Credits	3:0:3	Instructor	Dug Young Kim
Course Title	Korean	푸리에 광학					
	English	Fourier Optics and Adaptive Optics					

Course Outline

Applications of the Fourier transform and linear systems theory to the analysis of optical systems such as wave propagation, diffraction, coherent and incoherent and incoherent imaging, pattern recognition and holography. Computational work will be emphasized

Prerequisite	Graduate standing (Any level of graduate student may attend the course)
Textbook and References	Text : Goodman, Introduction to Fourier Optics, McGraw-Hill References : -R.G.Wilson, Fourier Series and Optical Transform Techniques in Contemporary Optics, John Wiley & Sons -B.Bradley, Signal Processing using Optics, Oxford Univ. Press

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Groundwork	
2nd week	Groundwork	
3rd week	Fourier Transformation	
4th week	Fourier Transformation	
5th week	Linear Systems	
6th week	Linear Systems	
7th week	Linear Filters	
8th week	Phasor Representation of Monochromatic Waves	Midterm Exam
9th week	Diffraction	
10th week	Lenses	
11th week	Coherent Image Formation	
12th week	Coherent Image Formation	
13th week	Incoherent Image Formation	
14th week	Incoherent Image Formation	
15th week	Holography and Wavefront Reconstruction	
16th week	Final Exam	

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

Instructor *Dug Young Kim* (Seal)

Dept. Chair *Jong Hyun, Lee* (Seal)

SYLLABUS

Classification	Elective	Course No.	34620	Hrs.: E: Credits	3:0:3	Instructor	Hyuk Lim
Course Title	Korean	무선 네트워크					
	English	Wireless Networks					

Course Outline

Various topics in wireless networking research area will be covered. First it provides a brief introduction to wireless networking systems such as IEEE 802.11, 802.15, 802.16, wireless sensor networks, and wireless mesh networks. Then, the media access control, ad-hoc routing, and transport, and cross-layer issues for wireless channel will be discussed in detail. The performance analysis and evaluation for wireless network protocols and algorithms will be also covered.

Prerequisite	1635 컴퓨터 네트워킹 (Computer Networking)
Textbook and References	Couse handouts will be provided

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Course overview / network protocol stack	
2nd week	Physical layer discussion	
3rd week	Capacity analysis of wireless networks	
4th week	MAC: Basic/modified ALOHA	
5th week	MAC: Hidden/exposed terminal prob.	
6th week	MAC: P-persistent protocol IEEE 802.11 DCF	
7th week	MAC: Scheduling and fairness	
8th week	MAC: Power/rate/carrier sense control	Mid term exam
9th week	Routing: Proactive ad hoc routing	
10th week	Routing: Reactive ad hoc routing	
11th week	Routing for wireless mesh networks	
12th week	Transport in wireless networks	
13th week	Cross-layer approach	
14th week	Interference mitigation for mesh networks	
15th week	Power saving for wireless sensor networks	
16th week	Topology control for wireless sensor networks	Final term exam

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

Instructor *Hyuk Lim* (Seal)

Dept. Chair *Jong Hyun, Lee*

(Seal)

SYLLABUS

Classification	Elective	Course No.	2426	Hrs.: E: Credits	3:0:3	Instructor	Yang, Sung
Course Title	Korean	BioMEMS/BioNEMS 응용을 위한 미세유체역학					
	English	Microfluidics for BioMEMS/BioNEMS applications					

Course Outline

Microfluidics is the study of flow phenomena at small length scales with characteristic channel dimensions typically less than the diameter of a human hair. Small length scale effects become important as surface forces such as viscous drag and surface tension govern flow behavior rather than body forces (inertia) as seen in macroscale fluid mechanics. Miniaturization of fluid handling systems also allows the development of micro Total Analysis Systems (μTAS) or so called "lab on a chip" which combines biological sample preparation, separation and analysis in a single device. Topics explored in this class include: Basic Concepts in Microfluidics, Governing equations for Microfluidics/Basic Flow solutions, Hydraulic Resistance and Compliance, Diffusion, Time-dependent Flow, Capillary Effects, Electrohydrodynamics, Electroosmosis, Dielectrophoresis, Magnetophoresis, Thermal Transfer, Two-phase Flow, Optofluidics, Nanofluidics. As a final step of this class, students will conduct their own term projects related with the material covered in the class.

Prerequisite	*Engineering Mathematics (Preferred), Fundamentals of Fluid Mechanics (Preferred), General Biology (preferred)*
Textbook and References	*1. "Theoretical Microfluidics," Henrik Bruus, Oxford University Press, 2008.* *2. "Transport Phenomena in Biological Systems", George A. Truskey, Fan Yuan, and David F. Katz, Pearson Prentice Hall Bioengineering, 2004.* *3. "Transport Phenomena," Revised 2nd edition, R. Byron Bird, Warren E. Steward, Edwin N. Lightfoot, John Wiley & Sons, Inc., 2007.* *4. "Fluid Mechanics," 4th edition, Pijush K. Kundu, Ira M. Cohen, Academic Press, 2007.* *Grading* *Attendance (10%), Mid Term Exam (20%), Final Exam (20%), Term Project (40%), ETC (10%)*

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Basic Concepts in Microfluidics	
2nd week	Governing equations for Microfluidics/Basic Flow solutions	
3rd week	Hydraulic Resistance and Compliance	
4th week	Diffusion	
5th week	Time-dependent Flow	
6th week	Capillary Effects	
7th week	Mid-term Exam	
8th week	Electrohydrodynamics	
9th week	Electroosmosis	
10th week	Dielectrophoresis	
11th week	Magnetophoresis	
12th week	Thermal Transfer	
13th week	Two-phase Flow	
14th week	Optofluidics	
15th week	Nanofluidics	
16th week	Term Paper Presentation/ Final Exam	

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

Instructor *Yang, Sung* (Signature)

Dept. Chair *Jong Hyun, Lee* (Signature)

SYLLABUS

Classification	Elective	Course No.	34626	Hrs.: E: Credits	3:0:3	Instructor	So Hee, Kim
Course Title	Korean	유한요소해석					
	English	Finite Element Analysis and Simulations					

Course Outline

The finite element method to solve differential equations for engineering problems is introduced. Theoretical basis and concepts of FEM are covered with 1-D and 2-D problems. Practical approaches to FE analysis of structural, thermal, mechanical as well as multiphysics problems are covered. Element types, boundary conditions, mesh generation, and modeling considerations are discussed by using commercial finite element software.

Prerequisite	College-level Mathematics
Textbook and References	Will announce

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction to FEM	
2nd week	Theoretical background of FEM	
3rd week	FE analysis of 1-D problems	
4th week	FE analysis of 1-D problems	
5th week	FE analysis of 2-D problems	
6th week	Weak form and discretization	
7th week	FE matrix equation and solver	
8th week	Mid-term exam	
9th week	FE analysis of beams and frames	
10th week	FE analysis of heat conduction	
11th week	FE analysis of heat convection	
12th week	FE analysis of plane solids	
13th week	FE procedures and modeling	Lab practice
14th week	FE procedures and modeling	Lab practice
15th week	Multiphysics FE analysis	
16th week	Presentation and final exam	

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

Instructor 김소희 (Seal)

Dept. Chair 이장원

SYLLABUS

Classification	Elective	Course No.	24629	Hrs.: E: Credits	3:0:3	Instructor	Yong-Chul Kim
Course Title	Korean	의약화학 II					
	English	Medicinal Chemistry II					

Course Outline

Current and historical drug target proteins such as receptors and the mechanism of action including structure activity relationships of small molecule ligands or drugs will be reviewed.

Prerequisite	None
Textbook and References	An Introduction to Medicinal Chemistry (by L. Patrick) Principles of Medicinal Chemistry (by W. O. Foye)

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction	
2nd week	Antibacterial Agents	
3rd week	Antibacterial Agents	
4th week	Cholinergics, Anticholinergics, and Anticholinesterases	
5th week	Cholinergics, Anticholinergics, and Anticholinesterases	
6th week	Cholinergics, Anticholinergics, and Anticholinesterases	
7th week	The Adrenergic Nervous System	
8th week	The Adrenergic Nervous System	
9th week	Mid-Term Exam	
10th week	The Opium Analgesics	
11th week	The Opium Analgesics	
12th week	H2-receptor Antagonists (Cimetidine)	
13th week	H2-receptor Antagonists (Cimetidine)	
14th week	Cancer Chemotherapy	
15th week	Cancer Chemotherapy	
16th week	Final Exam	

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

Instructor *Yong-Chul Kim* (Seal)

Dept. Chair *Jong Hyun, Lee* (Seal)

SYLLABUS

Classification	Elective	Course No.	2428	Hrs.: E: Credits	3:0:3	Instructor	Sangyong Jon
Course Title	Korean	바이오콘쥬게이트 화학 2					
	English	Bioconjugate Chemistry II					

Course Outline

Bioconjugate chemistry is about themethods of how to conjugate bioactive ligands or nanomaterials to biomolecules such as proteins and DNAs. This course will cover the principles and actual examples of bioconjugation that has been used in current nano-biotechnology as well as for biological study to date. There is no pre-requisite for this class.

Prerequisite	Permission of Instructo
Textbook and References	None

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction & Principles of Bioconjugate Chemistry	
2nd week	Functional Targets	
3rd week	The Chemistry of Reactive Group	
4th week	Cross Linkers Zero Length, Homo- or Hetero-bifunctional	
5th week	Cleavable Reagents System	
6th week	Tags and Probes	
7th week	Antibody Modification and Conjugation	
8th week	Liposome Conjugates and Derivatives	
9th week	Avidin-Biotin Systems	
10th week	Colloidal Gold-Labeled Proteins	
11th week	Modification with Synthetic Polymers	
12th week	Nucleic Acid and Oligonucleotide Modification and Conjugation	
13th week	Model Study Using Actual Examples in Recent Papers	
14th week	Model Study Using Actual Examples in Recent Papers	
15th week	Model Study Using Actual Examples in Recent Papers	
16th week	Model Study Using Actual Examples in Recent Papers	

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

Instructor *Sangyong Jon*

Dept. Chair *Jong Hyun, Lee*

SYLLABUS

Classification	Elective	Course No.	24629	Hrs.: E: Credits	3:0:3	Instructor	양성
Course Title	Korean	임상생리학의 이해					
	English	General Consideration of Clinical Physiology					

Course Outline

The Beauty of physiology is that it attempts to integrate the individual functions of all the body's different cells and organs into a total functional whole, the human or animal body. Physiologists call this high level of internal dodily control homeostasis. In disease conditions, more often than not the functional balances become seriously disturbed.

One of the principal goals of this physiology lecture is to explain and emphasize the effectiveness and beauty of the body's homeostasis mechanisms, and the other goal is to encourage the students to feel that he/she can grasp and understand the whole subject and get the fundamental idea for their project in Bioengineering.

Prerequisite	Anatomy (Preferred)
Textbook and References	1. Most course materials will be distributed to students 2. "Textbook of Medical Physiology" 11th edition, Guyton AC, published by W.B. Saunders Company Grading Attendance(30%), Pop Quiz(20%), Final Exam(50%)

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction to Clinical Physiology	김수완(신장내과)
2nd week	Heart(1)	안영근(순환기내과)
3rd week	Heart(2)	정명호(순환기내과)
4th week	Circulation	이종은(생리학교실)
5th week	Sodium and Water Transport	김수완(신장내과)
6th week	Kidney Diseases	배은희(신장내과)
7th week	Hemodialysis	마성권(신장내과)
8th week	Sexual Medicine (from basic research to clinical application)	박광성(비뇨기과)
9th week	Endocrine Physiology	강호철(내분비대사내과)
10th week	Respiratory Physiology	김영철(호흡기내과)
11th week	Neuroanatomy and Cognitive Neurology	김병채(신경과)
12th week	Clinical Application of Biomaterials for Bone Diseases	윤택림(정형외과)
13th week	Oncology	이제중(혈액종양내과)
14th week	Cancer Imaging	민정준(핵의학과)
15th week	From Basic Research to Clinical Laboratory	기승정(진단검사의학과)
16th week	Final Exam	

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

Coordinator Sung, Yang (Seal)

Dept. Chair Jong Hyun, Lee (Seal)

붙임 #2

SYLLABUS

Classification	Optional	Course No.	26605	Hrs.: E: Credits	3	Instructor	Park, Seong-Ju
Course Title	Korean	박막제조공정					
	English	Thin Film Technology					

Course Outline The subject of this lecture is the study of the vacuum technology, preparation and etching of thin films, and their mechanisms. Growth/etching mechanisms and properties of thin films based on the thermodynamics and molecular theory will be lectured. Following topics will be included: vacuum technology, preparation and etching of thin films, mechanisms of film formation and plasma etching, characterization of thin films, properties of thin films, epitaxy, applications of thin films.

Prerequisite	None
Textbook and	Materials Science of Thin Films, Milton Ohring, Academic Press, 2002

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Vacuum Science and Technology	
2nd week	Vacuum Science and Technology	
3rd week	Thin-Film Evaporation Processes	
4th week	Discharges, Plasma, and Ion-Surface Interactions	
5th week	Plasma and Ion Beam Processing of Thin Films(deposition/etching)	
6th week	Plasma and Ion Beam Processing of Thin Films(deposition/etching)	
7th week	Plasma and Ion Beam Processing of Thin Films(deposition/etching)	
8th week	Chemical Vapor Deposition	Midterm exam
9th week	Chemical Vapor Deposition	
10th week	Substrate Surfaces and Thin-Film Nucleation	
11th week	Epitaxy	
12th week	Epitaxy	
13th week	Film Structure	
14th week	Characterization of Thin Films and Surfaces	
15th week	Characterization of Thin Films and Surfaces	
16th week	Characterization of Thin Films and Surfaces	Final exam

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

Instructor *Seong-Ju Park* (Seal)

Program Director *Do-Young Noh* (Seal)

붙임 #2

SYLLABUS

Classification	optional	Course No.	2660	Hrs.: E: Credits	3:0:3	Instructor	K.A.Janulewicz
Course Title	Korean	파동광학					
	English	Wave optics					

Course Outline The main goal of the course is to deliver students comprehensive and homogeneous theory of wave optics. This kind of optics constitutes physical (experimental and theoretical) foundations of modern optics-oriented technological fields such as photonics, noninvasive diagnostics, computer vision, optical metrology etc. The fundamental physical processes being a basis of these and other applications are analysed in detail under the point of view of their applicability in practice.

Prerequisite	
Textbook and References	M. Born E. Wolf "Principles of Optics", E. Hecht "Optics" (4th ed.) E. Wolf, L. Mandel "Coherence and Quantum Optics"

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Basic elements of classic description of electromagnetic field	
2nd week	Electromagnetic interpretation of selected light phenomena	
3rd week	Propagation of beams	
4th week	Interference	
5th week	Diffraction theory I	
6th week	Diffraction theory II	
7th week	Scattering of light	
8th week	Midterm exam	
9th week	Introduction to statistical optics	
10th week	Coherence	
11th week	Speckle	
12th week	Elements of nonlinear optics	
13th week	Elements of crystalline optics	
14th week	Physical backgrounds of holography	
15th week	Approximation of geometrical optics	
16th week	Final exam	

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

Instructor K.A.Janulewicz (Seal)

Program Derector Noh, Do young (Seal)

SYLLABUS

Classification	Opyional	Course No.	2bbio	Hrs.: E: Credits	3.00	Instructor	Tae, Giyoong
Course Title	Korean	생화학특론					
	English	Biochemistry					
Course Outline	This course is to provide the key concepts of biochemistry, covering physical chemistry concepts in biological molecules and structures and functions of biological molecules (proteins and genetic materials).						
Prerequisite	None						
Textbook and References	Biochemistry (Stryer et al.) Molecular Biology of the Cell (Alberts et al.)						

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Introduction and basic cell structure	
2nd week	Amino acids and proteins	
3rd week	Enzymes	
4th week	Nucleic acids and genetic flow	
5th week	Lipids and membrane transports	
6th week	Ion Channel & Pump	
7th week	Signal transduction	
8th week	Mid-term exam	
9th week	Sensory systems & Molecular motors	
10th week	Immune systems	
11th week	Carbohydrates & metabolism	
12th week	Glycolysis	
13th week	Cytric acid cycles	
14th week	Electron transport and oxidative phosphorylation	
15th week	Topic presentation	
16th week	Final exam	

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

Instructor Tae, Giyoong (Seal)

Program Director Noh, Do Young (Seal)

SYLLABUS

Classification	optional	Course No.	26611	Cr. Hrs.	3.00	Instructor	Lee, Kwanghee
Course Title	Korean	유기물광전자 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	Hadzioannou and P.F. van Hutten (eds), 'Semiconducting Polymers', Wiley-VCH, 2000.

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Introduction to Organic Electronics	
2nd	Electrical Properties of Semiconducting Organic Materials	
3rd	Optical Properties of Semiconducting Organic Materials	QUIZ 1
4th	Semiconducting Device Physics I : Basics	
5th	Semiconducting Device Physics II : P-N Junction Theory	
6th	Semiconducting Device Physics III : Organic Electronics	QUIZ 2
7th	Organic Light-Emitting Devices I	
8th	Organic Light-Emitting Devices II	MIDTERM
9th	Organic Solar Cells I	
10th	Organic Solar Cells II	
11th	Organic Field-Effect Transistor I	
12th	Organic Field-Effect Transistor II	QUIZ 3
13th	Organic Circuit I	
14th	Organic Circuit II	
15th	Organic Memory Devices	
16th	Organic Photonics Materials: Lasers and NLO	FINAL

*** If there will be experiments, describe them in the "Remarks".**

Instructor Lee, Kwanghee (seal) Kwanghee Lee

Program Director Noh, Do Young (seal)

SYLLABUS

Classification	optional	Course No.	26612	Cr. Hrs.	3:0:3	Instructor	Noh, Do Young
Course Title	Korean	고급 X-ray 회절론					
	English	Modern X-ray Diffraction					

Course Outline

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	2. B. E. Warren X-ray Diffraction, 2. B. D. Cullity Elements of X-ray Diffraction, 1. Jens Als-Nielsen, Element of Modern x-ray physics

Weekly Course Schedule

Calendar	*Description*	*Remarks*
1st	Properties of X-rays	
2nd	Synchrotron X-rays	
3rd	X-ray Scattering by Atoms	
4th	Reciprocal Lattice Space	
5th	Single Crystal X-ray Diffraction	
6th	Thermal vibration and diffuse scattering	
7th	Integrated Intensity	
8th	Experimental methods	
9th	X-ray studies of order-disorder	
10th	Residual stress measurement	
11th	Surface X-ray Scattering	
12th	X-ray Reflectivity (1)	
13th	X-ray Reflectivity (2)	
14th	Small Angle X-ray Scattering (1)	
15th	Small Angle X-ray Scattering (2)	
16th	Advanced Synchrotron X-ray Scattering method	

* If there will be experiments, describe them in the "Remarks".

Instructor 노 도영 (seal)

Program Director Noh. Do Young (seal)

SYLLABUS

Classification	optional	Course No.	26613	Cr. Hrs.	3.00	Instructor	이 탁희
Course Title	Korean	나노전자학					
	English	Nanoelectronics					

Course Outline

Electronic properties of quantum nanostructures will be studied in this lecture. Nanofabrication and measurement techniques of nanostructuers 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 Heinzel, Ref: Nanoelectronics and Information Technology, edited by Rainer Waser

Weekly Course Schedule

Calendar	Description	Remarks
1st	Nanoelectronics: Introduction	
2nd	Mesoscopic transport: Overview, key issues	
3rd	Experimental techniques: Fabrications	
4th	Experimental techniques: Measurements	
5th	Quantum Electronic Effects: Heterostructures	
6th	Quantum Electronic Effects: Surfaces, interfaces	
7th	2-dim quantum films: Deposition methods	
8th	2-dim quantum films: Quantum wells	
9th	2-dim quantum films: Magnetotransport	
10th	1-dim quamtum wires: Ballistic transport	
11th	1-dim quamtum wires: Landuaer formalism	
12th	1-dim quamtum wires: Nanowires, Nanotubes	
13th	1-dim quamtum wires: Organic wires	
14th	0-dim quantum dot: Fabrication, overview	
15th	0-dim quantum dot: Single electron tunneling	
16th	Final exam	

*** If there will be experiments, describe them in the "Remarks".**

Instructor Lee Takchee (seal)

program Director Noh, Do Young (seal)

SYLLABUS

Classification	elective	Course No.	26614	Cr. Hrs.	3.0	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 Microelectonic Fabrication", edited by Stephen A. Campbell "Handbook of VLSI Microlithography", edited by Glendinning

Weekly Course Schedule

Calendar	Weekly Course Schedule	*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,	
10th week	Self-assembly lithography	
11th week	Immersion lithography, Dip-pen lithography	
12th week	Ion-beam lithography, Interference lithography	
13th week	Wet etching process	
14th week	Wet etching process, Dry-etching process	
15th week	Dry-etching process, Selective etching process	
16th week	Overview of current silicon technology development	

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

Instructor Jung, Gun Young (Seal)

Dept. Chair Noh, Do Young (Seal)

SYLLABUS

Classification	optional	Course No.	56615	Hrs.: E: Credits	3:0:3	Instructor	G. Hugh Song
Course Title	Korean	수리 물리					
	English	Mathematical methods for Physics					
Course Outline	Introduces various topics in the mathematical physics. Emphasis has been placed on the fundamental principles rather than exercise problem solving.						
Prerequisites	none						
Textbook and References	G. H. Song, Principle of Photonics Appendix, G. B. Arfken and Weber						

Calendar	Description	*Remarks
1st week	Physical units, constants, SI and Gauss systems	
2nd week	Functions and transforms for analsysis	
3rd week	Linear space and scalar product	
4th week	Vector calculus in a flat geometry	
5th week	traditional orthogonal curvilinear coordinate systems	
6th week	Divergence and curl	
7th week	Green function in electromagnetics	
8th week	Reciprocity & Laplacian operator for Radiative systems	
9th week	Linear second-order differential equations	
10th week	valid boundary conditions for partial-diff equations of the three types	
11th week	Bessel functions	
12th week	Variational method and Hamilton's principle	
13th week	Euler-Lagrange equations, method of Lagrange multipliers	
14th week	Eigenvalue equations for the Sturm--Liouville system	
15th week	self-adjointness, completeness, Green-function solutions	
16th week	Eigenfunction expansion of Green functions	

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

Instructor ***G. Hugh Song***

Program Director ***Noh, Do Young***

SYLLABUS

Classification	Required	Course No.	00003	Hrs.: E: Credits	3:0:0	Instructor	이소림
Course Title	Korean	한국어 1					
	English	Beginner Korean 1					
Course Outline 한국어 기초를 배우는 시간으로 , 한글익히기를 포함하여 생활에 필요한 기초 회화를 익힌다.							
Prerequisite							
Textbook and References	Active Korean 1, Language Education Institute Seoul national University, Moonjinmedia. 2008.						

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	Course orientation 1과 한글 HANGEUL	
2nd week	1과 한글 HANGEUL	
3rd week	2과 인사와 소개 GREETINGS & INTERDUCTIONS	
4th week	2과 인사와 소개 GREETINGS & INTERDUCTIONS	STUDENT'S ACTIVITY
5th week	3과 식당 RESTAURANT	
6th week	4과 쇼핑 SHOPPING	
7th week	복습 REVIEW	STUDENT'S ACTIVITY
8th week	MID TERM EXAM	
9th week	5과 일상생활 DAILY LIFE	
10th week	6과 날짜와 시간 DATE&TIME	
11th week	6과 날짜와 시간 DATE&TIME	
12th week	7과 약속 APPOINTMENT	
13th week	문화체험학습 CULTURE CLASS	
14th week	8과 위치와 방향 LOCATIONS &DIRECTIONS	
15th week	9과 전화 PHONE CALL	
16th week	복습, 기말고사 REVIEW & FINAL EXAM	

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

Instructor ***(Seal)***

Dept. Chair Keechul Jung (Seal)

Dean of Academic & Student Affairs

SYLLABUS

Classification	Required	*Course No.*	00006	*Hrs.: E: Credits*	3:0:0	*Instructor*	
Course Title	*Korean*	*영어 1 : 영작문*					
	English	*English 1: Writing and Grammar*					
Course Outline		*Course Description:*					
Prerequisite		*None*					
Textbook and		*English I Writing & Grammar: Fall, 2008 original text to be purchased.*					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Orientation; Previous learning experience; Expectations, Self Evaluation.	
2nd week	Instruction & practice: Email communication	Assessment
3rd week	Writing Basics	
4th week	Error Recognition; Proofreading; Integrated skills: Writing task "Problem solving"	
5th week	Articles (A, An, The, and Ø); Punctuation & Grammar	
6th week	Parts of a paragraph: Topic sentences. Paragraph Structure	
7th week	Parts of a paragraph: Coherence	Assessment
8th week	Cover Letters and CVs – Skills vocabulary	
9th week	CV Building: Brainstorming Skills and Experiences w/ Job Ad; CV Organization	
10th week	Cover Letter Building: Cover Letter structure	Assessment
11th week	Writing Summaries	
12th week	Essay Organization: Chronological Order; Logical Division of Ideas	
13th week	Essay Organization: Comparison & Contrast; Assignment Development: "Personality Comparisons" Preparation	

14th week	Assignment Development	Assessment
15th week	In-class writing: Assignment	Assessment
16th week	Final comments	

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

Instructor ***(Seal)***

Dept. Chair Heechul Cho (Seal)

Dean of Academic & Student Affairs

SYLLABUS

Classification	Required	*Course No.*	00007	*Hrs.: E: Credits*	3:0:0	*Instructor*	
Course Title	*Korean*	*영어 1 : 영작문*					
	English	English 1: Speaking and Listening					
Course Outline		Course Description:					
Prerequisite		None					
Textbook and		English I Speaking & Listening: Fall, 2008 original text to be purchased.					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Orientation; Previous learning experience; Expectations; SILL Self-Assessment	
2nd week	Goal Setting; Self Assessment Presentation	Assessment
3rd week	Questioning Skills; Opinion Language: Agree & Disagree; Egg Drop Competition	
4th week	Understanding Communication; Presentation Basics: Articulation, Body posture, Confidence	
5th week	Presentation Basics: Visual Aids; Language Organization: Lists, Sequences	
6th week	Language Organization: Cause & Effect; News; Story writing; Story boards	Assessment
7th week	Story Presentations; Story Presentations	Assessment
8th week	'Phobias': Listening for Main Idea, Notetaking & Summarizing; Listening for Specific Information &	
9th week	'Why': Adding reasons & Giving support to arguments; Phobias Presentations	Assessment
10th week	Cross-cultural Communication: Translations & Interpretations	
11th week	Poster Presentations: Instruction and Presentation	Assessment
12th week	Summarizing; Listening Practice	
13th week	Final Task: Recruiting (Instruction)	

14th week	Using what you know: Inclusive Language; Introducing yourself to others: Recruiting in English	
15th week	Recruiting Presentation; Listening Evaluation	Assessment
16th week	Personal Interviews concerning/determining student achievement	

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

Instructor ***(Seal)***

Dept. Chair Heechul Choi ***(Seal)***

Dean of Academic & Student Affairs

SYLLABUS

Classification	Elective	*Course No.*	00008	*Hrs.: E: Credits*	3:0:0	*Instructor*	
Course Title	*Korean*	*영어 2 : 학술작문*					
	English	English II: Academic Writing					
Course Outline		Course Description:					
Prerequisite		English 1: Writing and Grammar					
Textbook and		English II Academic Writing: Fall, 2008 to be purchased.					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Orientation, Introductions, Expectations; Formal Emails: Politeness, Errors	
2nd week	Formal Emails: Practice; Task: Formal Email & Writing sample	Assessment
3rd week	Guide to Science Writing; Word Choice in Academic Writing	
4th week	Word Choice & Practice	Assessment
5th week	Sentence Writing: Instruction and Practice	
6th week	Paragraph Writing: Instruction and Practice	
7th week	General-Specific Texts; Problem-Solution Texts	
8th week	Mid-session Assessment; Research Paper (RP) Construction: Introduction	Assessment
9th week	RP Construction: Methods	
10th week	RP Construction: Data Commentary	
11th week	RP Construction: Results/Discussion/Conclusion I	
12th week	RP Construction: Results/Discussion/Conclusion II	
13th week	Bring Draft for Discussion; RP Review/Consultations	

SYLLABUS

Classification	Elective	*Course No.*	00009	*Hrs.: E: Credits*	3:0:0	*Instructor*	
Course Title	*Korean*	영어 2 : 프리젠테이션					
	English	English 2: Presentations and Pronunciation					
Course Outline		Course Description					
Prerequisite		English 1: Speaking and Listening					
Textbook and		English II Pronunciation and Presentations: Fall, 2008 to be purchased.					

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	Orientation, self-evaluation, and needs analysis	
2nd week	Interactive communication: Developing fluency and confidence	
3rd week	Skills seminar: Preparation for 2-minute video (body language & public speaking)	Assessment
4th week	Effective public speaking: Instruction & Practice; Stress, intonation, and pausing	
5th week	Phonology Practice & Assessment; Skills development: Giving advice, using appropriate language and style	Assessment
6th week	Role-play: Advising & Counseling; Toastmasters topics	Assessment
7th week	Review of skills: Fluency plus accuracy; Presentation Practice "GIST Influences"	
8th week	Seminar: Instructions and practice for 1st presentations; Fluency practice and informal, individual feedback on skills	
9th week	Preparation for Presentation (News Influence) and First Presentations	Assessment
10th week	Discussion skills: Effective speaking; Content & style of expressing opinion in an academic context	Assessment
11th week	Expressing your point of view: "Heart-felt Speech"; Short presentations of effective speaking	
12th week	Debating skills: Instruction & Practice; The Great Debate	Assessment
13th week	Poster Presentations: Instruction and Practice	Assessment

14th week	PowerPoint Presentations: Instructions & Criteria; Effective Interview skills: Instructions & Practice	
15th week	PowerPoint Presentations	Assessment
16th week	Final grades	

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

Instructor ***(Seal)***

Dept. Chair Keechul Choi (Seal)

Dean of Academic & Student Affairs

SYLLABUS

Classification	Elective	Course No.	00606	Hrs.: E: Credits	3:0:0	Instructor	이소림
Course Title	Korean	한국어 2					
	English	Low Intermediate Korean 2					

Course Outline

한글 공부를 마친 학생들을 대상으로 일상 생활에 필요한 회화를 익힌다.

Prerequisite	한국어 1 수료자 또는 그에 상당한 수준을 갖춘 자.
Textbook and References	Active Korean 2, Language Education Institute Seoul national University, Moonjinmedia. 2008.

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	COURSE ORIENTATION , PRE-TEST	
2nd week	1과 가족 FAMILY	
3rd week	1과 가족 FAMILY	
4th week	2과 교통 TRANSPORTATION	STUDENT'S ACTIVITY
5th week	3과 이유 REASON	
6th week	4과 우체국 POST OFFICE	
7th week	복습 REVIEW	
8th week	MID TERM EXAM	
9th week	5과 예약 RESERVATIONS	
10th week	5과 예약 RESERVATIONS	
11th week	6과 예의 ETIQUETTE	STUDENT'S ACTIVITY
12th week	7과 병원 HOSPITAL	
13th week	문화체험학습 CULTURE CLASS	
14th week	8과 충고와 제안 ADVUCE&SUGGESTIONS	
15th week	9과 쇼핑 SHOPPING	
16th week	복습, 기말고사 REVIEW & FINAL EXAM	

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

Instructor ***(Seal)***

Dept. Chair Heechul Cho (Seal)

Dean of Academic & Student Affairs

SYLLABUS

Classification	Elective	Course No.	00609	Hrs.: E: Credits	3:0:0	Instructor	이소림
Course Title	Korean	한국어 3					
	English	High Intermediate Korean 3					

Course Outline

일상 생활에 필요한 회화에 익숙해지도록 학습하며, 생각이나 감정을 표현하거나 한국인들과 더 깊이 있는 의사소통이 되도록 학습한다.

Prerequisite	한국어 2 수료자 또는 그에 상당한 실력을 갖춘 자.
Textbook and References	Active Korean 13 Language Education Institute Seoul national University, Moonjinmedia. 2008.

Weekly Course Schedule

Calendar	Description	*Remarks
1st week	COURSE ORIENTATION , PRE-TEST	
2nd week	1과 경험 EXPERIENCE	
3rd week	1과 경험 EXPERIENCE	
4th week	2과 취미 HOBBIES	STUDENT'S ACTIVITY
5th week	2과 취미 HOBBIES	
6th week	3과 취업 EMPLOYMENT	
7th week	복습 REVIEW	
8th week	MID TERM EXAM	
9th week	4과 유행 FASHON	
10th week	5과 고장 OUT OF ORDER	
11th week	6과 변화 CHANGE	
12th week	7과 정보 INFORMATION	STUDENT'S ACTIVITY
13th week	문화체험학습 CULTURE CLASS	
14th week	8과 진실과 거짓 TRUE AND FALSE	
15th week	9과 갈등과 고민CONFLICT AND WORRY	
16th week	복습, 기말고사 REVIEW & FINAL EXAM	

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

Instructor (Seal)

Dept chair Heechul Choi (Seal)

Dean of Academic & Student Affairs

SYLLABUS

Classification	Required	***Course No.***	00004 00005	***Hrs.: E : Credits***	1:0:0	***Instructor***	Visiting Speakers
Course Title	***Korean***	특별교양강좌 Ⅰ, Ⅱ					
	English	Special Cultural Lecture Ⅰ, Ⅱ					

Notice

To receive a degree from GIST, all students must complete both '**Special Cultural Lecture Ⅰ**' and '**Special Cultural Lecture Ⅱ**' offered by the Institute and receive a grade of '**Satisfactory**'. The course is opened every semester. You may take the course any time before graduation.

A. Special Cultural Lecture will be given every second and fourth Tuesdays of the month between **16:00 - 18:00**. (subject to change depending on the circumstances of the lecturer.)

B. Schedule for Fall Semester 2009 will be announced **on the bulletin board** during the semester.

C. Completion of this course: a participant must attend over 2/3 Lectures which are held in a semester.
※ Lecturer must give a lecture in English. But if the number of English-Lecture cannot get to 1/3 of whole Lectures because of Lecturer's given condition, International student may attend only lectures held in English.

D. **Ph.D. Students** who already took both Lecture Ⅰ and Lecture Ⅱ during their M.S. course in GIST **do not need to take both courses again.**

Weekly Course Schedule

No.	***Date.***	***Speaker***	***Remarks***
1st Lecture **(in English)**	Sep. 8	Hyun Gak /Monk, President of International Zen Center at Hwa-gye temple	the schedule and lectures information will be noticed on the bulletin board before lectures. and please, see an attached paper.
2nd Lecture	Sep.22	Cho, Yun Bum /Violinist, Leader of a string quartet, The Quartet X	
3rd Lecture	Oct. 6	Choi, Jae Chun. Ph.D /Unversity Prof. of Ewha academy	
4th Lecture **(in English)**	Oct.20	Kang, Seong Wook /CEO of Cisco Systems Asia Branch	
5th Lecture	Nov. 3	Lee, Sun Bok. Ph.D / Prof. of Seoul National Univ.	
6th Lecture	Nov.24	Lee, Ju Heon / Fine Arts Critics	
7th Lecture **(in English)**	Dec. 1	Chung, Dong Su / President of KOTRA Invest Korea	

Instructor

Dean of Academic & Student Affairs

2009학년도 2학기

특별교양강좌

제1강

9월 8일(화)
16:00
(English Lecture)

"Regarding the spiritual culture of Korea"

강사 : 현각 / 스님, 화계사 국제선원장
소개 : 하버드대 비교종교학
하버드 대학원 재학 중 화계사 조실 순산 대선사의 설법을 듣고 출가. 홍법원 주지 역임, 현정사 주지 역임

제2강

9월 22일(화)
16:00

"조윤범의 파워클래식 : 한 시간에 듣는 서양음악사"

강사 : 조윤범 / 바이올리니스트
소개 : 현악사중주단 콰르텟엑스 리더
한국일보 고정 칼럼 '조윤범의 파워클래식' 기고, 예당아트TV '콰르텟엑스와 함께하는 조윤범의 파워클래식' 진행, '조윤범의 파워클래식' 저술

제3강

10월 6일(화)
16:00

"21세기와 학문의 통섭 "

강사 : 최재천 / 이화학술원 석좌교수
소개 : 하버드대학 생물학 박사
서울대 생명과학부 교수 역임, 한국환경운동연합 공동대표, 기후변화센터 공동대표, 한국생태학회 회장, 미국곤충학회 젊은 과학자상 수상, 대한민국 과학문화상 수상, '닮고 싶고 되고 싶은 과학기술인' 선정

제4강

10월 20일(화)
16:00
(English Lecture)

"Succeeding in the Third Wave of Globalization : Catching Market Transitions"

강사 : 강성욱 / CISCO Systems 아시아총괄 사장
소개 : 서울대 경제학과, MIT 슬론 경영대학원(MBA) 석사
한국IBM 공공기관 영업 Branch 역임, Tandem 동아시아 총괄 사장 역임, 한국 Compaq 대표이사 역임, 한국 HP 국내 엔터프라이즈 시스템 그룹총괄 사장 역임, 현 Cisco systems 아시아 총괄 사장

제5강

11월 3일(화)
16:00

"인간과 예술의 기원"

강사 : 이선복 / 서울대학교 교수
소개 : 아리조나주립대학 인류학과 박사
서울대학교 인문대학 고고미술사학과 교수, 한국고고학회 총무 역임, 한국지리학회, 한국지형학회, 대한지질학회, Sigma Xi, Phi Kappa Phi 회원, 동원학술상 수상

제6강

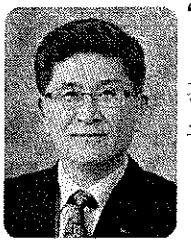
11월 24일(화)
16:00

"미술로 보는 창의력의 세계"

강사 : 이주헌 / 미술평론가
소개 : 홍익대 서양화과
한겨레 미술 담당 기자, 학고재 관장 역임. 베스트셀러 '50일간의 유럽 미술관 체험'과 '이주헌의 행복한 그림 읽기', '명화는 이렇게 속삭인다', '이주헌의 프랑스 미술기행' 등 20여 권의 교양 미술책 저술

제7강

12월 1일(화)
16:00
(English Lecture)



"The Future Course of Korean Economic Development & the Role of Foreign Direct Investment"

강사 : 정동수 / KOTRA 인베스트코리아 단장
소개 : UCLA대학원 법학 박사
법무법인 율촌 고문변호사, 미국 상무부 금융서비스업담당 부차관보 역임, 미국 빌 클린턴 행정부 대통령직인수위원회 근무, 세계은행 방글라데시담당 경제분석가 역임

SYLLABUS

Classification	Elective	*Course No.*	00602	*Hrs.: E: Credits*	3:0:3	*Instructor*	GTI
Course Title	*Korean*	*특허개론: 실습을 통해 배우는, 부(富)를 창출하는 특허만들기*					
	English	*Introduction to Patents: Making Patent, Creating Fortune*					

Course Outline

Due to globalization and fast dissemination of knowledge through the internet, developing science and technology has become competitive and expensive, and the lifetime of technology very short. Under the current situation, one should be able to find, read and understand the patents of one's competition (scientists, R&D group, company, and nation). In addition, because it is very expensive to make patents one should know how to make money-making strategic patents that can be sold beyond the cost of making patents. In this course, one can learn the essence of patents and apply them in searching and making patents, which will help one's study and research here at GIST.

Participation: 10%, Quiz: 20%, 실습 1: 30%, 실습 2: 40%

Prerequisite	None
Textbook and References	Lecture Note and Handouts Selected articles, Invention disclosure, etc.

Weekly Course Schedule

Calendar	*Description*	**Remarks*
1st week	특허와 연구개발	Instructor
2nd week	특허법 개론 - 한국/미국/일본/유럽 특허제도의 원리와 특허요건 - 한국/미국/일본/유럽 특허의 출원 및 등록절차 - PCT, 우선권주장, 신규성의제 등의 주요절차	Patent Attorney from KIPO
3rd week	직무발명과 연구성과 - 직무발명제도의 이해 - 공동연구개발의 소유권 - 산업체 위탁과제의 소유권	Patent Attorney from KIPO
4th week	특허명세서의 이해 - 특허명세서의 구성 - 특허청구범위의 해석 - 특허명세서 작성시 유의점	Patent Attorney from KIPO
5th week	특허검색의 이해 - 특허분류 체계의 이해, 키워드 조사방법 - 국가별 DB 및 이용법 소개 - Quiz: 20%	Patent Attorney from KIPO
6th week	[특강] 국가 R&D 정책과 특허 - 교육과학기술부 or 지식경제부: 정부과제 수행과 특허조사 - 특허청: 특허심사 지침 및 특허관련 각종 지원사업 소개	Invited Speakers
7th week	특허검색 실습 - 생명기술분야 특허검색의 유의점 - 표준특허의 이해	Patent Attorney from KIPO
8th week	특허검색 결과발표 및 평가 - 평가비율 30%	Patent Attorney from KIPO

9th week	기술의 가치평가 - 기술가치평가의 방법론 - 특허지수의 소개 - 시장조사 방법론	Invited Speakers
10th week	특허맵의 목적 및 종류 - 기술분류표 작성방법 - 데이터 추출 및 처리	Patent Attorney from KIPO
11th week	특허맵 분석기법 - 인용특허, 패밀리 특허 분석 - 기술발전도 작성 - 정량분석의 종류 및 목적	Patent Attorney from KIPO
12th week	특허맵 분석기법 - 정성분석 기법 - 정량분석 사례분석 - 정성분석 사례분석	Patent Attorney from KIPO
13th week	특허맵 실습 - 정량분석 tool 소개 및 사용법 - 특허 포트폴리오 구축 전략	Patent Attorney from KIPO
14th week	[특강] 주요 대기업의 특허경영 사례 - 삼성전자, LG전자, 3M 등	Invited Speakers
15th week	특허맵 결과발표 및 평가 I - 평가비율 40%	Patent Attorney from KIPO
16th week	특허맵 결과발표 및 평가 II - 평가비율 40%	Patent Attorney from KIPO

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

Instructor ***GTI*** ***(Seal)***

Dept. Chair ***Park, Seong Ju*** ***(Seal)***

Dean of Academic & Student Affairs

SYLLABUS

Classification	elective	Course No.	6650	Hrs.: E: Credits	3:0:3	Instructor	Yong Tak Lee, Kamal Alameh
Course Title	Korean	광전자공학					
	English	Optoelectronics					

Course Outline

This course is designed to provide graduate students with understanding of the fundamental properties of and optoelectronic materials and devices, and their use in a wide range of applications, including Information and Communication Technology, Health, Biomedical Technology and Environmental.
Course starts at the basic understanding of semiconductors and light propagation, generation, detection, modulation devices and their applications in various fields.

Prerequisite	*Basic knowledge in semiconductors and photonics*
Textbook and References	• Electronic and optoelectronic properties of semiconductor structures/ ed. by J. Singh (Cambridge Press), 2003. • J. Piprek, Semiconductor optoelectronic devices. Introduction to physics and simulation/ Academic Press, 2003, 279p. • Physics of optoelectronic devices/ ed. by S.L. Chuang, (Wiley series in pure and applied optics), 1995, 717p. • Semiconductor lasers/ G.P. Agrawal and N.K. Dutta. -2nd ed., 1993, 616p.

Weekly Course Schedule

Week	Description	*Remarks
1st week	Fundamentals of semiconductors(1)	
2nd week	Fundamentals of semiconductors(2)	
3rd week	Heterostructure and Quantum wells	
4th week	Light propagation in various media	
5th week	Generation of light	
6th week	Light Emitting Diodes (LEDs)	
7th week	Semiconductor lasers	
8th week	Midterm exam	
9th week	Vertical Cavity Surface Emitting Lasers (VCSELs)	
10th week	VCSEL applications-Optical Interconnects, Optical Sensors	
11th week	Modulation of Light	
12th week	Liquid crystal & Opto-VLSI processors	
13th week	Single-mode and tunable lasers	
14th week	Optical amplifiers and photodetectors	
15th week	Application of Optoelectronic Devices	
16th week	Final exam	

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

Instructor: *Yong Tak Lee/Kamal Alameh* ***(Signature)***

Dept. Chair: ***Kurt E. Geckeler*** ***(Signature)***