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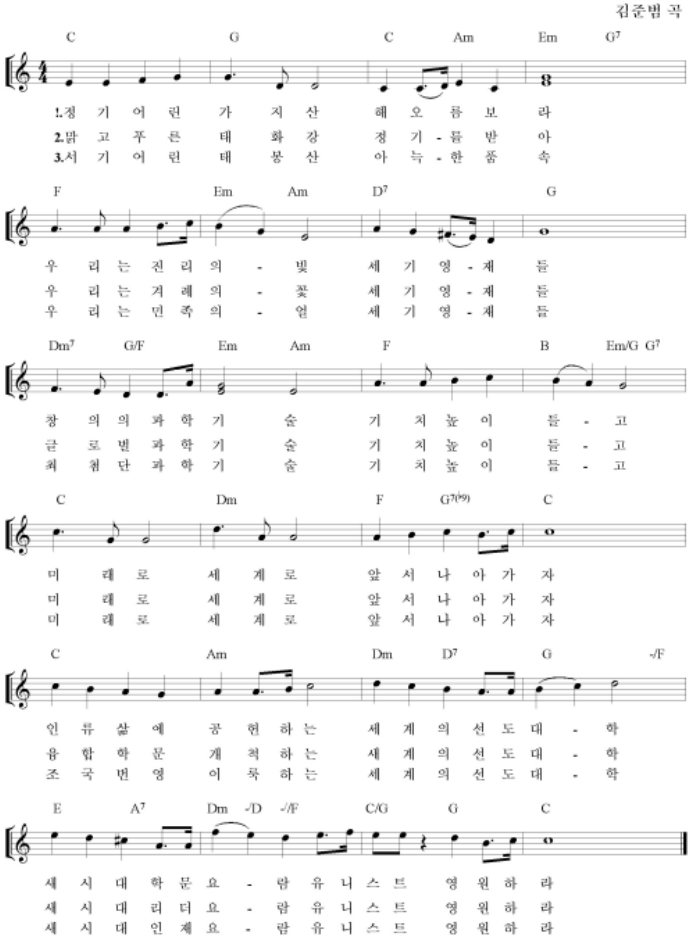
2012 COURSE CATALOG

UNIST
Ulsan National Institute of Science and Technology

교 가

박종해 글
김준범 곡



2012 UNIST Academic Calendar

Year	Month	Date	Schedule
First Term	March	2/27(Mon)	2012 Matriculation Ceremony
		1(Thu)	**2012 First Term Begins,** Holiday - Independence Movement Day
		5(Mon)	**Beginning of instruction**
		9(Fri)	Course change deadline
		21(Wed)	End of first quarter of the Term, Course Confirmation(Course Drop deadline), Leave of Absence(without tuition payment) application deadline
	April	6(Fri)	End of second quarter of the Term, Leave of Absence application deadline(General)
		9(Mon) ~ 13(Fri)	Spring Break (No classes)
		24(Tue) ~ 26(Thu)	Leave of absence/Return application for the 2nd Term, Registration for interdisciplinary major
	May	1(Tue) ~ 3(Thu)	Course Registration for the 2nd Term
		2(Wed)	End of third Quarter of the Term, Course Withdrawal deadline, Deadline for "Nomination of Thesis Committee" submission (Graduate school)
		5(Sat)	Holiday - Children's Day
		16(Wed) ~ 18(Fri)	Final Exams
		18(Fri)	**Last day of the first Term**
Summer Vacation		21(Mon) ~ Aug.26(Sun)	Summer Vacation (14 weeks)
		23(Wed)	Grades due
		28(Mon)	Holiday - Buddha's Birth Day
	June, July	4(Mon) ~ Jul.27(Fri)	Summer Session
		6(Wed)	Holiday - Memorial Day
	August	1(Wed)	Grades due for summer session
		15(Wed)	Holiday - Independence Day
		24(Fri)	Conferral of degrees
		27(Mon)	**2012 Second Term Begins, Beginning of instruction**
		27(Mon) ~ 29(Wed)	Tuition fee payment

Year	Month	Date	Schedule
Second Term		31(Fri)	Course change deadline
	September	12(Wed)	End of first quarter of the Term, Course Confirmation(Course Drop deadline), Leave of absence(without tuition payment) application deadline
		13(Thu)	University Foundation Day
		28(Fri)	End of second quarter of the Term, Leave of Absence application deadline(General)
		29(Sat) ~ Oct. 1(Mon)	Holiday - Chuseok
	October	3(Wed)	Holiday - National Foundation Day
		9(Tue) ~ 11(Thu)	Leave of absence/Return application for the 3rd Term, Registration for interdisciplinary major
		15(Mon) ~ 19(Fri)	Fall Break (no classes)
		26(Fri)	End of third Quarter of the Term, Course withdrawal deadline, Deadline for "Nomination of Thesis Committee" submission (Graduate school)
		23(Tue) ~ 25(Thu)	Course Registration for the 3rd Term
	November	7(Wed) ~ 8(Thu)	Make-up class period
		9(Fri) ~ 13(Tue)	Final Exams
		13(Tue)	**Last day of the second Term**
		14(Wed) ~ 25(Sun)	Fall vacation
		16(Fri)	Grades due
Third Term		26(Mon)	**2012 Third Term Begins, Beginning of instruction**
		26(Mon) ~ 28(Wed)	Tuition fee payment
		30(Fri)	Course change deadline
	December	17(Fri)	Conferral of degrees
		12(Wed)	End of first quarter of the Term, Course Confirmation(Course Drop deadline), Leave of Absence(without tuition payment) application deadline
		25(Tue)	Holiday - Christmas
		31(Mon)	End of second quarter of the Term, Leave of Absence application deadline(General)
		31(Mon)	Make-up class period
	2013 January	1(Tue) ~ 4(Fri)	Winter Break (No classes)
		15(Tue) ~ 17(Thu)	Leave of absence/Return application for the 1st

Year	Month	Date	Schedule
			Term,2013. Registration for interdisciplinary major
		22(Tue) ~ 24(Thu)	Course Registration for the 1st Term, 2013.
		23(Wed)	End of third Quarter of the Term, Course Withdrawal deadline, Deadline for "Nomination of Thesis Committee" submission (Graduate school)
	2013 February	6(Wed) ~ 8(Fri)	Final Exams
		8(Fri)	**Last day of the third Term**
		9(Sat) ~ 11(Mon)	Holiday - Lunar New Year's Day
		11(Mon) ~ 28(Thu)	Spring Vacation
		14(Thu)	Grades due
		26(Tue)	Commencement

※ Schedules above are subject to change according to the school policies.

Undergraduate

Contents

Required Credit for graduation

☐ Engineering Field

Engineering Field					
Major	Major	Track 1 / Track 2		33/27	
		Internship		3	
Subtotal					63
Fundamental	Math & Science	Calculus I/Calculus II		6	
		Differential Equations/Applied Linear Algebra/Statistics : Choose two		6	
		General Physics I, II		6	
		General Physics Lab		2	
		General Chemistry I, II		6	
		General Chemistry Lab		2	
		General Biology		3	
	IT	Engineering Programming		3	
		Engineering Programming Lab.		2	
		Dynamics of IT (or designated course by each school)		3	
	MGT	Leadership and Teamwork		3	
		Innovation and Entrepreneurship		3	
Subtotal					45
Liberal Arts	English	Prerequisite	English Foundation	4	
		Group1	English Forward, Building Writing/ Building Speaking & Grammar : Choose one		
		Group2	English Forward, Building Writing/ Building Speaking & Grammar : Choose one		
		Group3	Building Writing/ Building Speaking & Grammar		
	Language	Chinese Foundation/Chinese Forward : Choose one		2	
	AHS	Arts and Creativity		3	Choose seven
		Literature and Creativity		3	
		Globalization and Economy		3	
		Society and Culture		3	
		Evolution of Civilization		3	
		What is "I"?		3	
		Effective Communication		3	
		Music and Creativity		3	
		Korean History		3	
Subtotal					27
Free Elective	Free Elective			0	
Subtotal					0
Leadership	ULP	UNIST Leadership Program I		2AU	
		UNIST Leadership Program II		2AU	
		UNIST Leadership Program III		2AU	
		UNIST Leadership Program IV		2AU	
Subtotal					8AU
Total 135 credits / 8AU					

※ Students who entered UNIST in 2009 should take 'UNIST Leadership Program I & II', 4 AU(Activity Unit, 1AU=1Hour/week)

☐ Management Field

Techno Management Field				
Major	Major	Track 1 / Track 2	33/27	
		Internship	3	
Subtotal				63
Fundamental	Math & Science	Calculus/Applied Linear Algebra	6	
		Statistics	3	
		General Physics	3	
		General Chemistry	3	
		General Biology	3	
	IT	Dynamics of IT	3	
		Business Programming	3	
		Dynamics of IT Lab	2	
	MGT	Leadership and teamwork	3	
		Innovation and entrepreneurship	3	
		Economics	3	
Subtotal				35
Liberal Arts	English	Group1 Prerequisite: English Foundation	4	
		Group1: English Forward, Building Writing/ Building Speaking & Grammar : Choose one		
		Group2: English Forward, Building Writing/ Building Speaking & Grammar : Choose one		
		Group3: Building Writing/ Building Speaking & Grammar		
	Language	Chinese Foundation/Chinese Forward : Choose one	2	
	AHS	Arts and Creativity	3	Choose seven
		Literature and Creativity	3	
		Globalization and Economy	3	
		Society and Culture	3	
		Evolution of Civilization	3	
		What is "I"?	3	
		Effective Communication	3	
		Music and Creativity	3	
		Korean History	3	
Subtotal				27
Free Elective	Free Elective		9	
Subtotal				9
Leadership	ULP	UNIST Leadership Program I	2AU	
		UNIST Leadership Program II	2AU	
		UNIST Leadership Program III	2AU	
		UNIST Leadership Program IV	2AU	
Subtotal				8AU
Total 134 credits / 8AU				

※ Students who entered UNIST in 2009 should take 'UNIST Leadership Program I & II', 4 AU(Activity Unit, 1AU=1Hour/week)

☐ Credit Requirement for Each Track

School	Track	Required/Elective	Credit(minimum)	
			1Track	2Track
ECE	Electrical Engineering(EE)	Required	21	15
		Elective	12	12
	Computer Science & Engineering(CSE)	Required	21	15
		Elective	12	12
	Device Physics(DPH)	Required	21	15
		Elective	12	12
MAME	Mechanical System Design & Manufacturing (SDM)	Required	25	25
		Elective	8	2
	Thermo-Fluid & Power Engineering(TFP)	Required	25	25
		Elective	8	2
	Materials Science Engineering(MSE)	Required	22	16
		Elective	11	11
NBC	Nanochemistry(NCS)	Required	22	16
		Elective	11	11
	Chemical Engineering(ACE)	Required	22	16
		Elective	11	11
	Bioengineering(BEN)	Required	21	15
		Elective	12	12
	Biomedical Science(BMS)	Required	21	15
		Elective	12	12
DHE	Integrated Industrial Design(IID)	Required	28	22
		Elective	5	5
	Affective & Human Factors Design(AHE)	Required	28	22
		Elective	5	5
	Engineering & Systems Design(ESD)	Required	28	22
		Elective	5	5
UEE	Environmental Analysis and Pollution Control Engineering (PCE)	Required	10	10
		Elective	23	17
	Earth Science and Engineering (ESE)	Required	10	10
		Elective	23	17
	Urban Development Engineering (UDE)	Required	10	10
		Elective	23	17
	Disaster & Risk Management Engineering (DRE)	Required	10	10
		Elective	23	17
GEE	Energy Conversion & Storage (ECS)	Required	15	15
		Elective	18	12
	Nuclear Energy (NUE)	Required	16	16
		Elective	17	11
TM	General Management (GM)	Required	31	31
		Elective	2	-
	Technology Management/ Information System/ Entrepreneurship (TIE)	Required	19	19
		Elective	14	8
	Finance/ Accounting (FIA)	Required	16	16
		Elective	17	11
	Marketing/ International Business(MIB)	Required	22	22
		Elective	11	5

Division of General Studies

1. Division Introduction

UNIST provides excellence in education with the convergence of Science, Engineering, and Technology Management. To achieve the educational mission of UNIST, the Division of General Studies provides programs of Arts, Humanities, and Social Sciences (AHS), Information Technology, Communication, and Languages. We provide the programs to enhance the students' creativity and leadership as global leaders. The programs are developed two-folds: all freshmen take the foundation courses of the theoretical concepts and basic skills of each discipline; sophomores and advanced students take the advanced courses to develop the ability to solve actual problems in the real world. With the excellent faculty and outstanding programs, the Division of General Studies prepares students to work in their majors of Science, Engineering, and Business Management fields.

2. Programs

1) Math & Science

The Math & Science area is designed to provide a solid basic knowledge in the students' specialties by offering General Science courses like Mathematics, Physics, Chemistry, Biology, and also enabling students to study more effectively and efficiently by harmonizing theoretical studies and laboratory work. By following UNIST's vision, which is completing multidisciplinary courses, we are opening a course named 'Introduction to Disciplines' to provide sufficient information (individual departments, open track, and multidisciplinary studies, etc) to the students, before they start their specialties.

2) IT

The IT area is designed to teach the basic knowledge of computer programming, practical IT skills, and the applications and potential of IT. For engineering students, the topics are: the basics of computer programming and how to formulate solutions for existing engineering problems by numerous case studies, through lectures and laboratory practices. For students of management majors, the concepts, operations and application of information systems for business purposes are presented. A number of courses are offered to help students understand and use fundamental computer system principles, so that they will function more efficiently and effectively as future engineers and managers.

3) Management

Management is focused on cultivating fundamental knowledge of Business Administration by offering courses like Leadership and Teamwork, Innovation and Entrepreneurship, and Microeconomics.

4) English

The main goal of the English courses is to cultivate fundamental knowledge of English. Students, according to their English proficiency, will take two English courses which provide the students with opportunities to acquire not only comprehension skills, such as listening and reading, but also production skills like speaking and writing. Students will participate in student-centered learning by means of on-line materials and in class meetings with instructors. Upon completion of the required English courses, students will advance to elective English courses that focus on uses of English appropriately by styles, culture, and context.

5) Language

The main goal is to educate global citizens by cultivating fundamental knowledge of languages other than English. Courses offered are Chinese Foundation and Chinese Forward, and try to increase the students' interests through various teaching methods.

6) AHS (Arts, Humanities & Social Sciences)

Various AHS courses are offered to increase the creative power of engineering and business students. In these courses, the students will also acquire basic knowledge in AHS areas by the means of discussions, presentations, and LMS (Learning Management System) which set them apart from the general education courses at other universities.

7) Free Elective

The field is formed with free elective courses. It should offer various courses, so the students can attend the courses more freely.

8) UNIST Leadership Program

The goal of the Leadership Program is to build up students' character as UNISTARS with characteristics such as honesty, sincerity, cooperative spirit, mutual respect, etc. through participation in team activities following a creative planning process. It also aims to foster students' leadership qualities such as discussion skills, presentation skills, ability to organize and operate a team, and mentoring juniors, etc.

3. Curriculum

▶ Engineering Field Fundamental

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
M&S	MTH111	Calculus I	미적분학 I	3-3-0	
	MTH112	Calculus II	미적분학 II	3-3-0	
	MTH103	Applied Linear Algebra	응용선형대수	3-3-0	
	MTH201	Differential Equations	미분방정식	3-3-0	MTH111 or MTH101
	MTH211	Statistics	통계학	3-3-0	
	PHY101	General Physics I	일반물리 I	3-3-0	
	PHY102	General Physics II	일반물리 II	3-3-0	
	PHY106	General Physics Lab	일반물리실험	2-0-4	
	CHE101	General Chemistry I	일반화학 I	3-3-0	
	CHE102	General Chemistry II	일반화학 II	3-3-0	
	CHE104	General Chemistry Lab	일반화학실험	2-0-4	
	BIO101	General Biology	일반생물	3-3-0	
IT	ITP107	Engineering Programming	공학프로그래밍	3-3-0	
	ITP117	Engineering Programming Lab	공학프로그래밍실습	2-1-2	
	ISM201	Dynamics of IT	Dynamics of IT	3-3-0	
MGT	GMT101	Leadership and Teamwork	리더십과 팀워크	3-3-0	
	GMT102	Innovation and Entrepreneurship	기업가정신과 혁신	3-3-0	

▶ Management Field Fundamental

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
M&S	MTH101	Calculus	미적분학	3-3-0	
	MTH103	Applied Linear Algebra	응용선형대수	3-3-0	
	PHY105	General Physics	일반물리	3-3-0	
	CHE103	General Chemistry	일반화학	3-3-0	
	BIO101	General Biology	일반생물	3-3-0	
	MTH211	Statistics	통계학	3-3-0	
IT	ISM201	Dynamics of IT	Dynamics of IT	3-3-0	
	ISM202	Dynamics of IT lab	Dynamics of IT lab	2-0-4	
	ITP108	Business Programming	경영프로그래밍	3-2-2	
MGT	GMT101	Leadership and Teamwork	리더십과 팀워크	3-3-0	
	GMT102	Innovation and Entrepreneurship	기업가정신과 혁신	3-3-0	
	GMT106	Economics	경제원론	3-3-0	

☐ Recommended Course Schedule (Field Fundamental)

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
1st	MTH101,MTH111 PHY101,PHY106 PHY105 CHE101,CHE104 BIO101 ITP107,ITP117 ITP108,ISM202 GMT101 GMT106	MTH111 MTH112, MTH211 PHY101,PHY102 PHY106 CHE101,CHE102 CHE104 BIO101 ITP107,ITP117 ISM201,ISM202 GMT102	MTH101 MTH112, MTH211 PHY102,PHY106 CHE102,CHE104 BIO101 ITP108 ISM201,ISM202 GMT102	MTH111,MTH112 PHY106 CHE101,CHE102 CHE104	

▶ General Education (Common)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
ENG	-	English Foundation	English Foundation	Prerequisite	
	ENG107	English Forward	English Forward	2-2-0	
	ENG108	Building Writing	Building Writing	2-2-0	ENG107
	ENG109	Building Speaking &Grammer	Building Speaking &Grammer	2-2-0	ENG107
LNG	LGN201	Chinese Foundation	Chinese Foundation	2-2-0	
	LNG202	Chinese Forward	Chinese Forward	2-2-0	
AHS	AHS101	Arts and Creativity	예술과 창의성	3-3-0	
	AHS102	Literature and Creativity	문학과 창의성	3-3-0	
	AHS103	Globalization and Economy	세계화와 경제	3-3-0	
	AHS104	Society and Culture	사회와 문화	3-3-0	
	AHS105	Evolution of Civilization	문명의 발전	3-3-0	
	AHS106	What is "I"?	나의 정체성	3-3-0	
	AHS107	Effective Communication	효과적인 커뮤니케이션	3-3-0	
	AHS108	Music and Creativity	음악과 창의성	3-3-0	
	AHS109	Korean History	한국사	3-3-0	

▶ Free Elective

Course is	Course No.	Course Title	Course Title(kor.)	Cred.-Lec.-Exp	Requirement/ Credit
Free elective	ENG106	Introduction to English Styles	Introduction to English Styles	3-3-0	
	ENG110	English Language &Culture	English Language & Culture	3-3-0	ENG107
	ENG111	English for Business	English for Business	3-3-0	ENG107
	ENG112	English for Science and Technology	English for Science and Technology	3-3-0	ENG107
	ENG113	Academic Reading and Writing	Academic Reading and Writing	3-3-0	ENG107
	AHS110	Sports and Health	스포츠와 건강	1-0-2	

▶ Arts, Humanities, Social Sciences (AHS)

Course is	Course No.	Course Title	Course Title(kor.)	Cred.-Lec.-Exp	Requirement/ credit
Required	AHS101	Arts and Creativity	예술과 창의성	3-3-0	Choose seven/ 21
	AHS102	Literature and Creativity	문학과 창의성	3-3-0	
	AHS103	Globalization and Economy	세계화와 글로벌경제	3-3-0	
	AHS104	Society and Culture	사회와 문화	3-3-0	
	AHS105	Evolution of Civilization	문명의 발전	3-3-0	
	AHS106	What is "I" ?	나의 정체성	3-3-0	
	AHS107	Effective Communication	효과적 커뮤니케이션	3-3-0	
	AHS108	Music and Creativity	음악과 창의성	3-3-0	
	AHS109	Korean History	한국사	3-3-0	
Free Elective	AHS110	Sports and Health	스포츠와 건강	1-0-2	

☐ Recommended Course Schedule

▶ English/Language

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
1st	ENG106,ENG107 ENG108,ENG109 LNG201,LNG202 ENG111	ENG107 ENG108,ENG109 LNG201,LNG202 ENG112	ENG107,ENG108 ENG109 LNG201,LNG202 ENG110,ENG113	ENG107,ENG108 ENG109 LNG201,LNG202	

▶ AHS

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
1st	AHS101 AHS102 AHS103 AHS104 AHS105 AHS106 AHS107 AHS108 AHS109	AHS101 AHS102 AHS103 AHS104 AHS105 AHS106 AHS107 AHS108 AHS109	AHS101 AHS102 AHS103 AHS104 AHS105 AHS106 AHS107 AHS108 AHS109		

4. Required Mathematics Course for Each Track (ENG)

School	Track	Required Mathematics course
School of Electrical and Computer Engineering	Electrical Engineering	Applied Linear Algebra Differential Equations
	Computer Science & Engineering	
	Device Physics	
School of Mechanical and Advanced Materials Engineering	Mechanical System Design & Manufacturing	Applied Linear Algebra Differential Equations
	Thermo-Fluid & Power Engineering	
	Materials Science Engineering	
School of Nano-Bioscience and Chemical Engineering	Nanochemistry	Applied Linear Algebra Differential Equations
	Chemical Engineering	
	Bioengineering	
	Biomedical Science	Applied Linear Algebra Statistics
School of Design and Human Engineering	Integrated Industrial Design	Applied Linear Algebra Statistics
	Affective & Human Factors Design	
	Engineering & Systems Design	
School of Urban and Environmental Engineering	Environmental Analysis and Pollution Control Engineering	Differential Equations **Choose One Between:** Applied Linear Algebra, Statistics
	Earth Science and Engineering	
	Urban Development Engineering	
	Disaster & Risk Management Engineering	
Interdisciplinary School of Green Energy	Energy Conversion & Storage	Applied Linear Algebra Differential Equations
	Nuclear Energy	

5. Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
ECE	Engineering Programming	Digital System Lab	Engineering Programming Lab
MAME		Dynamics of IT or IT courses designated by other schools	
NBC		Computational Methods for Biological and Chemical Engineering	
DHE		Design IT 3D CAD & Prototyping Interactive Technology Dynamics of IT : choose 1	
UEE		Dynamics of IT or IT courses designated by other schools	
GEE		Dynamics of IT or IT Courses designated by other schools : choose 1	
TM	Business Programming	Dynamics of IT	Dynamics of IT Lab

6. Required Fundamentals
(when students choose tracks from another field)

☐ Fundamentals required by MGT field students when they choose ENG field tracks

Course Title	School of Electrical and Computer Engineering			School of Mechanical and Advanced Materials Engineering			School of Nano-Bioscience and Chemical Engineering			
	CSE	EE	DPH	TFP	SDM	AME	NCS	ACE	BEN	BMS
Calculus I	A	A	A	A	A	A	A	A	A	A
Calculus II	O	O	R	R	R	O	O	O	O	O
Applied Linear Algebra	A	A	A	A	A	A	A	A	A	A
Differential Equations	R	R	R	R	R	R	R	R	R	O
Statistics	-	-	-	-	-	-	-	-	-	A
General Physics I	A	A	R	R	R	A	A	A	A	A
General Physics II	R	R	R	R	R	R	O	R	R	O
General Chemistry I	O	O	O	A	A	R	R	R	R	R
General Chemistry II	O	O	O	O	O	R	R	R	R	R
General Physics Lab	R	R	R	R	R	R	O	O	R	O
General Chemistry Lab	O	O	O	O	O	R	R	R	R	R

Course Title	School of Design and Human Engineering			School of Urban and Environmental Engineering				Interdisciplinary School of Green Energy	
	IID	AHE	ESD	PCE	ESE	UDE	DRE	ECS	NUE
Calculus I	A	A	A	A	A	A	A	A	A
Calculus II	O	R	R	O	O	O	O	R	R
Applied Linear Algebra	A	A	A	A	A	A	A	A	A
Differential Equations	O	O	O	R	R	R	R	R	R
Statistics	A	A	A	A	A	A	A	-	-
General Physics I	A	A	A	A	A	A	A	R	R
General Physics II	O	O	O	O	O	O	O	R	R
General Chemistry I	A	A	A	A	A	A	A	R	R
General Chemistry II	O	O	O	R	R	O	O	R	R
General Physics Lab	O	O	O	O	O	O	O	R	R
General Chemistry Lab	O	O	O	R	R	O	O	R	R

☐ Fundamentals required by ENG field students when they choose MGT field tracks

Course Title	School of Technology Management			
	GMT	TIE	FIA	MIB
Leadership and Teamwork	R	R	R	R
Innovation and Entrepreneurship	R	R	R	R
Economics	R	R	R	R

R : Required A : Accepted O : Optional

☐ For MGT students who choose Engineering field track as their 2nd track

1. Students who complete General Physics in 2009 ☞ They don't have to take General Physics I
   (In 2009, General Physics I and General Physics were designated as similar courses)
2. Students who didn't take General Physics in 2009 ☞ They should take General Physics I if it is required by their 2nd track (Refer to the table above)

☐ Required Courses to Take When Change the Field

1. Management Field -> Engineering Field

Category	Course	Remarks
Accepted	Calculus = Calculus I	
	Business Programming = Engineering Programming	
Identical	Applied Linear Algebra = Applied Linear Algebra	
	Statistics = Statistics	
	General Biology = General Biology	

2. Engineering Field -> Management Field

Category	Course	Remarks
Accepted	Calculus I = Calculus	
	Engineering Programming = Business Programming	
	General Physics I = General Physics	
	General Chemistry I = General Chemistry	
Identical	Applied Linear Algebra = Applied Linear Algebra	
	Statistics = Statistics	
	General Biology = General Biology	

3. Course Descriptions

▶ Math & Science

MTH101 Calculus [미적분학]

Calculus is the branch of mathematics dealing with change, rate of change, and motion and it applies in many areas, e.g. engineering, the physical sciences, and the biological sciences. We will investigate the concepts of differentiation and integration of real-valued functions of single variables and their applications. The topics include trigonometrics, logarithmics, hyperbolic functions and their inverse functions, limits, sequence, series and convergence as well as differentiation and integration.

MTH111 Calculus I [미적분학 I]

Calculus is the branch of mathematics dealing with change, rate of change, and motion and it applies in many areas, e.g. engineering, the physical sciences, and the biological sciences. We will investigate the concepts of differentiation and integration of real-valued functions of single variables and their applications. The topics include trigonometrics, logarithmics, hyperbolic functions and their inverse functions, limits, sequence, series and convergence as well as differentiation and integration.

MTH112 Calculus II [미적분학 II]

Beyond basic calculus we study differentiation and integration of vector-valued functions of multi-variables and their applications. The topics include vector functions, partial derivatives, multiple integrals and vector calculus.

MTH103 Applied Linear Algebra [응용선형대수]

This course studies solving systems of linear equations, matrix algebra, linear transformations, determinants, rank, vector spaces, eigenvalues and eigenvectors and diagonalization.

MTH201 Differential Equations [미분방정식]

This course studies ordinary differential equations and their existence and uniqueness, and methods for their solution, including series methods and Laplace transforms, systems of differential equations and their solvability, stability, and numerical methods.

MTH211 Statistics [통계학]

This course introduces the concepts of probability and distribution, expectation, distributions of functions of random variables, statistical inference, estimation, and statistical tests.

PHY101 General Physics I [일반물리 I]

Physics I is the first half of a one-year introductory university physics course intended for students who plan to major in the fields of science and engineering. It introduces the fundamental concepts and analytical descriptions of classical mechanics, wave mechanics, and thermodynamics. Topics covered include measurement basics of physical quantities, vectors, translational motions in one, two, and three dimensions, force, conservation laws of energy and momentum, rotational motion, gravitation, fluid mechanics, description of waves, kinetics of gases, and thermodynamic laws. Knowledge of calculus is routinely used but the emphasis is placed on understanding basic concepts. E-educational system will be actively used in conjunction with class lectures.

PHY102 General Physics I H [일반물리 I]

Students, who take this course driven by famous experts, can learn in-depth physics and will experience a new world of physics. It covers the same contents as General Physics I.

PHY103 General Physics II [일반물리 II]

Physics II is the second half of a one-year introductory university physics course intended for students who plan to major in the fields of science and engineering. It introduces the fundamental concepts and analytical descriptions of electricity, magnetism, optics, and also modern physics based on quantum physics. Topics covered include electric forces and fields, electric energy, capacitance and resistance, circuits, magnetic forces and fields, induction, electromagnetic waves, reflection and refraction of light, wave optics, atomic physics, electrical conduction of solids, and subatomic (nuclear, elementary particles) physics. Knowledge of calculus is routinely used but the emphasis is placed on understanding basic concepts. An E-education system will be actively used in conjunction with class lectures.

PHY104 General Physics II H [일반물리 II]

Students, who take this course will learn in-depth physics and will experience a new world of physics. It covers the same contents as General Physics II.

PHY105 General Physics [일반물리]

Physics is a one-semester introductory university physics course intended for students planning to major in technology management. This course focuses on providing students with the fundamental ideas of general physics area to help them understand modern technology from a technology management perspective. Hence the majority of course is devoted to discussing the basic principles and concepts of physics although knowledge of calculus is assumed. Topics covered will be selected from classical mechanics, thermodynamics, electricity and magnetism, optics, and modern physics. The E-educational system will be actively used in conjunction with class lectures.

PHY106 General Physics Lab [일반물리실험]

General Physics Lab is a one-semester introductory university physics laboratory course intended for students who plan to major in the fields of science and engineering. It provides students with hands-on experience in performing actual experimental activities for the topics selected in classical mechanics, thermodynamics, optics, wave mechanics, and electrodynamics.

This lab course is aimed at helping students improve their understanding on related physical concepts and the relevance of experimental activities in physics area.

CHE101 General Chemistry I [일반화학 I]

This course presents the concepts and models of chemistry. Topics include atomic and molecular structure, nomenclature, chemical reaction and stoichiometry, thermochemistry, periodicity and atomic structure. and chemical bonding. This course is designed for students who plan to major in one of the engineering schools.

CHE102 General Chemistry II [일반화학 II]

As the continuation of General Chemistry I, this course includes chemical kinetics, chemical equilibrium, acid and base, electrochemistry, thermodynamics, transition elements and coordination chemistry. This course is designed for students who plan to major in one of the engineering schools.

CHE103 General Chemistry [일반화학]

This course presents chemistry conceptually, focusing on the study of how atoms combine to form materials, on what materials are made of, and why they behave as they do. This course is designed for students who plan to major in the technology management.

CHE104 General Chemistry Lab [일반화학실험]

This course is designed to demonstrate fundamental principles of general chemistry in a laboratory environment. This laboratory and its experiments help students understand the underlying concepts, experimentation and of laboratory instruments and techniques. It will be an effective way to make chemistry more fun.

BIO101 General Biology [일반 생물]

This is a one-semester course dealing with the principles and concepts of biology needed for success in higher level science courses. Topics include the organization of living matter, metabolism, reproduction, and genetics. The laboratory activities will demonstrate some of the concepts presented in lecture and will introduce the student to the scientific method and techniques. Each class will consist of two lectures per week and one laboratory class per month.

▶ General Management

GMT101 Leadership and Teamwork [리더십과 팀워크]

This course provides theoretical background and practical tools for the effective management of organizations and for improving leadership capabilities. The main topics include personality, motivation, leadership and team management, organization design, culture, and organizational changes, in both micro and macro perspectives.

GMT102 Innovation and Entrepreneurship [음악과 창의성]

This course offers a framework for understanding the entrepreneurial process faced by entrepreneurs, and perspectives that seek to understand how technological innovation and new business development can generate growth and economic value. Theoretical models, practical tools and business cases are discussed in the class.

GMT106 Economics [경제학 원론]

This course aims to provide a basic understanding of Economics. This course provides an introduction to the analysis of the principles underlying the behavior of individual consumers and business firms. Topics include problems of international trade, distribution of incom, problems of environmental pollutions, and effects of various market structures on economic activity.

▶ IT

ITP107 Engineering Programming [공학프로그래밍]

This course introduces the fundamental concepts and methodology of computer programming, especially in C++. This course aims at providing students with basic programming skills along with clear understanding of the state-of-the-art computer program design concepts. The scope of this course includes the syntax of ANSI standard C++, which covers expression syntax, decision making, loops, functions, arrays, algorithms, pointers, and C++ classes as well as the basic elements of the OOP (object-oriented programming) concepts.

ITP117 Engineering Programming Lab. [공학프로그래밍 실습]

In this course, students will gain hands-on experience in C++ programming in UNIX environment. This course introduces the usage of the UNIX operating system and how to design, compile, test, and debug C++ programs. This course includes a lecture session and a laboratory session that take place once a week respectively. Lecture sessions will provide the introduction to UNIX commands for basic file manipulation, vi editor, as well as special features of the UNIX shell environment. Laboratory sessions will emphasize the implementation of C++ programs. A large number of programming assignments will be handed out that could be

typically completed during the lab session. Programming assignments will cover basic programming concepts such as variables, assignments, conditional branch, loops, functions, arrays, file streams, and OOP that is learned from Engineering Programming course.

ITP108 Business Programming [경영프로그래밍]

This course aims at providing attendees with understanding of the computer system mechanisms along with basic programming skills. The scope of this course includes the principles of computer systems, organization of computer hardware, as well as the basic elements of Visual Basic programming such as its syntax, program structures, data types, arithmetic operations, functions, loops, and branch operations.

ISM201 Dynamics of IT

This course presents information systems concepts from a managerial perspective to understand how information systems work and how they are used for business purposes. It is designed to help students understand and use fundamental information systems principles so that they will efficiently and effectively function as future knowledge workers and managers. Topics include: hardware and software of computers, telecommunication and networks (including the Internet), database management, e-commerce, systems development and systems security.

ISM202 Dynamics of IT Lab.

This course is an introduction to the major components of MS Office software for personal and organizational productivity improvement. Focus is on MS Excel and MS Access for spreadsheet and database applications through covering features in MS Excel such as working and formatting worksheets, using formulas and functions, creating and modifying charts, and using analytical options and Macros; and those in MS Access such as creating tables, forms, & reports, entering/editing/deleting/displaying data, sorting/filtering records, queries, expressions, sharing data between applications.

▶ English

English Foundation (no-credit)

This course is offered for students who need basic training in reading and listening in order to take regular-credit English courses. The students will study materials on-line and are required to pass an exit test.

ENG107 English Forward

This course is the general English class which focuses on training in English listening and discussion. The major goal of the course is to help UNIST students grow more autonomous in

learning English through the experience of the virtual English course. The students will actively participate in on-line learning and in-class discussions of the studied listening materials.

ENG108 Building Writing

This course is a practice of English writing along with building grammatical competence necessary for a good writer in an academic field. The students will actively participate in on-line and in-class practices of English papers, essays, and correspondence.

ENG109 Building Speaking & Grammar

This course is a practice of English speaking and conversation in relation to appropriate uses of English grammar in speaking. The students are expected to develop fluency and accuracy in English speaking by learning through on-line materials and participating in classroom activities.

ENG110 English language and culture

This course introduces the crucial relationship between English language and culture. Students are expected to learn how to manage different communicative tasks appropriately to the cultural and contextual constraints. Through reading and listening to various texts/episodes of English, students will practice how to handle communicative problems in terms of culture.

ENG111 English for Business

This course will help the students understand practical English in a business situation. Students will learn and practice how to function in business-related contexts in English appropriately and effectively.

ENG112 English for Science and Technology

The course is designed to engage students in English for science and technology. To this end, the course offers situation-based listening and speaking activities, content-based reading exercises, and scientific research writing practices. At the end of this course, students will be able to achieve necessary English proficiency as scientists.

ENG113 Academic Reading and Writing

The course is designed to develop students' academic reading and writing processes. Toward this end, the course covers the nature of academic writing, critical thinking and argumentation, while students engage in academic content area reading followed by in-depth discussion. At the end of this course, students will be able to critically evaluate and read academic contents, and re-synthesize the contents.

▶ Foreign Languages

LNG201 Chinese Foundation [초급 중국어]

This is a lecture and discussion-based course. Chinese Foundation is not open to students who have learned, from whatever source, enough Chinese to qualify for more advanced courses. It is an introduction to fundamentals of standard Chinese, including pronunciation, grammar, and Chinese characters, with emphasis on all basic language skills (speaking, listening comprehension, reading, and writing).

LNG202 Chinese Forward [중급 중국어]

This is a lecture and discussion-based course. Recommended preparation for Chinese Forward is the ability to speak and understand Mandarin or other Chinese dialects at elementary levels. It is designed for students who already have listening and speaking skills in Mandarin or other Chinese dialects at elementary levels. Training in all basic language skills (speaking, listening, reading, and writing).

▶ AHS

AHS101 Arts and Creativity [예술과 창의성]

Arts and creativity are inseparable, in as much as a piece of art cannot be born without creativity. More importantly, artistic creativity is not limited to arts. The significance of creativity has been widely recognized as essential to problem-solving skills. In this course, students will look at various examples of artistic creativity and in so doing, they will be expected to nurture their creativity.

AHS102 Literature and Creativity [문학과 창의성]

Creativity has been perceived as important because it is recognized as essential to problem-solving skills. This course aims at looking into the dynamic relationship between literature and creativity. In doing so, we will explore major genres of literature and the mechanisms of creativity. The intersection of literature and science will be given special attention as well.

AHS103 Globalization and Economy [글로벌과 경제]

This course focuses on how the growing impact of globalization is transforming the economy and culture of the world. It also discusses the issues on how to deal with the fast changing structures of the economy and market as globalization is being accelerated.

AHS104 Society and Culture [사회와 문화]

Cultural diversity has become an important issue in Korea as it is worldwide. In response to the social conditions of globalized society, this course aims at familiarizing students with diverse societies and cultures. Understanding other cultures will lead students to a better appreciation of

their own culture. Ultimately, this course will prepare students to contribute to the global society.

AHS105 Evolution of Civilization [문명의 발전]

This course aims to investigate the factors behind the stages of civilizations. It provides causal explanations of why some civilizations rose and fell in the past. Students will improve not only the ability to analyze history but also think critically about it. An emphasis can be put on the impact science and technology had on the evolution of civilizations.

AHS106 What is "I"? [나의 정체성]

This course is an attempt to answer the question, What is “I”?, drawing upon multiple disciplines: philosophy, psychology, computer science, neuroscience, biology, and physics. We aim to increase our ability to think critically and communicate effectively by being engaged in argumentations over the issues concerning logic, morality, happiness, death, mind, science, religion, and self.

AHS107 Effective Communication [효과적인 커뮤니케이션]

This course will improve the students' ability to communicate effectively, which is essential for success in both the professional and academic worlds. In order to become a more skillful and effective communicator, students will learn about the basic theories and techniques of presentations, as well as technical writing. The class will give students the opportunity to practice these two skills. Also, critiques and feedback of all oral and written performances will be given.

AHS108 Music and Creativity [음악과 창의성]

The course opens students to the possibilities of creative expression in music, through instruction in the fundamental principles of music appreciation, musical composition and musical performance. Students will also acquire an understanding of the historical development of music as well as historical exemplars of musical virtuosity. Coursework may be project- or performance-based, at the discretion of the professor.

AHS109 Korean History [한국사]

The course introduces students to multiple dimensions of the history of Korea, a society which conserves distinctive traditions while also undergoing rapid changes associated with modernization. Students will study historical cases selected from ancient and/or modern Korea, to understand the historical development of Korean society and unique features of its culture. Any relevant theme of historical investigation may be included, such as technology, society, economy, education, gender, politics, medicine, religion, or agriculture.

AHS110 Sports and Health [스포츠와 건강]

The course provides instruction in fitness activities for the development of physical and mental health.

▶ Leadership

ULP101, 102, 201, 202 UNIST Leadership I, II, III, IV [리더십프로그램]

In the leadership program, students independently decide activities to do for a semester. While they experience systematic and specialized community life, they can develop qualifications required to be competent leaders such as upright character, cooperative spirit, commitment, etc.

School of Electrical and Computer Engineering

1. School Introduction

The school of electrical and computer engineering at UNIST is dedicated to educating students in interdisciplinary scholarship that will serve for our future society. Our teaching and research take places in interdisciplinary programs and institutes where traditional departmental boundaries are things of the past. Our mission is to provide enabling technologies for the future way of life through the convergence of electrical and computer engineering with new nano, bio, and environmental technologies. Our efforts will bring out exciting new technologies that will contribute not only to Ulsan's world-leading automotive, shipbuilding, and petroleum industries but also to industries and societies world-wide. The school of ECE is establishing collaborations with universities and companies on the other parts of the globe to provide global environment for education and researches. Come join our efforts to become a world leading institute in science and technology.

2. Undergraduate Programs

□ Track Introduction

1) Electrical Engineering [EE] track

EE is a field of engineering that deals with everything from solid-state devices and designing integrated circuits to developing information and control systems. It focuses on research and development of IT convergence systems which are capable of enriching the future life of human being to be pleasant, secured, convenient and socially connected. A broad range of IT technologies in the EE areas are to be proactively merged together to create new benefits with the advent of ubiquitous information society driven by digital convergence. EE track encourages students and researchers alike to initiate a wide range of interactions among different areas in wireless communications and networking, intelligent control and assistive robotics, multimedia signal processing, digital/analog circuits design, VLSI design, high speed mixed-signal IC, RF and wireless IC design. EE track encompasses the experimentation, design, modeling, simulation and analysis of devices, circuits as well as complete systems. The combination of the educational program and the leading edge testing facilities provides a full cycle exposure from

concept to product realization, necessary for a top-notch quality engineer that can bring immediate contributions in both academia and industries.

2) Computer Science and Engineering [CSE] track

Computer science and engineering(CSE) aims to improve the quality of human life by researching and developing computer and information systems which are pervasive in every facet of modern life. In this track, students will learn the foundational principles behind operating systems, compilers, and networks, which are necessary to implement computer systems, and will study computer graphics, artificial intelligence, algorithms, and information security, which are essential to utilize computer systems for practical uses. With this curriculum, we cultivate the finest engineers who are able to research and develop embedded systems, high performance massive computing systems, wireless and wired network systems and services, information engineering, computer vision, natural language processing, and other computer applications of critical importance in the upcoming era.

3) Device Physics [DPH] track

A lot of core technologies and their associated devices, equipments, and giant facilities that have been innovating the human life and leading to the splendid modern civilization, such as public media, ultra-fast communication, information technology, computers, and energy facilities, are essentially based on fundamental physical mechanisms. During the course of developing these technologies, physicists and electrical engineers have been taking crucial roles as inventors or initiators. In the Device Physics (DPH) track of UNIST, we aim at educating students to be able to apply the knowledge of basic sciences to engineering applications so that they eventually become such leaders in ground-breaking future technologies.
The students majoring in the DPH track will learn about semiconductor engineering, display engineering, optoelectronic devices, plasma, RF and terahertz engineering as well as basic courses such as electromagnetic theory, quantum mechanics, statistical mechanics, solid state physics, optics, etc.

☐ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		1Track	2Track
Electrical Engineering	Required	21	15
	Elective	12	12
Computer Science & Engineering	Required	21	15
	Elective	12	12
Device Physics	Required	21	15
	Elective	12	12

▶ Required Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course
School of Electrical and Computer Engineering	Electrical Engineering	MTH103	Applied Linear Algebra
		MTH201	Differential Equations
	Computer Science & Engineering	MTH103	Applied Linear Algebra
		MTH201	Differential Equations
	Device Physics	MTH103	Applied Linear Algebra
		MTH201	Differential Equations

▶ Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
ECE	Engineering Programming	Digital System Lab	Engineering Programming Lab

☐ Curriculum

▶ Electrical Engineering (EE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Fundamental (Math/IT)	MTH103	Applied Linear Algebra	응용선형대수	3-3-0	
	MTH201	Differential Equations	미분방정식	3-3-0	
	ITP107	Engineering Programming	공학프로그래밍	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	ITP117	Engineering Programming Lab	공학프로그래밍실습	2-1-2	
	CSE201	Digital System Lab	디지털시스템실험	3-2-2	
Required	EE201	Basic Circuit Theory	회로이론	3-3-1	
	EE301	Microelectronics I	전자회로 I	3-3-0	EE201
	EE311	Signals and Systems	신호및시스템	3-3-0	
	EE321	Electronics Experiment Laboratory	전자회로실험	3-1-4	EE201
	EE490	Interdisciplinary Project	창의시스템구현	1-0-2	
	DPH201	Electromagnetics I	전자기학I	3-3-0	
1TR:R 2TR:E	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스개론	3-3-0	
	DPH301	Introduction to electronic devices	전자소자개론	3-3-0	
Elective	EE302	Microelectronics II	전자회로 II	3-3-0	EE301
	EE312	Introduction to Communications	통신개론	3-3-0	EE311, EE211
	EE313	Introduction to Control	자동제어공학개론	3-3-0	EE311
	EE401	Analog Integrated Circuits	아날로그집적회로설계	3-3-0	EE301
	EE402	Introduction to VLSI Design	초고밀도 집적회로 설계	3-3-2	EE301
	EE411	Digital Signal Processing	디지털신호처리	3-3-0	EE311
	EE412	Communication Systems	통신시스템	3-3-0	EE311,EE211
	EE480	Special Topics in EE	전자및전기공학특론	3-3-0	
	CSE202	Advanced Programming	고급프로그래밍	3-2-2	

☐ Recommended Course Schedule [EE]

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH201 *EE201 *DPH201 #CSE201 CSE202	&MTH103 *EE201 **EE211 #CSE201	*DPH201		
3rd	*EE301 *EE311 *EE321 **DPH301	EE302 EE312 EE313 *EE321	*EE301 *EE311		
4th	EE402 EE412 *EE490	EE401 EE411 *EE490	*EE490		

▶ Computer Science & Engineering (CSE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Fundamental (Math/IT)	MTH103	Applied Linear Algebra	응용선형대수	3-3-0	
	MTH201	Differential Equations	미분방정식	3-3-0	
	ITP107	Engineering Programming	공학프로그래밍	3-3-0	
	ITP117	Engineering Programming Lab	공학프로그래밍실습	2-1-2	
	CSE201	Digital System Lab	디지털시스템실험	3-2-2	
Required	CSE202	Advanced Programming	고급 프로그래밍	3-2-2	
	CSE231	Data Structures	데이터구조	3-3-0	CSE202
	CSE301	Computer Organization	컴퓨터조직론	3-3-0	CSE201
	CSE331	Introduction to Algorithms	알고리즘	3-3-0	CSE232
	CSE490	Interdisciplinary Project	창의시스템구현	1-0-2	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
1TR:R 2TR:E	CSE232	Discrete Mathematics	이산수학	3-3-0	
	CSE311	Introduction to Operating Systems	운영체제	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Elective	CSE211	Introduction to Programming Languages	프로그래밍언어	3-3-0	CSE202
	CSE321	Introduction to Database	데이터베이스	3-3-0	
	CSE351	Introduction to Computer Network	컴퓨터네트워크	3-3-0	
	CSE431	Introduction to Computer Graphics	컴퓨터 그래픽스	3-3-0	
	CSE461	Software System Design	소프트웨어시스템디자인	3-1-4	
	CSE480	Special Topics in CSE	컴퓨터공학특론	3-3-0	
	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스개론	3-3-0	

☐ Recommended Course Schedule [CSE]

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH201 #CSE201 *CSE202 *EE201	&MTH201 #CSE201 *CSE231 **CSE232 *EE201 EE211	CSE211		
3rd	*CSE301 *CSE331	**CSE311	CSE321 CSE351		
4th	CSE431 *CSE490	CSE461 *CSE490	*CSE490		

▶ Device Physics (DPH)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Fundamental (Math/IT)	MTH103	Applied Linear Algebra	응용선형대수	3-3-0	
	MTH201	Differential Equations	미분방정식	3-3-0	
	ITP107	Engineering Programming	공학프로그래밍	3-3-0	
	ITP117	Engineering Programming Lab	공학프로그래밍실습	2-1-2	
	CSE201	Digital System Lab	디지털시스템실험	3-2-2	
Required	DPH201	Electromagnetics I	전자기학I	3-3-0	
	DPH301	Introduction to electronic devices	전자소자개론	3-3-0	
	DPH302	Microelectronics Lab	전자소자실험	2-1-2	
	DPH303	Quantum mechanics I	양자역학I	3-3-0	
	DPH490	Interdisciplinary Project	창의시스템구현	1-0-2	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
1TR:R 2TR:E	DPH202	Electromagnetics II	전자기학 II	3-3-0	
	DPH304	Quantum mechanics II	양자역학 II	3-3-0	
Elective	DPH305	Thermal and statistical physics	열 및 통계역학	3-3-0	
	DPH401	Solid state physics	고체물리학	3-3-0	
	DPH403	Modern VLSI Devices	현대집적회로소자	3-3-0	
	DPH405	Optoelectronics	광전자공학	3-3-0	
	DPH480	Special Topics in DPH	소자물리특론	3-3-0	
	EE301	Microelectronics I	전자회로 I	3-3-0	EE201
	EE302	Microelectronics II	전자회로 II	3-3-0	EE301
	MSE250	Modern Physics of Materials	재료현대물리	3-3-0	

☐ Recommended Course Schedule [DPH]

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH201 *DPH201 *EE201 #CSE201	&MTH201 **DPH202 *EE201 #CSE201	*DPH201 MSE250		
3rd	*DPH301 *DPH303 EE301	**DPH304 DPH305 EE302	*DPH302 EE301		
4th	DPH401 DPH405 *DPH490	DPH403 *DPH490	*DPH490		

3. Course Descriptions

▶ Electrical Engineering

EE201 Basic Circuit Theory [회로이론]

The aims of this course are to make the students understand the principles and the fundamental concepts of circuit analysis; to develop the student's familiarity and understanding in modeling and analyzing circuits through a variety of real-world examples; and to extend the student's ability to apply system analysis to other branches of engineering. Memory, circuits, communication and control system, design of VLIS, magnetically coupled networks, power analysis, laplace transform, capacitor, inductor, and polyphase circuits are main topics of the course. The LabView tool will be introduced and used for basic experiments. This course is focused on both hands-on experience and design practice.

EE211 Probability and Introduction to Random Processes [확률과 랜덤프로세스개론]

This course introduces probability, random process, confidence interval, experimental design and hypothesis testing, statistical average, correlation, spectral analysis for wide sense stationary processes, random signals and noise in linear systems.

EE301 Microelectronics I [전자회로 I]

This course covers an introduction to electronic circuits and the analysis and design of transistor amplifiers. First, the course extensively explains the basic operation principles of diodes, BJTs, and MOSFETs derived from physical structures and gives a concept of equivalent device models. Then, we will study the design and analysis of basic BJT and FET amplifiers and differential and multi-stage amplifiers.

EE302 Microelectronics II [전자회로 II]

This course is the succession of the Microelectronics I course where the material covered focused on single elements and their operational principles. In Microelectronics II, amplifiers, current mirrors, frequency response, and stability will be covered to understand the implementation of microelectronics.

EE311 Signals and Systems [신호및시스템]

This course introduces time-domain frequency domain response using Fourier series, Fourier transform, Laplace transform, discrete Fourier series and transform, sampling, z-transform, relationship between time and frequency descriptions of discrete and continuous signal and linear time invariant systems.

EE312 Introduction to Communications [통신개론]

This course introduces core concepts in communication systems: amplitude, frequency, pulse, and pulse coded modulation, narrow band noise representation and signal-to-noise ratios for various modulation scheme, pulse shaping, timing recovery, carrier synchronization and equalization.

EE313 Introduction to Control [자동제어공학개론]

This course introduces fundamentals of linear systems control: mathematical modeling, analysis, and design of systems, transfer function, root locus, bode diagram, nyquist method, and state space method.

EE321 Electronics Experiment Laboratory [전자회로실험]

Experiments related to circuit theory and electronic circuits are performed. This course is focused on both hands-on experience and design practice with the following experiments:
Circuit theory: 1. Measuring equipments and RC transient response, 2. Phasor and AC steady-state response, 3. 3-phase circuits. Electronic circuit: 4. Diode and BJT characterisitcs, 5. BJT and MOSFET amplifier, 6. Application of operational amplifiers. Design: 7. Sine/square wave function generator design, 8. Active filter design, 9. DC power supply design.

EE401 Analog Integrated Circuits [아날로그집적회로설계]

This course covers basic concepts of fabrication, operation and design techniques related to CMOS integrated circuits. It also covers analysis and design of analog ICs using analytic techniques and CAD tools. Topics include amplifiers, current sources, output circuits, and other analog blocks.

EE402 Introduction to VLSI Design[초고밀도 집적회로 설계]

This course studies analysis and design techniques for implementations of very large-scale integrated (VLSI) circuits, MOS technology, logic, interconnect, and memory by using electronic design aid (EDA) tools. Topics include full custom design methodology of logic gate generations, timing/power simulations, layout, DRC/LVS rule checking, and floor plan. Projects will be conducted to develop and lay out circuits.

EE411 Digital Signal Processing [디지털신호처리]

This course introduces sampling of continuous-time signals and reconstruction of continuous signals from samples, spectral analysis of signals, fast Fourier transform, design of finite and infinite impulse response filters, signal flow graphs and filter implementation methods.

EE412 Communication Systems [통신시스템]

This course covers fundamental techniques for digital communication systems. The topics include analog to digital transformation using sampling and quantization, baseband and

bandpass digital transmission, and an introduction to source and channel coding.

EE490 Interdisciplinary Project [창의시스템구현]

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Computer Science & Engineering

CSE201 Digital System Lab [디지털 시스템 실험]

To understand the basic principles of digital logic circuit, this course introduces the fundamental concepts, components and operations of digital system. TTL, ECL, CMOS, binary system, Boolean algebra and logic gate, combinational logic, and sequential logic are covered.

CSE202 Advanced Programming [고급 프로그래밍]

This course is a second programming course for Computer Science Engineering track with a focus on object-oriented programming. The goal of the course is to develop skills such as algorithm design and testing as well as the implementation of programs. This course requires students to implement a large number of small to medium-sized applications, and to learn how to use relevant development tools.

CSE211 Introduction to Programming Languages [프로그래밍언어]

By studying the design of programming languages and discussing their similarities and differences, this course provide introduces the concept of modern programming languages and improves the ability to learn diverse programming languages.

CSE231 Data Structures [데이터구조]

This course introduces abstract data type concept such as array, queue, stack, tree, and graph to obtain the ability to program these abstract data types in computer programming languages.

CSE232 Discrete Mathematics [이산수학]

This course introduces discrete objects, such as permutations, combinations, networks, and graphs. Topics include enumeration, partially ordered sets, generating functions, graphs, trees, and algorithms.

CSE301 Computer Organization [컴퓨터조직론]

This course provides students with a basic understanding of computer organization and

architecture. It is concerned mostly with the hardware aspects of computer systems: structural organization and hardware design of digital computer systems; underlying design principles and their impact on computer performance; and software impact on computer.

CSE311 Introduction to Operating Systems [운영체제]

This course introduces the objective and various forms of operating systems. Also resource management mechanisms such as process management, memory management, storage management and syncronization tools are covered in this course.

CSE321 Introduction to Database [데이터베이스]

This course introduces the concept of databases and provides basic experience in database programming. This includes the design of relational model, relational algebra, and SQL. The second half of the class will focus on the under-the-hood of DBMS systems and database design principles are also in the scope of this course.

CSE331 Introduction to Algorithms [알고리즘]

This course introduces the basic concepts of design and analysis of computer algorithms: the basic principles and techniques of computational complexity (worst-case and average behavior, space usage, and lower bounds on the complexity of a problem), and algorithms for fundamental problems. It also introduces the areas of NP-completeness and parallel algorithms.

CSE351 Introduction to Computer Network [컴퓨터 네트워크]

This course provides the fundamental concepts of computer networking and exercises for network programming. The topics covered in this course are data link, networking, transport, and application layers.

CSE431 Introduction to Computer Graphics [컴퓨터 그래픽스]

This course introduces the theory behind the computer graphics for displaying 3D objects and the algorithms to improve the reality of the 3D computer graphics and provides the experience of 3D computer graphics programming with OpenGL.

CSE461 Software System Design [소프트웨어 시스템 디자인]

The aim of this course is for students to obtain hands-on software development skills in large software systems by designing and implementing diverse applications.

CSE490 Interdisciplinary Project [창의시스템구현]

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Device Physics

DPH201 Electromagnetics I [전자기학 I]

This course is the first half of one-year electromagnetics course. It deals with basic electro- and magnetostatic phenomena and the related theories using vector calculus, such as coulomb and ampere law, electric and magnetic fields and their boundary conditions at the interface of different media. It also covers the fundamental aspects of dielectric and magnetic materials, and electromagnetic induction.

DPH202 Electromagnetics II [전자기학 II]

This course is the second half of the one-year electromagnetics course. The subjects covered are theories related to time-varying electromagnetic waves such as Maxwell's equations, wave equation, reflection and refraction of electromagnetic waves at the boundary of dielectric materials. Transmissions of electromagnetic waves in guided structures are discussed. Gauge transformations, special relativity, and radiation of electromagnetic fields are also introduced.

DPH301 Introduction to Electronic Devices [전자소자개론]

This course first covers the fundamental physical concepts related to electronic devices, i.e., crystal structure of semiconductor materials, electronic energy band, dopants, carrier transport. Then it introduces the basic working principles of various electronic devices such as PN junction, bipolar transistor, Metal/Semiconductor junction, field effect transistor, microwave devices, and photonic devices.

DPH302 Microelectronics Lab [전자소자실험]

This course supplies students hands-on experiences on semiconductor device fabrication processes (oxidation, chemical cleaning/etching, lithography, diffusion, metalization) by actually making planar diodes and transistors on a silicon wafer in cleanroom environment. Students also learn about the methodologies of characterizing the fabricated devices.

DPH303 Quantum Mechanics I [양자역학I]

This course is the first half of one-year quantum physics course. It covers the experimental basis of quantum mechanics and its general formalism such as wave mechanics, Schrodinger equation, uncertainty principle, and Hilbert space. We also learn about harmonic oscillator, angular momentum, spin, time-independent perturbation theory, and hydrogen atom.

DPH304 Quantum Mechanics II [양자역학 II]

This course is the second half of one-year quantum physics course. It deals with variational and WKB methods, He atom, charged particles in magnetic field, time-dependent perturbation theory, scattering, and Dirac equation, which are the key quantum mechanical phenomena in modern physics.

DPH305 Thermal and Statistical Physics [열 및 통계역학]

This introductory course covers basic principles and applications of statistical thermodynamics. The course includes the statistical approach in mechanical problems, the relation of macroscopic thermodynamics and microscopic statistical mechanics, Kinetic Theory and transport phenomena, and fundamentals of quantum statistical mechanics. Also the actual applications of statistical thermodynamics to the gas, liquid and solid systems are introduced.

DPH401 Solid State Physics [고체물리학]

As an introductory course to solid state physics for engineering majors, this course covers crystal structure, lattice vibration, free electron theory in metals, the quantum electron theory and the concept of band theory, electron transport in metal/semiconductor/insulator, dielectric and magnetic properties of materials, and superconducting materials.

DPH403 Modern VLSI Devices [현대집적회로소자]

In this course, we study in depth how the various semiconductor devices operate by using analytical approach and computer simulation. The fabrication processes and the operating principles of the manufacturing equipments are also covered. Finally, the application of semiconductor devices to actual integrated circuits and new types of devices will be discussed.

DPH405 Optoelectronics [광전자공학]

This introductory course is intended to familiarize students with underlying principles of optoelectronic and optical communication devices. Topics of this course include an overview of laser, fiber optic communication systems, optics review, light wave fundamentals, light detectors, noise analysis, and system design.

DPH490 Interdisciplinary Project [창의시스템구현]

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

MSE250 Modern Physics of Materials [재료현대물리]

The course is directed at the development of a background in the basic physics required to understand the behavior of electrons in atoms, molecules and solids. Examples to illustrate the application of these techniques will be centered in the free and nearly free electron theory of solids. The application of modern physics to many state-of-the-art materials analysis techniques will be demonstrated throughout the course.

School of Mechanical and Advanced Materials Engineering

1. School Introduction

The School of Mechanical and Advanced Materials Engineering focuses on world-class research and education specialized in automotive, shipbuilding, MEMS (Micro Electro Mechanical Systems), and advanced materials in order to nurture creative experts and scholars who can contribute to the development and advancement of cutting-edge industries. With the state-of-the-art facilities, the combination of traditional engineering and IT, and interdisciplinary approaches, the school concentrates on a variety of fields, including design, manufacturing, system analysis, energy, and advanced material technologies. In addition, the education of our students emphasizes creativity and ingenuity. This school provides students with track curricula in which they can learn about advanced fields, such as mechanical systems, design innovation, thermofluid control, precision processing, semiconductors, polymers, nano-based functional materials, and intelligent materials.

2. Undergraduate Programs

□ Track Introduction

1) Mechanical System Design and Manufacturing(SDM)

Manufacturing is the process of converting raw materials into value-added products. The science and technology of manufacturing processes and systems have made dramatic advances on a global scale and continue to have a major impact on the global economies and the standard of living. An indispensible part of the field of Mechanical Engineering, manufacturing in particular, is optimal design of mechanical systems, including automobiles, aircrafts, power systems, machinery, and their integral components. In the Mechanical System Design and Manufacturing track, students are educated and trained to learn the underlying principles of mechanical design and manufacturing engineering, and to apply the knowledge to real-world examples and case studies hands-on. Disciplines include machine design, advanced materials processing, laser-assisted manufacturing, micro/nano machining, MEMS, biomedical products, controls and mechatronics, acoustics and dynamics, and tribology.

2) Thermo-Fluid and Power Engineering(TFP)

Automobiles, aircraft, ships, and submarines are designed using the principles of Fluid Mechanics because they move in a fluid such as air and water; they are propelled by a

power-generating device such as a jet engine or an internal combustion engine, which are all based on the principles of Thermodynamics. Thermo-Fluid & Power Engineering is a branch of engineering that deals with problems like these, and has numerous important applications, such as heat problems in microchips and light emitting diodes, wind power, blood flow, micro/nanofluidics (which is one of the key technologies in biochip research), and heat exchanger design in nuclear power plants.

3) Materials Science and Engineering(MSE)

Materials Science and Engineering (MSE) is an interdisciplinary field which emphasizes the study of processing-structure-property relations in materials. In order to develop new materials and find their applications, it is important to understand the fundamental relationship between the structure and properties. Students in this track will learn how the structure is controlled during the manufacturing process by various chemical, thermal, mechanical, electrical and other treatments. MSE track is directed towards understanding of various materials such as metals, ceramics, semiconductors, polymers and hybrid materials at both macroscopic and microscopic scale. Advanced materials in this area include structural materials covering cars, aerospace and ships, electronic materials covering semiconductors and displays, and energy materials covering solar cells, fuel cells, batteries and supercapacitors. We expect the students to play a key role in a wide range of modern sciences, technologies and industrial fields based on the knowledge of materials science and engineering.

☐ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		1Track	2Track
Mechanical System Design and Manufacturing	Required	25	25
	Elective	8	2
Thermo-Fluid and Power Engineering	Required	25	25
	Elective	8	2
Material Science and Engineering	Required	22	16
	Elective	11	11

▶ Required Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course
School of Mechanical and Advanced Materials Engineering	Mechanical System Design and Manufacturing	MTH103	Applied Linear Algebra
		MTH201	Differential Equations
	Thermo-Fluid and Power Engineering	MTH103	Applied Linear Algebra
		MTH201	Differential Equations
	Materials Science and Engineering	MTH103	Applied Linear Algebra
		MTH201	Differential Equations

※ Complete based on 1TR

※ Engineering field students who entered in 2009 should take 'Calculus (or I), Applied Linear Algebra, Differential Equations, Statistics' 12 credits.

▶ Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
School of Mechanical and Advanced Materials Engineering	Engineering Programming	Dynamics of IT or IT Courses designated by other schools : choose 1	Programming Lab.

※ Complete based on 1TR

☐ Curriculum

▶ Mechanical System Design and Manufacturing (SDM)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	SDM230	Solid Mechanics I	고체역학 I	3-3-0	
	SDM231	Solid Mechanics II	고체역학 II	3-3-0	SDM230
	SDM250	Mechanical Drawing and Lab	기계제도 및 실습	3-2-2	
	SDM270	Dynamics	동역학	3-3-0	
	SDM351	Machine Element Design	기계요소설계	3-3-0	SDM230

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	SDM490	Interdisciplinary Project	창의시스템구현	1-0-2	
	TFP210	Thermodynamics	열역학	3-3-0	
	TFP220	Fluid Mechanics	유체역학	3-3-0	
	TFP300	Mechanical Engineering Lab	기계공학실험	3-1-4	
Elective	SDM302	Introduction to Finite Element Method	유한요소법개론	3-3-0	SDM230
	SDM350	Manufacturing Processes and Lab	기계공작법 및 실습	3-2-2	
	SDM352	Creative Engineering Design I	창의적공학설계 I	3-1-4	
	SDM370	System Dynamics and Control	시스템제어	3-3-0	SDM270
	SDM431	Introduction to Plastic Deformation	소성학개론	3-3-0	SDM230
	SDM451	Introduction to MEMS	MEMS개론	3-3-0	
	SDM452	Creative Engineering Design II	창의적공학설계 II	3-1-4	SDM352
	SDM453	CAD/CAM/CAE	CAD/CAM/CAE	3-2-2	SDM250
	SDM454	Optimal Design	최적설계	3-2-2	
	SDM461	Introduction to Robotics	로봇공학	3-3-0	
	SDM462	Introduction to Biomechanics	생체역학	3-3-0	
	SDM470	Mechanical Vibration	기계진동학	3-3-0	SDM270
	SDM472	Introduction to Sensors	센서개론	3-3-0	
	SDM473	Acoustics	음향학	3-3-0	
	SDM499	Special Topics in Mechanical System Design and Manufacturing	기계 시스템 설계 및 생산공학 특론	3-3-0	
	TFP211	Applied Thermodynamics	응용열역학	3-3-0	TFP210
	TFP301	Numerical Analysis	수치해석	3-3-0	
	TFP310	Heat Transfer	열전달	3-3-0	TFP210,

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	TFP311	Internal Combustion Engine	내연기관	3-3-0	TFP210
	TFP312	Mechatronics and Thermofluid Control	메카트로닉스 및 열유동제어	3-3-0	
	TFP320	Applied Fluid Mechanics	응용유체역학	3-3-0	TFP220
	TFP411	Combustion	연소공학	3-3-0	TFP210, TFP220
	TFP412	Air-Conditioning and Refrigeration	공기조화냉동	3-3-0	TFP210
	TFP455	Multiscale System Design	멀티스케일시스템설계	3-3-0	TFP220
	TFP456	Energy System Design	에너지 시스템설계	3-3-0	TFP210, TFP220
	TFP457	Introduction to Electric-Electronic Engineering	전기전자공학개론	3-3-0	PHY103
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	MSE311	Introduction to Metallic Materials	금속재료개론	3-3-0	
	MSE354	Introduction to Semiconductor	반도체개론	3-3-0	
	MSE370	Introduction to Polymer Materials	고분자재료개론	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	EE301	Microelectronics I	전자회로 I	3-3-0	EE201
	DPH201	Electromagnetics I	전자기학 I	3-3-0	
	ESD201	Design IT	디자인 IT	3-2-2	
	ESD211	System Control	시스템제어	3-2-2	
	ESD301	Engineering Design Methods	공학디자인 기법	3-3-0	MTH103
	DHE201	Design Thinking	디자인적 사고	3-3-0	
	IID201	Design Elements and Principles	디자인 요소와 원리	3-2-2	
	ACE232	Transport Phenomena I	전달현상 I	3-3-0	
	BEN321	Nano-Bioengineering	나노바이오공학	3-3-0	
	BEN431	Materials for Biomedical Applications	의생명공학재료	3-3-0	
	BEN434	Current Topics in Bioengineering	최신생물공학특론	3-3-0	

☐ Recommended Course Schedule (SDM)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH103 *SDM230 *TFP210 MSE202 EE201 DPH201 DHE201 IID201	&MTH201 *SDM231 *SDM250 TFP211 *TFP220 MSE202 EE201 ESD201 ESD211	*SDM250 *SDM270 TFP320 DPH201 ESD211 ACE232		
3rd	*SDM351 SDM370 TFP301 TFP311 MSE370 ESD301 EE301	SDM302 SDM352 TFP310 MSE311 MSE354 BEN321	SDM350 *TFP300 TFP312 EE301		
4th	SDM452 SDM470 SDM473 *SDM490 TFP411 TFP457	SDM451 SDM453 SDM462 *SDM490 TFP412 TFP455 BEN434	SDM431 SDM454 SDM461 SDM472 *SDM490 TFP456 BEN431		

▶ Thermo-Fluid and Power Engineering (TFP)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	TFP210	Thermodynamics	열역학	3-3-0	
	TFP220	Fluid Mechanics	유체역학	3-3-0	
	TFP300	Mechanical Engineering Lab	기계공학실험	3-1-4	
	TFP310	Heat Transfer	열전달	3-3-0	TFP210
	TFP320	Applied Fluid Mechanics	응용유체역학	3-3-0	TFP220
	TFP490	Interdisciplinary Project	창의시스템구현	1-0-2	
	SDM230	Solid Mechanics I	고체역학 I	3-3-0	
	SDM231	Solid Mechanics II	고체역학 II	3-3-0	SDM230
	SDM270	Dynamics	동역학	3-3-0	
Elective	TFP211	Applied Thermodynamics	응용열역학	3-3-0	TFP210
	TFP301	Numerical Analysis	수치해석	3-3-0	
	TFP311	Internal Combustion Engine	내연기관	3-3-0	TFP210
	TFP312	Mechatronics and Thermofluid Control	메카트로닉스 및 열유동제어	3-3-0	
	TFP411	Combustion	연소공학	3-3-0	TFP210, TFP220
	TFP412	Air-Conditioning and Refrigeration	공기조화냉동	3-3-0	TFP210
	TFP455	Multiscale System Design	멀티스케일 시스템설계	3-3-0	TFP220
	TFP456	Energy System Design	에너지 시스템설계	3-3-0	TFP210, TFP220
	TFP457	Introduction to Electric-Electronic Engineering	전기전자공학개론	3-3-0	PHY103
	TFP499	Special Topics in Thermo-Fluid and Power Engineering	열유체 및 동력공학 특론	3-3-0	
	SDM250	Mechanical Drawing and Lab	기계제도 및 실습	3-2-2	
	SDM302	Introduction to Finite Element Method	유한요소법개론	3-3-0	SDM230
	SDM350	Manufacturing Processes and Lab	기계공작법 및 실습	3-2-2	
	SDM351	Machine Element Design	기계요소설계	3-3-0	SDM230
	SDM352	Creative Engineering Design I	창의적공학설계 I	3-1-4	
	SDM370	System Dynamics and Control	시스템제어	3-3-0	SDM270
	SDM431	Introduction to Plastic	소성학개론	3-3-0	SDM230

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
		Deformation			
	SDM451	Introduction to MEMS	MEMS개론	3-3-0	
	SDM452	Creative Engineering Design II	창의적공학설계 II	3-1-4	SDM352
	SDM453	CAD/CAM/CAE	CAD/CAM/CAE	3-2-2	SDM250
	SDM454	Optimal Design	최적설계	3-2-2	
	SDM461	Introduction to Robotics	로봇공학	3-3-0	
	SDM462	Introduction to Biomechanics	생체역학	3-3-0	
	SDM470	Mechanical Vibration	기계진동학	3-3-0	SDM270
	SDM472	Introduction to Sensors	센서개론	3-3-0	
	SDM473	Acoustics	음향학	3-3-0	
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	MSE311	Introduction to Metallic Materials	금속재료개론	3-3-0	
	MSE354	Introduction to Semiconductor	반도체개론	3-3-0	
	MSE370	Introduction to Polymer Materials	고분자재료개론	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	EE301	Microelectronics I	전자회로 I	3-3-0	EE201
	DPH201	Electromagnetics I	전자기학 I	3-3-0	
	ESD201	Design IT	디자인 IT	3-2-2	
	ESD211	System Control	시스템제어	3-2-2	
	ESD301	Engineering Design Methods	공학디자인 기법	3-3-0	MTH103
	IID201	Design Elements and Principles	디자인 요소와 원리	3-2-2	
	DHE201	Design Thinking	디자인적 사고	3-3-0	
	NUE213	Fundamentals of Nuclear Engineering	원자력 공학 개론	3-3-0	
	ACE232	Transport Phenomena I	전달현상 I	3-3-0	
	BEN321	Nano-Bioengineering	나노바이오공학	3-3-0	
	BEN431	Materials for Biomedical Applications	의생명공학재료	3-3-0	
	BEN434	Current Topics in Bioengineering	최신 생물공학특론	3-3-0	

☐ Recommended Course Schedule (TFP)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH103 *TFP210 *SDM230 MSE202 EE201 DPH201 DHE201 IID201 NUE213	&MTH201 TFP211 *TFP220 *SDM231 SDM250 MSE202 EE201 ESD201 ESD211 NUE213	*TFP320 SDM250 *SDM270 DPH201 ESD211 ACE232		
3rd	TFP301 TFP311 SDM351 SDM370 MSE370 EE301 ESD301	*TFP310 SDM302 SDM352 MSE311 MSE354 BEN321	*TFP300 TFP312 SDM350 EE301		
4th	TFP457 TFP411 *TFP490 SDM452 SDM470 SDM473	TFP412 TFP455 *TFP490 SDM451 SDM453 SDM462 BEN434	TFP456 *TFP490 SDM431 SDM454 SDM461 SDM472 BEN431		

▶ Materials Science and Engineering (MSE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	MSE203	Physical Chemistry of Materials I : Thermodynamics	재료물리화학 I : 열역학	3-3-0	
	MSE230	Introduction to Crystallography	결정학개론	3-3-0	
	MSE312	Phase Transformations in Materials	재료상변태	3-3-0	
	MSE350	Solid State Physics of Materials	재료고체물리	3-3-0	
	MSE490	Interdisciplinary Project	창의시스템구현	1-0-2	
1TR:R 2TR:E	MSE212	Mechanical Behavior of Materials	재료의기계적거동	3-3-0	
	MSE300	Materials Lab	재료실험	3-1-4	
Elective	MSE211	Physical Chemistry of Materials II : Reaction Engineering	재료물리화학 II : 반응공학	3-3-0	
	MSE250	Modern Physics of Materials	재료현대물리	3-3-0	
	MSE301	Organic Materials Lab	유기재료실험	3-1-4	
	MSE302	Semiconducting Materials Lab	반도체재료실험	3-1-4	
	MSE303	Metallic Materials Lab	금속재료실험	3-1-4	
	MSE311	Introduction to Metallic Materials	금속재료개론	3-3-0	
	MSE351	Thin Film Technology	박막공학	3-3-0	
	MSE353	Introduction to Nanomaterials	나노재료개론	3-3-0	
	MSE354	Introduction to Semiconductor	반도체개론	3-3-0	
	MSE370	Introduction to Polymer Materials	고분자재료개론	3-3-0	
	MSE371	Soft Materials Engineering	연성소재공학	3-3-0	
	MSE401	Transmission Electron Microscopy	전자현미경학	3-3-0	
	MSE410	Dislocation Theory	전위론	3-3-0	
	MSE411	Physical Metallurgy	물리야금	3-3-0	
	MSE430	Electrical Ceramics	전자세라믹스	3-3-0	
	MSE431	Magnetic Properties of Materials	재료의 자기적 성질	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	MSE452	Semiconducting Devices and Process	반도체소자 및 공정	3-3-0	
	MSE454	Thin Film Mechanics	박막역학	3-3-0	
	MSE470	Polymer Physics	고분자물리	3-3-0	
	MSE499	Special Topics in Materials Science	신소재특론	3-3-0	
	SDM230	Solid Mechanics I	고체역학 I	3-3-0	
	TFP301	Numerical Analysis	수치해석	3-3-0	
	DPH201	Electromagnetics I	전자기학 I	3-3-0	
	DPH303	Quantum Mechanics I	양자역학 I	3-3-0	
	ECS314	Electrochemistry	전기화학	3-3-0	
	ECS316	Fundamentals of Energy Materials	에너지재료 개론	3-3-0	
	NCS301	Instrumental Analysis	기기분석	3-3-0	
	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	NCS311	Introduction to Nanoscience and Nanotechnology	나노과학 및 기술	3-3-0	
	NCS321	Inorganic Chemistry	무기화학	3-3-0	

☐ Recommended Course Schedule (MSE)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	&MTH103 *MSE202 *MSE203 SDM230 DPH201 NCS201	&MTH201 *MSE202 *MSE203 **MSE212	MSE211 *MSE230 MSE250 DPH201		
3rd	*MSE312 *MSE350 MSE370 TFP301 DPH303 ECS314 ECS316 NCS321	**MSE300 MSE311 MSE353 MSE354 ECS314 NCS301 NCS311	MSE301 MSE302 MSE303 MSE351 MSE371		
4th	MSE401 MSE410 MSE411 MSE452 *MSE490	MSE430 MSE431 MSE454 *MSE490	MSE470 *MSE490		

3. Course Descriptions

▶ Mechanical System Design & Manufacturing

SMD230 Solid Mechanics I (고체역학 I)

In this course, students perform an in-depth study on the concept of stress-strain analysis, based on statics (force and moment) and mechanics of deformable bodies. Students learn to analyze the force and moment applied on the cross-section of a beam subjected to tension, compression, bending, and torsion. Methods to determine stress-strain distribution and deflection of beams are presented. Energy methods based on the equilibrium between strain energy and external work, alternative to force-moment equilibrium, are also introduced.

SDM231 Solid Mechanics II (고체역학 II)

This course builds upon Solid Mechanics and introduces the mechanical behavior of various materials, including metals, ceramics, polymers, and composites. A rigorous definition of three-dimensional stresses and strains is presented, based on which the mechanical behavior is analyzed. Students learn representative failure modes, including fracture, fatigue, wear, and creep, and methods are presented to predict the failure mode and life based on various failure criteria. Various case studies are performed to demonstrate failure analysis techniques.

SDM250 Mechanical Drawing and Lab (기계제도 및 실습)

This course is provided in two modes – lecture and lab – that run in parallel. In lectures, lines, projections, views, and tolerances, which are fundamental components of mechanical drawings, are presented. The lab component allows the students to apply the knowledge obtained in lectures to produce drawings utilizing CAD software. In the term project, 3-4 students work as a team to execute the project in a creative and practical manner. The projects will help students learn to work efficiently in a teamwork environment and improve their communication skills.

SDM270 Dynamics (동역학)

This course introduces various dynamics systems. For dynamics analysis, principles and applications of Newton's law, work-energy methods, and impulse-momentum methods will be covered in this course.

SDM302 Introduction to Finite Element Method (유한요소법개론)

In this course, the theory and formulation behind the finite element method will be introduced. To gain hands-on experience of the finite element method, practical applications in engineering will be covered.

SDM350 Manufacturing Processes and Lab (기계공작법 및 실습)

The course introduces engineering materials used in industry from the perspectives of composition, microstructures, properties, and heat treatment. It provides an extensive knowledge of various manufacturing processes, develops basic mathematical descriptions for selected processes, and helps students apply these concepts to process selection and planning. Manufacturing processes ranging from traditional (casting, machining, forging, powder metallurgy, injection molding, welding) to nontraditional/cutting-edge (electrodischarge machining, rapid prototyping, microfabrication) are introduced. From the manufacturing standpoint, the students learn the advantages and limitations of various processes in terms of quality, cost, and productivity. The lab component of this course allows the students to design and manufacture mechanical components hands-on.

SDM351 Machine Element Design (기계요소설계)

This course prepares students to design mechanical systems both at component- and system-level in a creative and comprehensive manner. Students learn to analyze, select, and synthesize machine components, as applied to springs, bearings, shafts, gears, fasteners, and other elements in a mechanical system. In addition, students learn to identify and quantify the specifications and trade-offs for the selection and application of components, which are commonly used in the design of complete mechanical systems. The course will require team projects in which the students will learn to develop conceptual design, optimize design parameters, and work efficiently in a teamwork environment.

SDM352 Creative Engineering Design I (창의적공학설계 I)

In this course, students will develop their design capabilities through a team-project. To accomplish a given objective, students should define the problem, design and manufacture the system, and evaluate the final product by themselves. Through the whole process, students can broaden their understanding about creative engineering design.

SDM370 System Dynamics and Control (시스템제어)

Automatic control has played a vital role in various engineering and technological fields. It is not only important in space vehicles, missile guidance systems, aircraft autopiloting, and robots, but also in modern manufacturing and industrial processes. This course covers dynamic modeling and response of systems with mechanical, hydraulic, thermal and electrical elements, linear feedback control systems design, and analysis in time and frequency domains. Students learn basic mathematical and computational tools for modeling and analysis of dynamic systems. They are also trained to identify, model, analyze, design, and simulate dynamic systems in various engineering disciplines using a unified approach.

SDM431 Introduction to Plastic Deformation (소성학개론)

This course deals with the fundamental theory of plasticity including the constitutive relations in

plastic deformation and the methods of analysis for grasping the deformation behavior. The analytic solution of nonlinear problems in plastic deformation will be covered.

SDM451 Introduction to MEMS (MEMS 개론)

This course introduces MEMS, one of the most typical interdisciplinary research areas. Physical principles of micro structure and micro-fabrication techniques will be taught first and case studies of design, fabrication, and applications of diverse micro devices including micro-mechanical sensors (accelerometer, pressure sensor, flow sensor, temperature sensor), micro-actuator, and microfluidics will be covered in this course.

SDM452 Creative Engineering Design II (창의적공학설계 II)

In this course, students can develop their design ability as an independent mechanical engineer through a term-project where they propose an engineering problem including its necessity, design, manufacture, evaluate and present the system by themselves.

SDM453 CAD/CAM/CAE (CAD/CAM/CAE)

In this course, students study the theories and algorithms of CAD/CAM/CAE used in the design and manufacture of various products. Through these studies, the students will develop their capabilities to design, analyse, and manufacture various products using CAD/CAM/CAE techniques.

SDM454 Optimal Design (최적설계)

In this course, various optimization theories and algorithms are introduced, in order to improve students' capabilities in optimization including defining a problem, developing formulae, and adopting proper algorithms.

SDM461 Introduction to Robotics (로봇공학)

Robot definition, history, and its components/Open and closed loop Kinematics and inverse kinematics/Jacobian and Inverse Jacobian/Dynamics/Actuators, sensors, vision, voice recognition/Robot Controls/Robot Projects

SDM462 Introduction to Biomechanics (생체역학)

Introduction to biomechanics/Bio-Dynamics/Multibody dynamics/Computational biomechanics/ Human body components biomechanics/Prothetics and protheses/Biomechanics of bone, tendon, ligaments/Advanced topics: Bio-robotics, Rehabilitation engineering/Semester Project

SDM470 Mechanical Vibration (기계진동학)

This course introduces concepts of mechanical vibration, including free and forced vibration of single/multi-degree of freedom systems. Relevance of eigenvalue problems to multiple DOF system analysis is introduced together with some numerical techniques. Finally, numerical

approximation and techniques for the distributed systems are studied.

SDM472 Introduction to Sensors (센서개론)

This course introduces principles and characteristics of diverse physical, chemical, and biological sensors and teaches how to convert the measured values from the sensors into meaningful result.

SDM473 Acoustics (음향학)

For the control of sound/noise, study of acoustic terminology, fundamental principles of sound/noise generation, wave propagation, wave equation solution, and instrumentation will be covered in this course.

SDM490 Interdisciplinary Project (창의시스템구현)

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Thermo-Fluid & Power Engineering

TFP210 Thermodynamics (열역학)

Thermodynamics is the most fundamental course in Mechanical Engineering. This course aims to have students understand various fundamental laws of thermodynamics and to develop the ability to apply them to various thermal systems. It covers energy, heat and work, enthalpy, entropy, laws of thermodynamics, thermodynamic properties, analysis of cycle performance and various engineering cycles.

TFP211 Applied Thermodynamics (응용열역학)

This course is focused on the application of the principles of thermodynamics to understand the properties of ideal gas mixtures. Topics cover available energy, availability and second-law efficiency, chemical reactions, thermodynamic relations and phase and chemical equilibrium. The basics of molecular dynamics and statistical thermodynamics are introduced.

TFP220 Fluid Mechanics (유체역학)

This is an introductory course in Fluid Mechanics. Topics covered include fundamental concepts of fluid mechanics, fluid statics, governing equations in integral form, governing equations in differential form, Bernoulli equation, dimensional analysis, viscous flow in ducts, and boundary layer flows.

TFP300 Mechanical Engineering Lab (기계공학실험)

This course provides students with practical and experimental techniques for observation and measurement of mechanical principles and physical phenomena and focuses on analyzing experimental results and writing technical reports.

TFP301 Numerical Analysis (수치해석)

This course introduces numerical methods with emphasis on algorithm construction, analysis and implementation. It includes programming, round-off error, solutions of equations in one variable, interpolation and polynomial approximation, approximation theory, direct solvers for linear systems, numerical differentiation and integration, and initial-value problems for ordinary differential equations.

TFP310 Heat Transfer (열전달)

This course deals with heat transfer problems associated with steady and transient conductions, forced and free convections, and radiation. Basic heat transfer mechanism, formulation of the problems and their solution procedures, and empirical correlations will be introduced. Also, some examples of practical applications will be discussed.

TFP311 Internal Combustion Engine (내연기관)

This course covers internal combustion engines such as 4-cycle spark ignition, 4-cycle compression ignition and 2-cycle engines. The topics include fundamentals of thermodynamics in engines, combustion and fuel properties, lubricant and lubrication, heat transfer, friction phenomena, power, efficiency, and emissions.

TFP312 Mechatronics and Thermofluid Control (메카트로닉스 및 열유동제어)

Mechatronics is a fusion course consisting of mechanical engineering and electronics engineering. This course covers how to control mechanical systems by using a microprocessor, electric circuits, OP-AMP, analog circuits, and embedded programming.

TFP320 Applied Fluid Mechanics (응용유체역학)

In this course, based on the topics learned in TFP220, advanced topics such as viscous flows, inviscid flows, lift and drag, basic turbulent flows, fundamentals of compressible flows, and turbomachinery will be covered.

TFP411 Combustion (연소공학)

Combustion is based on thermodynamics, heat transfer, and fluid mechanics. This course deals with the energy conversion process from chemical to mechanical energy. Since energy consumption mostly occurs during the combustion process, the topics include not only flames and their characteristics but also practical combustion machines.

TFP412 Air-conditioning and Refrigeration (공기조화냉동)

This course covers the basic engineering principles of air-conditioning and refrigeration systems based on the topics in thermodynamics, heat transfer, and fluid mechanics. Cooling load calculation methods, Psychrometric chart, Air-conditioning system design based on thermodynamic cycle analysis, and performance analysis for major components such as compressor, condenser, evaporator and expander are introduced. It also discusses various alternative refrigeration methods and refrigerants.

TFP455 Multiscale System Design (멀티스케일 시스템설계)

This course aims at extending the design principles based on mechanics to designing multi-scale systems. It not only deals with the design principles that are important in macro systems, but it also studies new design principles that are more important in micro-/nano-scales when the ratio of surface to volume decreases. COMSOL Multi-physics, which is a multi-physics modeling and simulation software is also taught to improve the capability of modeling, analyzing and designing multi-scale systems.

TFP456 Energy System Design (에너지 시스템설계)

This course covers optimal design methods for thermal fluids systems consisting of heat exchangers, burners, compressors and pumps, etc. Mathematical formulations for large thermal fluid systems and their solution methods are presented, and several optimization methods for design of the systems are also provided.

TFP457 Introduction to Electric-Electronic Engineering (전기전자공학개론)

Introduction to electric-electronic engineering: This course is designed to provide the mechanical engineering students with basic electrical and electronic skills and knowledge required for experimental set-ups. For example, basic circuit theory, fundamental electromagnetics, op amp, dc power supply, diode, rectification circuits will be discussed.

TFP490 Interdisciplinary Project (창의시스템설계)

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Material Science Engineering

MSE202 Introduction to Materials Science and Engineering (재료공학개론)

The need for new materials is now increasing as both the mechanical and (opto-)electronic devices become small, light, and integrated. The understanding of basic structures and properties of materials in the areas of metals, semiconductors, ceramics, and polymers is

essential to develop new materials. The main background of this course is educating the fundamental sciences and techniques associated with various structures, properties, and engineering process. This lecture is to help students understand the relationship between microstructures of materials and physical (mechanical, electrical, magnetic, optical) and chemical properties.

MSE203 Physical Chemistry of Materials I : Thermodynamics (재료물리화학 I : 열역학)

This course is one of the fundamental courses in Materials Science and Engineering as a topic in the field of Applied Physical Chemistry, and is focused on the understanding of material properties and fundamental phenomena related to material processes. Specific topics will include gas state properties and structures, thermodynamic laws, and equilibrium state.

MSE211 Physical Chemistry of Materials II: Reaction Engineering II (재료물리화학 II: 반응공학)

This course is designed to extend the concepts and knowledge learned from subject MSE203 Physical Chemistry of Materials I : Thermodynamics and provide fundamental knowledge of thermodynamics for materials scientists and engineers. It covers phase equilibrium, calculation of heat capacitance, and the relation between free energy and phase diagram.

MSE212 Mechanical Behavior of Materials (재료의 기계적거동)

This course explores the phenomenology of mechanical behavior of materials at the macroscopic level and the relationship of mechanical behavior to material structure and mechanisms of deformation and failure. Topics covered include elasticity, viscoelasticity, plasticity, creep, fracture, and fatigue. Case studies and examples are drawn from structural and functional applications that include a variety of material classes: metals, ceramics, polymers, thin films, composites, and cellular materials.

MSE230 Introduction to Crystallography (결정학개론)

This course covers the derivation of symmetry theory; lattices, point groups, space groups, and isotropic and anisotropic properties of crystals. This course also covers the principles and applications of x-ray diffraction and electron diffraction to identify cystal structure.

MSE250 Modern Physics of Materials (재료현대물리)

The course is directed at the development of a background in the basic physics required to understand the behavior of electrons in atoms, molecules and solids. Examples to illustrate the application of these techniques will be centered in the free and nearly free electron theory of solids. The application of modern physics to many state-of-the-art materials analysis techniques will be demonstrated throughout the course.

MSE300 Materials Lab (재료실험)

This course provides an experimental introduction to key concepts in materials such as metals,

ceramics, and semiconductors and the relationships among structure, properties and performance will be examined.

MSE301 Organic Materials Lab (유기재료실험)

This course is a selective senior subject in the Department of Materials Science and Engineering for Organic Materials. The laboratory subject combines experiments illustrating electrical/optical/magnetic properties of materials and structure-property relationships through practical organic materials.

MSE302 Semiconducting Materials Lab (반도체재료실험)

This course is designed to provide professional understanding in the semiconductor structures and their characterization. First, the semiconductor structures contains basic understanding in semiconductor process such as preparation of semiconductor substrates, film deposition, dry/wet etching etc. Second, the laboratory subject combines experiments illustrating mechanical and electrical/optical/magnetic properties of materials and structure-property relationships through practical materials examples.

MSE303 Metallic Materials Lab (금속재료실험)

This course aims to deepen the students' understanding of metallic materials by analyzing the microstructure and mechanical properties of metals and alloys. This course includes metallographic experiments such as mechanical polishing and chemical etching and mechanical experiments such as hardness and tensile tests at room and elevated temperatures.

MSE311 Introduction to Metallic Materials (금속재료개론)

This course aims to basically understand the microstructure and mechanical properties of metallic materials, which include ferrous and non-ferrous metals and alloys. Dislocation, phase transformation, and strengthening mechanisms will be covered in this course. The relationship between microstructure and mechanical properties in metallic materials will also be discussed.

MSE312 Phase Transformations in Materials (재료상변태)

The state of matter is dependent upon temperature, thermal history, and other variables. In this course the science of structural transitions is treated, with the purpose in mind of utilizing them for producing materials with superior properties. The subjects covered include the methods of structural analysis, solidification, solid state transformation, and order-disorder transition.

MSE350 Solid State Physics of Materials (재료고체물리)

This course will provide fundamental knowledges of electrical, magnetic, and optical properties of various materials such as metals, ceramics, and semiconductors (and superconductors). Topics include crystal structure, lattice dynamics, reciprocal space, phonons, solid-state

thermodynamics, free and nearly free electron models, kinetic theory and transport, energy band theory, semiconductors physics and devices.

MSE351 Thin Film Technology (박막공학)

The need for thin films is now increasing as the electronic devices become small, light and integrated. In addition, fabrication of thin films from bulk materials is necessary to maximize their performance. Therefore, in this course we study the basic principles and techniques for the fabrication of thin films, the characterization methods and the applications of thin films.

MSE353 Introduction to Nanomaterials (나노재료개론)

Low-dimensional materials such as nanodot, nanotube, graphene, is considered as a promising future materials for nanotechnology, due to its unique size-dependent properties (mechanical, thermal, chemical, electronic, optical, and magnetic). This course will cover an interdisciplinary introduction to processing, structure, and properties of materials at the nanometer scale.

MSE354 Introduction to Semiconductor (반도체개론)

Concerning present and projected needs, this course provides a strong intuitive and analytical foundation for dealing with solid state devices. Emphasis is placed on developing a fundamental understanding of the internal working of the most basic solid state device structures, such as silicon based, metal-semiconductor contact, PN junction, MOS capacitor, bipolar transistor, and MOSFET.

MSE370 Introduction to Polymer Materials (고분자재료개론)

This course is designed to provide an introduction to the basic concept of polymer and various kinds of polymer materials. Students will learn basic chemical synthesis and polymer properties such as thermal, chemical, physical, mechanical, and electro-optic characteristics.

MSE371 Soft Materials Engineering (연성소재공학)

In this course, students learn the physics and chemistry of soft materials, including colloids, polymers, gels, rubbers, biomaterials and liquid crystals. Soft materials often self-assemble into nano- and micrometer scale structures, producing novel new materials or templates for them. The most diverse soft materials are polymers and this course covers their physical chemistry including intermolecular forces, energies, phase transitions, elastic property and dynamics.

MSE401 Transmission Electron Microscopy (전자현미경학)

Theoretical and practical aspects of conventional and high-resolution transmission electron microscopy and related techniques will be covered; Imaging theory, electron diffraction theory and spectroscopy such as energy dispersive x-ray spectroscopy and electron energy loss spectroscopy.

MSE410 Dislocation Theory (전위론)

This course examines crystal structures, kinds of defects, and dislocation. It also covers Burgers vector, dislocation observation, and stress generation, cross-link, loop and mechanism of multiplication of dislocations in materials.

MSE411 Physical Metallurgy (물리야금)

The objective of this course is to reinforce fundamental concepts and introduce advanced topics in physical metallurgy with emphasis on microstructural evolution and structure-properties relations. Topics will include equilibrium phase diagrams, thermodynamics, diffusional and martensitic transformation kinetics, recrystallization, and grain growth etc.

MSE430 Electrical Ceramics (전자세라믹스)

This course will present the subject of dielectric crystals and their electrical properties; discussion and correlation of ferroelectric and piezoelectric properties of several crystal classes; coverage in detail of the perovskite class of ferroelectric compounds; and discussion of spiral, garnet, and hexagonal type ferrimagnetic crystals and their properties.

MSE431 Magnetic Properties of Materials (재료의 자기적 성질)

Magnetism is one of the most actively studied research area in modern science and technology. It is a collective phenomenon, involving the mutual cooperation of enormous numbers of particles. This course introduces elementary magnetostatics and atomic origins of magnetism. Students will learn properties of ferro-, para- dia- and antiferro-magnetics and the theories that describe them. In addtion, magnetic phenomena and magnetic materials in technological applications will be introduced.

MSE452 Semiconducting Devices and process (반도체소자 및 공정)

Concerning present and projected needs, this course provides a strong intuitive and analytical foundation for dealing with solid state devices. Emphasis is placed on developing a fundamental understanding of the basic process used in integrated- circuit(IC), such as vacuum, thin films, etching, lithography, diffusion, thermal process, ion implantation etc.

MSE454 Thin Film Mechanics (박막역학)

This course covers mechanical behavior of thin film at micro- and nano-scale. Since thin films are attached to other materials such as substrates and thin films, it is important and interesting to understand their mechanical behavior. This course provides ideas to resolve reliability issues in micro devices such as delamination, crack propagation, and degradation failure during design and manufacturing.

MSE470 Polymer Physics (고분자물리)

This course introduces natural and synthetic polymers and their physical properties. Students will learn structure and property of polymers starting from the single chain conformation. The emphasis is on the universial static and dynamic behavior of polymers in solvents and melts. In addition this course covers basic chemical synthesis and chemical property of polymers.

MSE490 Interdisciplinary Project (창의시스템구현)

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

School of Nano-Bioscience & Chemical Engineering

1. School Introduction

The School of Nano-Bioscience and Chemical Engineering was designed for an emerging field combining Chemical Engineering principles with Life Science and Nanotechnology. Students can learn fundamental science and engineering principles that can be used to improve the quality of life on earth and solve the most challenging issues of the 21st century. The field of Nano-Bioscience and Chemical Engineering encompasses a wide range of interests including biomedical and genetic engineering, green energy and environments, and advanced materials. Students can achieve in-depth knowledge and hands-on experience on nano materials and devices, polymers, fine chemicals, applied molecular chemistry, bioengineering, biomedical engineering, life science, and chemical engineering-related subjects.

2. Undergraduate Programs

□ Track Introduction

1) Nanochemistry (NCS)

Chemistry is a central science that seeks the understanding of the nature and interactions between atoms and molecules. In addition to this essential scientific question, modern nanoscience offers new chances to explore the world of “beyond atoms and molecules” to find and create new phenomena and materials that enlighten the world. The Nanochemical Science track (NCS) provides the opportunity for undergraduate students to obtain a thorough fundamental knowledge of all fields of chemistry and nanoscience. The track offers lectures in all fields of chemistry and nanoscience: physical, organic, analytical, biological, and materials chemistry, polymer science, and nanoscience. The track stresses a research experience as an essential educational tool. Research opportunities with our world-class researchers are provided to all undergraduate students in the state-of-the art facilities and environment. Students will also enjoy the collaborative environment in the NCS. Students can learn how to work together with colleagues in solving questions and doing research. Our goal is to educate next-generation chemists and scientists who lead the world in research and answer the question from the society and the humankind.

2) Chemical Engineering (ACE)

The Advanced Chemical Engineering track is a discipline focusing on the application of chemical engineering to a variety of specific areas, including energy and the environment, catalysis, reaction engineering, systems and process design, nanotechnology, polymers and colloids and biotechnology. It is a multi-scale engineering program in which students can learn about the creative design of new chemicals, materials, processes and systems by translating molecular level information into novel engineering principles. This track aims to produce brilliant and creative scientific minds that are familiar with the principles of chemical engineering and the cutting-edge equipment available at the state-of-the-art facilities provided by UNIST.

3) Bioengineering (BEN)

This track leads the way in interdisciplinary research and education by being at the intersection of engineering, medicine, and natural sciences. The goal of this track is to improve human health and quality of life and to solve global crises related with energy and the environment through the study of protein and genetic engineering, molecular biology and chemical engineering and many other scientific principles. As such, the Bioengineering track offers a number of pertinent courses which will provide the students with the know-how and practical experience needed, through in-depth discussions and laboratory experiments, to become leading researchers and experts within this discipline and the cutting-edge equipment available at the state-of-the-art facilities provided by UNIST.

4) Biomedical Science (BMS)

Biomedical Science offers interdisciplinary research training based on 1) Biology, where fundamental understanding of living organisms is obtained, and 2) Applied knowledge to medical science in order to improve the quality of life. Recent ground-breaking achievements, including the human genome project, stem cell research, cloning techniques, and innovative therapies in cancer, and age-related diseases, highlight the potential of Biomedical Science to be one of the most promising areas in science. This track aims to produce brilliant and creative scientific minds that are familiar with the principles of biology and the cutting-edge equipment available at the state-of-the-art facilities provided by UNIST.

☐ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		1Track	2Track
Nanochemistry	Required	22	16
	Elective	11	11
Chemical Engineering	Required	22	16
	Elective	12	12
Bioengineering	Required	21	15
	Elective	12	12
Biomedical Science	Required	21	15
	Elective	12	12

▶ Required Mathematics Course for Each Track

Track	Course No.	Required Mathematics course
Nanochemistry	MTH103	Applied Linear Algebra
	MTH201	Differential Equations
Chemical Engineering	MTH103	Applied Linear Algebra
	MTH201	Differential Equations
Bioengineering	MTH103	Applied Linear Algebra
	MTH201	Differential Equations
Biomedical Science	MTH103	Applied Linear Algebra
	MTH211	Statistics

※ Complete based on 1TR
※ Engineering field students should take :
- Calculus 1 & 2
- 2 elective mathematics courses designated by each track
※ who entered in 2009 should take 'Calculus (or I), Applied Linear Algebra, Differential Equations, Statistics' 12 credits.

☐ Required IT Course

Course No.	Course Title	Cred.-Lect.-Exp.
ITP107	Engineering Programming	3-2-2
ITP117	Engineering Programming Lab.	2-0-4
BEN301	Computational Methods for Biological and Chemical Engineering	3-3-0

※ Complete based on 1TR
※ Students who entered in 2009 and don't take 'Dynamics of IT' shoule take 'Computational Methods for Biological and Chemical Engineering'
※ Sudents who entered after 2010 should take 'Computational Methods for Biological and Chemical Engineering' instead of 'Dynamics'.

☐ Curriculum

▶ Nanochemistry (NCS)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	NCS211	Analytical Chemistry	분석화학	3-3-0	
	NCS231	Organic Chemistry II	유기화학 II	3-3-0	
	NCS251	Physical Chemistry I	물리화학 I	3-3-0	
	NCS321	Inorganic Chemistry	무기화학	3-3-0	
	NCS490	Interdisciplinary Project	창의시스템구현	1-0-2	
1TR : R 2TR : E	NCS252	Physical Chemistry II	물리화학 II	3-3-0	
	NCS311	Introduction to Nanoscience and Nanotechnology	나노과학및 기술	3-3-0	
Elective	NCS253	Physical Chemistry III	물리화학 III	3-3-0	
	NCS261	Organic/Physical Chemistry Laboratory I	유기/물리화학실험 I	2-0-4	
	NCS301	Instrumental Analysis	기기분석	3-3-0	
	NCS361	Organic/Physical Chemistry Laboratory II	유기/물리화학실험 II	2-0-4	
	NCS434	Current Topics in Nanochemistry	나노화학특론	3-3-0	
	ACE212	Introduction to Chemical Process	화학공정개론	3-3-0	
	ACE322	Introduction to Electronics Processing	전자회로공정개론	3-3-0	
	ACE351	Introduction to Polymer Science and Engineering	고분자과학개론	3-3-0	
	ACE352	Polymer Materials	고분자재료	3-3-0	
	ACE431	Introduction to Catalysis	촉매개론	3-3-0	
	ACE434	Current Topics in Chemical Engineering	화학공학특론	3-3-0	
	BEN301	Computational Methods for Biological and Chemical Engineering	생물화공전산	3-3-0	
	BEN431	Materials for Biomedical Applications	의생명공학재료	3-3-0	
	BEN434	Current Topics in Bioengineering	생명공학특론	3-3-0	
	BMS211	Biochemistry I	생화학 I	3-3-0	
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	MSE211	Physical Chemistry of Materials II: Reaction Engineering	재료물리화학II: 반응공학	3-3-0	
	MSE351	Thin Film Technology	박막공학	3-3-0	
	MSE371	Soft Materials Engineering	연성소재공학	3-3-0	
	MSE452	Semiconducting Devices and Process	반도체소자 및 공정	3-3-0	
	MSE454	Thin film Mechanics	박막역학	3-3-0	
	MSE470	Polymer Physics	고분자물리	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	ECS314	Electrochemistry	전기화학	3-3-0	
	ECS321	Solid State chemistry I	고체화학I	3-3-0	
	ECS336	Inorganic Chemistry II	무기화학 II	3-3-0	

☐ Recommended Course Schedule (NCS)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	&MTH103 *NCS201 *NCS251 ACE212 BMS211 MSE202 EE201	&MTH201 *NCS211 *NCS231 **NCS252 NCS261 MSE202 EE201	MTH211 NCS253 NCS261 MSE211		
3rd	*NCS321 NCS361 ACE351 ECS314	#BEN301 **NCS311 NCS301 ACE352 ECS314 ECS321	ACE322 MSE351 MSE371 ECS321 ECS336		
4th	*NCS490 ACE431 MSE452	*NCS490 MSE454	*NCS490 BEN431 MSE470		

▶ Chemical Engineering (ACE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	NCS251	Physical Chemistry I	물리화학 I	3-3-0	
	ACE211	Chemical Reaction Engineering	반응공학	3-3-0	
	ACE232	Transport Phenomena I	전달현상 I	3-3-0	
	ACE351	Introduction to Polymer Science and Engineering	고분자과학개론	3-3-0	
	ACE490	Interdisciplinary Project	창의시스템구현	1-0-2	
1TR : R 2TR : E	ACE212	Introduction to Chemical Process	화학공정개론	3-3-0	
	ACE231	Chemical Engineering Thermodynamics	화공열역학	3-3-0	
Elective	NCS211	Analytical Chemistry	분석화학	3-3-0	
	NCS231	Organic Chemistry II	유기화학 II	3-3-0	
	NCS252	Physical Chemistry II	물리화학 II	3-3-0	
	NCS253	Physical Chemistry III	물리화학 III	3-3-0	
	NCS261	Organic/Physical Chemistry Laboratory I	유기/물리화학실험 I	2-0-4	
	NCS301	Instrumental Analysis	기기분석	3-3-0	
	NCS311	Introduction to Nanoscience and Nanotechnology	나노과학및기술	3-3-0	
	NCS321	Inorganic Chemistry	무기화학	3-3-0	
	NCS361	Organic/Physical Chemistry Laboratory II	유기/물리화학실험 II	2-0-4	
	NCS434	Current Topics in Nanochemistry	나노화학특론	3-3-0	
	ACE302	Advanced Chemical Engineering Laboratory	첨단화학공학실험	2-0-4	
	ACE322	Introduction to Electronics Processing	전자회로공정개론	3-3-0	
	ACE332	Transport Phenomena II	전달현상 II	3-3-0	
	ACE352	Polymer Materials	고분자재료	3-3-0	
	ACE431	Introduction to Catalysis	촉매개론	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	ACE434	Current Topics in Chemical Engineering	화학공학특론	3-3-0	
	BEN301	Computational Methods for Biological and Chemical Engineering	생물화공전산	3-3-0	
	BEN431	Materials for Biomedical Applications	의생명공학재료	3-3-0	
	BEN434	Current Topics in Bioengineering	생명공학특론	3-3-0	
	BMS211	Biochemistry I	생화학 I	3-3-0	
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	MSE351	Thin Film Technology	박막공학	3-3-0	
	MSE452	Semiconducting Devices and Process	반도체소자및공정	3-3-0	
	MSE454	Thin film Mechanics	박막역학	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	ECS314	Electrochemistry	전기화학	3-3-0	
	ECS319	Introduction to Solar Cells	태양전지공학 입문	3-3-0	
	ECS321	Solid State chemistry I	고체화학I	3-3-0	
	ECS336	Inorganic Chemistry II	무기화학 II	3-3-0	
	ECS416	Fundamentals of Fuel Cell (Systems)	연료전지개론 (시스템)	3-3-0	
	TFP211	Applied Thermodynamics	응용유체역학	3-3-0	

☐ Recommended Course Schedule (ACE)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	&MTH103 *NCS201 *NCS251 **ACE212 BMS211 MSE202 EE201	&MTH201 *ACE211 NCS211 NCS231 NCS252 NCS261 MSE202 EE201 TFP211	MTH211 *ACE232 **ACE231 NCS253 NCS261		
3rd	*ACE351 NCS321 NCS361 ACE302 ECS314 ECS319	#BEN301 NCS301 NCS311 ACE352 ECS314 ECS321	ACE322 ACE332 MSE351 ECS321 ECS336		
4th	*ACE490 ACE431 MSE452	*ACE490 MSE454	*ACE490 BEN431		

▶ Bioengineering(BEN)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	BMS211	Biochemistry I	생화학 I	3-3-0	
	BMS261	Biochemistry Laboratory	생화학실험	2-0-4	
	ACE211	Chemical Reaction Engineering	반응공학	3-3-0	
	BEN311	Transport Phenomena in Biological Systems	생체유체역학	3-3-0	
	BEN321	Nano-Bioengineering	나노바이오공학	3-3-0	
	BEN490	Interdisciplinary Project	창의시스템구현	1-0-2	
1TR : R 2TR : E	BEN323	Biochemical Engineering	생물화학공학	3-3-0	
	NCS211	Analytical Chemistry	분석화학	3-3-0	
Elective	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	NCS251	Physical Chemistry I	물리화학 I	3-3-0	
	NCS434	Current Topics in Nanochemistry	나노화학특론	3-3-0	
	ACE322	Introduction to Electronics Processing	전자회로공정개론	3-3-0	
	ACE352	Polymer Materials	고분자재료	3-3-0	
	ACE434	Current Topics in Chemical Engineering	화학공학특론	3-3-0	
	BEN231	Microbiology	미생물학	3-3-0	
	BEN301	Computational Methods for Biological and Chemical Engineering	생물화공전산	3-3-0	Substitute Course for Dynamic IT
	BEN314	Instrumental Bioanalysis	생물기기분석	3-3-0	
	BEN316	Protein Engineering	단백질공학	3-3-0	
	BEN317	Metabolic Engineering	대사공학	3-3-0	
	BEN319	Optics and Imaging	광학이미징	3-3-0	
	BEN331	Biomedical Imaging	의생명이미징	3-3-0	
	BEN411	Physical Biology of the Cell	세포생물물리학	3-3-0	
	BEN412	Microbial Physiology	미생물생리학	3-3-0	
	BEN413	Biomedical Instrumentation Laboratory	의료기기실험	3-2-3	
	BEN431	Materials for Biomedical Applications	의생명공학재료	3-3-0	
	BEN434	Current Topics in Bioengineering	생물공학특론	3-3-0	
	BEN435	Tissue Engineering	조직공학	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	BMS201	Molecular Biology	분자생물학	3-3-0	
	BMS202	Molecular Biology Laboratory	분자생물학 실험	2-0-4	
	BMS221	Biochemistry II	생화학 II	3-3-0	
	BMS301	Cell Biology	세포생물학	3-3-0	
	BMS302	Developmental Biology	발생학	3-3-0	
	BMS332	Anatomy and Physiology	해부및생리학	3-3-0	
	BMS361	Cell Biology & Genetics Laboratory	세포생물학 및 유전학실험	2-0-4	
	BMS434	Current Topics in Biomedical Science	의생명과학특론	3-3-0	
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	ECS314	Electrochemistry	전기화학	3-3-0	
	SDM451	Introduction to MEMS	MEMS개론	3-3-0	

☐ Recommended Course Schedule (BEN)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH103 *BMS211 *BMS261 NCS201 NCS251 MSE202 EE201	&MTH201 *ACE211 **NCS211 BMS201 BMS202 MSE202 EE201	MTH211 BEN231 BEN314 BMS221		
3rd	*BEN311 BEN316 BEN317 BMS301 ECS314	#BEN301 **BEN323 ACE352 BEN319 BMS302 ECS314	*BEN321 ACE322 BEN331 BEN412 BMS332 BMS361	BEN435	
4th	*BEN490 BEN411 BEN413	*BEN490 SDM451	*BEN490 BEN431		

▶ Biomedical Science(BMS)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	BMS211	Biochemistry I	생화학 I	3-3-0	
	BMS261	Biochemistry Laboratory	생화학실험	2-0-4	
	BMS201	Molecular Biology	분자생물학	3-3-0	
	BMS301	Cell Biology	세포생물학	3-3-0	
	BMS332	Anatomy and Physiology	해부및생리학	3-3-0	
	BMS490	Interdisciplinary Project	창의시스템구현	1-0-2	
1TR : R 2TR : E	BMS221	Biochemistry II	생화학 II	3-3-0	
	BMS302	Developmental Biology	발생학	3-3-0	
Elective	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	ACE211	Chemical Reaction Engineering	반응공학	3-3-0	
	BEN231	Microbiology	미생물학	3-3-0	
	BEN301	Computational Methods for Biological and Chemical Engineering	생물화공전산	3-3-0	Substitute Course for Dynamic IT
	BEN314	Instrumental Bioanalysis	생물기기분석	3-3-0	
	BEN316	Protein Engineering	단백질공학	3-3-0	
	BEN317	Metabolic Engineering	대사공학	3-3-0	
	BEN323	Biochemical Engineering	생물화학공학	3-3-0	
	BEN331	Biomedical Imaging	의생명이미징	3-3-0	
	BEN411	Physical Biology of the Cell	세포생물물리학	3-3-0	
	BEN412	Microbial Physiology	미생물생리학	3-3-0	
	BEN431	Materials for Biomedical Applications	의생명공학재료	3-3-0	
	BEN434	Current Topics in Bioengineering	생물공학특론	3-3-0	
	BEN435	Tissue Engineering	조직공학	3-3-0	
	BMS202	Molecular Biology Laboratory	분자생물학 실험	2-0-4	
	BMS333	Genetics	유전학	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	BMS361	Cell Biology & Genetics Laboratory	세포생물학및 유전학실험	2-0-4	
	BMS431	Bioinformatics	생물정보학	3-3-0	
	BMS432	Immunology	면역학	3-3-0	
	BMS434	Current Topics in Biomedical Science	의생명과학특론	3-3-0	

☐ Recommended Course Schedule (BMS)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH103 *BMS211 *BMS261 NCS201	MTH201 *BMS201 BMS202 ACE211	&MTH211 **BMS221 BEN231 BEN314		
3rd	*BMS301 BEN316 BEN317 BMS333	**BMS302 #BEN301 BEN323	*BMS332 BEN331 BMS361 BMS432 BEN412	BEN435	
4th	*BMS490 BEN411	*BMS490 BMS431	*BMS490 BEN431		

3. Course Descriptions

▶ Nanochemical Science

NCS201 Organic Chemistry I [유기화학 I]

This class is an introduction to the classification, structure, reactions, and reaction mechanisms of carbon compounds. The class is set up so that, upon completion, students will understand the different characteristics of carbon compounds, including their classification, structure, nomenclature, reactions, reaction mechanisms, and synthesis. Some examples are halocarbons, alkenes, and alcohols. This course will provide a solid foundation in organic chemistry and the fundamentals essential for the subsequent study of biochemistry, molecular biology, and materials applications of polymers.

NCS211 Analytical Chemistry [분석화학]

The main purpose of the Course is to provide students with a strong theoretical and practical grounding in the principles and practices of analytical chemistry, including classical and instrumental analytical techniques.

NCS231 Organic Chemistry II [유기화학 II]

This course deals with the structure, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds that contain oxygen and nitrogen. This is the second group of lectures in a two-semester organic chemistry course that is being offered to introduce students to the comprehensive, and somewhat rigorous, principles of organic chemistry and to communicate the excitement of scientific discovery. The basic objective of Organic Chemistry II is to continue to lay a solid organic chemistry foundation for further advanced studies in chemistry and other important fields, such as biochemistry, the medical field and applied life sciences, all of which require a thorough understanding of organic chemistry.

NCS251 Physical Chemistry I [물리화학 I]

Theories of classical thermodynamics are covered in this course. First, second, and third laws of thermodynamics are explained along with basics concepts of thermodynamics such as equilibrium, pressure, temperature, heat, internal energy, free energies, work, enthalpy, and entropy.

NCS252 Physical Chemistry II [물리화학 II]

A series of lectures on quantum chemistry is provided in this course. In the introductory part, lectures are about the history of quantum mechanics including blackbody radiation, Planck's hypothesis, and Schrodinger equation. Basic concepts required for understanding quantum chemistry,such as discontinuity of energy states, wavefunction, and uncertainty principle,are

covered in the beginning of the course. Principles and applications of various spectroscopic techniques incorporating electronic spectroscopy, vibrational spectroscopy, rotational spectroscopy, and Raman spectroscopy are described in the following lectures.

NCS253 Physical Chemistry III [물리화학 III]

Statistical thermodynamics and kinetic theory are the two main topics of the course. Derivation of the Boltzmann distribution is introduced in the beginning and followed by lectures on basic concepts of statistical thermodynamics such as ensemble, partition function, and entropy. In the second half the course, basic kinetic theory including reaction rate, collision, diffusion, and activated complex theory (Eyring equation) are covered.

NCS261 Organic/Physical Chemistry Laboratory I

This course is a complementary laboratory course to the Organic Chemistry (I) and Physical Chemistry (I) lectures. It is designed to aid students in developing more advanced laboratory skills and techniques for the practical application of organic/physical chemistry principles. Learning to work safely is a primary concern. In the Organic/Physical Chemistry (I) Laboratory, students are introduced to basic techniques used in organic chemistry laboratories, such as extraction, distillation, and recrystallization and become familiar with several methods for organic analysis. In addition, the student will learn how to prepare informative lab reports. And also, students will learn several experimental techniques with an emphasis on spectroscopy and polymer characterization.

NCS301 Instrumental Analysis [기기분석]

This course introduces the principles of analytical instruments which are needed in the characterization of various materials, and provides students with the opportunity to learn how to operate them in laboratories. This course deals with many integuments for spectroscopic analysis (NMR, FTIR, Raman, UV/VIS), x-ray analysis (XRD, XRF), surface analysis (AFM, XPS, SIMS) , thermal analysis (DSC, TGA), mass spectrometry, and electron microscopy (SEM, TEM).

NCS311 Introduction to Nanoscience and Nanotechnology [나노화학및기술]

This course deals with subjects in modern nanoscience and nanotechnology. As such, it will present the essential principles and applications of the unique characteristics observed in materials of nanometer size.

NCS321 Inorganic Chemistry [무기화학]

The objective of this course is to understand basic principles of modern inorganic chemistry. Topics covered include atomic and molecular structures, molecular shape and symmetry, structure of solids, acid-base, oxidation-reduction, bonding, structure, synthesis and reactivity of transition metal complex, d- and f- block organometallic compounds, and catalysis.

NCS361 Organic/Physical Chemistry Laboratory II [유기/물리화학실험 II]

This course is a complementary laboratory course to the Organic Chemistry (II), Physical Chemistry (II), and Polymer Related lectures. It is designed to aid students in developing more advanced laboratory skills and techniques for the practical application of organic/physical chemistry principles. The students will also learn to report on and discuss their results using standard scientific methodologies. This course offers a variety of experiments designed to introduce the advanced experimental methods needed in organic, physical, and polymer chemistry.

NCS490 Interdisciplinary Project [창의시스템구현]

This course is joined with other tracks for completing a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge acquired at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Advanced Chemical Engineering

ACE211 Chemical Reaction Engineering [반응공학]

This course is designed to provide (1) an understanding of kinetics as it applies to chemical reactions from the microscopic viewpoint and (2) the basis required for designing chemical reactors for controlling chemical reactions.

ACE212 Introduction to Chemical Process [화학공정개론]

This course enhances student understanding of the connection between the chemistry and the chemical process. Students will gain a solid understanding of what chemical processes do (convert raw materials into useful products using energy and other resources), and learn about the ways in which chemical engineers make decisions and balance constraints to come up with new processes and products. Students will learn material and energy balances as tools to achieve a real goal: workable, economical, and safe chemical processes and products.

ACE231 Chemical Engineering Thermodyanamics [화공열역학]

This course offers students the basic understanding of thermodynamics and its practical applications relevant to various chemical processes. Through this course, students will learn the fundamental principles/laws of thermodynamics and how they can be used to describe and analyze systematically a wide variety of thermodynamic properties and phenomena such as phase equilibria.

ACE232 Transport Phenomena I [전달현상 I]

Most of the chemical operations are concerned with the behavior of fluids in process equipment. Underlying every step of the process are the principles of the transport phenomena, which include heat, mass and momentum transfer. The course covers balance equation, diffusion, steady-state, boundary conditions and flux laws.

ACE302 Advanced Chemical Engineering Laboratory [첨단화학공학실험]

The basic unit processes are understood through these experiments. This course covers fixed and fluidized beds, batch and continuous stirred tank reactors, catalytic reactors, ion exchange unit, enzyme reactors and so on.

ACE322 Introduction to Electronics Processing [전자회로공정개론]

The goal of this course is to introduce the fundamental concepts and processes used in device design and fabrication with nano-scales so that students can be more effective problem solvers in the industrial environment. Specifically, we aim to instill an appreciation of the advantages and limitations of modern semiconductor technology, unveil the chemistry behind the processes used in chip fabrication, and introduce the challenges that are currently faced in the industrial setting.

ACE332 Transport Phenomena II [전달현상 II]

This course offers an advanced level of understanding on the transport phenomena (momentum, heat, and mass transfer) from an unified viewpoint. We will learn how to derive rigorously the general balance equations from both microscopic and macroscopic approaches and how to apply such equations to solve a variety of real problems. We will also learn the microscopic interpretation of macroscopic transport properties such as viscosity, diffusion coefficient, heat conductivity, etc.

ACE351 Introduction to Polymer Science and Engineering [박막공학]

This course introduces the students to natural and synthetic polymers and their physical and chemical properties. Students will learn the structure and property of polymers, starting from single chain conformations. One emphasis will be on the universal static and dynamic behavior of polymers in good solvents, semi-dilute solvents, theta solvents, and in melts. In addition, this course will cover the basic chemical synthesis and chemical properties of different polymers.

ACE352 Polymer Materials [고분자재료]

This course is designed to provide an introduction to polymer materials science, including the synthesis, characterization, and applications of macromolecules. The emphasis will be on understanding the relationships between macromolecular architecture (and how it can be controlled and characterized), and the resulting chemical, physical and mechanical properties. Discussion of the recent literature will focus on how these structure-property relationships guide the design and synthesis of new materials and polymer-based reagents and devices. In addition, this course also

intends to deal with the application of polymers towards various fields of science.

ACE431 Introduction to Catalysis [촉매개론]

Catalysts are materials that enhance the kinetics of chemical reactions. This course provides the basis to understanding the interaction between catalysts and molecules; and the effects of the catalyst's surface structure on chemical reactions.

ACE490 Interdisciplinary Project [창의시스템구현]

This course is joined with other tracks for completing a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge acquired at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Bioengineering

BEN231 Microbiology [미생물학]

This course provides the basic concepts and fundamental aspects of microbiology, including genetics, physiology and classification. Topics covered will include the importance of microorganisms to ecosystems, their application to environmental issues, such as in bioremediation, and their various applications within diverse fields/industries.

BEN301 Computational Methods for Biological and Chemical Engineering [생물화공전산]

A series of lectures provide basic principles of relevant numerical methods in the field of bio and chemical sciences. Lectures will be supplemented by hands-on demonstration and exercises with scientific computing tools, such as Matlab, Mathematica and Chemdraw. Introduction to scientific databases including NCBI and SciFinder will also be given.

BEN311 Transport Phenomena in Biological Systems [생체유체역학]

This course introduces the fundamental principles of transport phenomena with the specific examples in medical, biological, and bioengineering applications. This course uniquely integrates biological and engineering concepts to help engineers to establish and critically analyze models of biological transport and reaction processes. It covers topics in fluid mechanics, mass transport and biochemical interactions.

BEN314 Instrumental Bioanalysis [생물기기분석]

This course is designed to give biological science and engineering students a fundamental understanding of bioanalytical tools and instruments. This course will cover the basic principles of qualitative and quantitative analyses of biomolecules, such as nucleic acids, carbohydrates, and proteins, and the fundamentals of instrumental bioanalysis, including electrochemical,

chromatographic, spectroscopic, and spectrometric methods.

BEN316 Protein Engineering [단백질공학]

This course will provide a general understanding of modern protein folding, structures, and protein engineering strategies. Topics include the fundamentals of proteins and protein complexes, analytical methods for protein structures and characterization, and biological and biochemical methods in protein design and manipulation, including biomedical and industrial application of engineered proteins.

BEN317 Metabolic Engineering [대사공학]

This course introduces the basic theories and practical applications used in metabolic engineering, offering a systematic analysis of complex metabolic pathways and ways of employing recombinant DNA techniques to alter cell behavior, metabolic patterns, and product formation.

BEN319 Optics and Imaging [광학이미징]

The objective of this course is to understand optical microscopy and tomography. The course will cover the fundamental optics including an overview of optical components and mechanics, and the principle of optical imaging techniques. Students will have an opportunity to design basic optical imaging system considering imaging parameters such as resolution, depth of focus, and field of view.

BEN321 Nano-Bioengineering [나노바이오공학]

This course discusses basic knowledge for interdisciplinary research in nanoscience, biology, electronic and mechanical engineering. This course, also, provides hand-on experiences on the modeling, microfabrication and characterization of bio-inspired microelectromechanical systems.

BEN323 Biochemical Engineering [생물화학공학]

The purpose of this course is to engineer biological strategies to produce useful products and also to design bio-reactors in which biological organisms or molecules can be used. The course covers the basic application of biology and biochemistry to bio-reaction engineering.

BEN331 Biomedical Imaging [의생명미미징]

An introduction to the principles of biomedical imaging and its applications. A series of lectures provide demonstrations of basic principles of noninvasive imaging methods in biology and medicine, including x-ray, PET, MRI, ultrasound and optical imaging. Lectures by the professor will be supplemented by in-class discussions of problems in research, and hands-on demonstrations of imaging systems.

BEN411 Physical Biology of the Cell [세포생물물리학]

This course will introduce students to skills of quantitative and semi-quantitative analysis applicable to broad number of topics even beyond biomedical topics but for purposes of class using the cell as a major focus. Topics include understanding basic structures and components of cells, designing, evaluating, and analyzing cellular experiments, and applying cell biology to biomedical research and engineering. Prerequisites are Biochemistry and Physical Chemistry or Thermodynamics.

BEN412 Microbial Physiology [미생물생리학]

The purpose of this course is to provide an understanding of the structure and function of microorganisms, the relationship between structure and function in its environment. It will also provide the mechanisms of cell division, composition of microbial cell walls and membranes, aerobic and fermentative metabolism, and regulation of genes and metabolism.

BEN413 Biomedical Instrumentation Laboratory [의료기기실험]

This course will provide the basic concept and hands-on experience of biomedical device. The course will be balanced with lecture and experiment covering the topics such as biological signal measurement, signal processing, and data analysis using LabVIEW programming. Through this course, students will gain the skill how to design, build, and control biomedical device for laboratory research.

BEN431 Materials for Biomedical Applications [의생명공학재료]

This course discusses the critical role of biomaterial in biomedical applications, ranging from the selection of materials, and the processing to the performance testing. The biocompatible issues of metallic, polymeric, ceramic, and composite implants and devices will be discussed. Emphasis will be placed on understanding how biological systems interact with biomaterial in the various aspects of physics, chemistry, biology and materials science.

BEN434 Current Topics in Bioengineering [최신생물공학특론]

This course discusses recent research trends on bioengineering. Especially, the interdisciplinary research examples such as biochips or lab-on-a-chips for analysis of nucleic acids, proteins, and cells in molecular or cell level. Proposal writing and oral presentation are also required.

BEN435 Tissue Engineering [조직공학]

This course is designed for both undergraduate and graduate-level students who have the desire for an introductory understanding of tissue engineering (TE) elements involved in Regenerative Medicine (RM). The course aims to attain the following two major objectives: (1) Primary objective: understand and explore the basic engineering and medical principles behind the TE, (2) Secondary objective: Understand the basic non-engineering/ analytic skills necessary for real-world development of the 'commercializable' biomedical products. Ethics involved in the

RM will be briefly reviewed. Students will gain experiences in real-life research topics and engaged to 'mock-up' research activities as well as business (commercialization) development.

BEN490 Interdisciplinary Project [창의시스템구현]

This course is joined with other tracks for completing a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge acquired at the undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Biomedical Science

BMS201 Molecular Biology [분자생물학]

This course is designed to teach students about DNA with regard to its structure, replication, and roles in transcription and translation, as well as various related control mechanisms. It will also introduce the students to recent recombinant DNA technologies and the principles behind these methodologies.

BMS202 Molecular Biology Laboratory [분자생물학실험]

In this laboratory course, each student will be actively involved and conduct a series of experiments related to molecular biology subjects. The principles of each technique will also be discussed for future applications.

BMS211 Biochemistry I [생화학 I]

This course is designed to teach students the various chemical processes occurring within every living organism. Topics discussed will include amino acids and proteins, molecules of heredity, enzymes, bioenergetics, glycolysis, the citric acid cycle, oxidative phosphorylation and gluconeogenesis, as well as others. This course will also cover macromolecules, their precursors and biosynthesis, and the chemical, physiological, and genetic regulation of biosynthesis.

BMS221 Biochemistry II [생화학 II]

This course is designed to teach students the various metabolic processes occurring within every living organism. Topics discussed will include bioenergetics, the citric acid cycle, oxidative phosphorylation, carbohydrate, lipid, and amino acid metabolisms, and their hormonal regulation.

BMS261 Biochemistry Laboratory

Students will be trained with the latest biological sciences techniques through a series of laboratory courses. Each student will actively conduct, perform, record and report on various experiments during the semester. The principles behind each lab technique will be introduced and students will learn how to collect and interpret experimental results by preparing a laboratory report after each class.

BMS301 Cell Biology [세포생물학]

This course is designed to teach students about the cell at both a microscopic and molecular level. The lectures will focus on numerous related subjects, such as cell composition, cell structure, the cell cycle and its regulation, and cellular interactions with the environments.

BMS302 Developmental Biology [발생학]

Students will learn about the processes by which living organisms develop and grow. The control mechanisms involved in cell differentiation, embryonal development, growth, metamorphosis, and regeneration at both a molecular and genetic level will be taught and discussed.

BMS332 Anatomy and Physiology [해부및생리학]

This course introduces the structure and function of tissues and organs. Their systemic regulation will be discussed.

BMS333 Genetics [유전학]

This course is designed to teach students about all aspects of heredity and genes. The lecture series will include gene expression, variation, and regulatory mechanisms. In addition, recent research and technologies related with genetics will be presented.

BMS361 Cell Biology & Genetics Laboratory [세포생물학 및 유전학실험]

In this laboratory course, each student will be actively involved and conduct a series of experiments related to cell biology and genetics topics. The principles of each technique will also be discussed for future applications.

BMS431 Bioinformatics [생물정보학]

This course provides basic knowledge and skills for genome data analysis. Microarray and sequence data analysis as well as exercises with software tools are included. Elementary Statistics is the prerequisite.

BMS432 Immunology [면역학]

This course is designed to teach students about all aspects of the immune system in both health and disease. A series of lectures on immune cell components, development, and functions, the innate and acquired immune system, pathogenesis, malfunctions of the immune system, such as immunodeficiency and autoimmunity, inflammation and various immunological techniques and their applications will be given.

BMS434 Current Topics in Biomedical Science [의생명과학특론]

This course will provide in-depth coverage of current hot topics in biomedical science.

BMS490 Interdisciplinary Project [창의시스템구현]

This course is joined with other tracks for completing a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge acquired at the undergraduate level. Lastly, students will present their work in public for evaluation.

School of Design and Human Engineering

1. School Introduction

The School of Design and Human Engineering (DHE) focuses on theoretical and practical studies on innovative design creation by investigating all aspects of product and product-service system development including needs finding, strategy establishment, planning, conceptualization, analysis of human capabilities and limitations, system integration, manufacturing and business implementation. DHE emphasizes synthetic thought processes that require interdisciplinary and convergent knowledge from (but not limited to) art, engineering, humanities and science. DHE provides three specialized tracks – Integrated Industrial Design (IID), Affective & Human Factors Engineering (AHE), and Engineering & Systems Design (ESD). A wide range of curricula will help students become global experts making innovation with creativity in diverse areas across design and engineering.

2. Undergraduate Programs

□ Track Introduction

1) Integrated Industrial Design (IID)

IID track is designed to foster creative designers who can lead innovative design of product and product-service system. It provides interdisciplinary courses on design knowledge, methods and techniques across the entire product development process, which are related to analyzing users and markets, searching unmet needs, generating creative idea, developing form and function, prototyping and starting up new business. Through balanced courses of theory and practice, students will learn how to establish design strategy and plan, how to generate creative design concept and how to implement innovative design idea. Students majored in IID track will play roles as integrative design thinkers and practitioners in future society, who lead positive and innovative change of our society by employing user-centered design and scientific methods.

2) Affective & Human Factors Engineering (AHE)

Human factors is the branch of science that applies what is known about human behavior, mental processes, and anatomy and physiology to the design development, and evaluation of work methods, environments, technologies, and systems. In the affective & human factors

engineering track, students will learn the basic knowledge and functions of human physical & cognitive systems, general ergonomics, and HCI (human computer interaction). This track also teaches color science, which is the scientific discipline dealing with measuring, quantifying and controlling colors we perceive.

3) Engineering & Systems Design (ESD)

The objective of the track is to provide a course of study that will enable the student: (i) to complement his/her viewpoint of the design activity from sketching to the logical engineering process of creating something new, or modifying/rearranging something that pre-exists for improvement, and thus (ii) to think not only creatively, but also systematically for the design of products, processes or other systems. The track provides the student with essential engineering design knowledge and tools to begin a productive professional career in industry or academia. Furthermore, the track teaches the student how to plan and manage the entire product development process. This will prepare the student to succeed not merely as an engineering designer but also as a design manager who is capable of driving the new product development projects.

☐ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		1Track	2Track
Integrated Industrial Design (IID)	Required	28	22
	Elective	5	5
Affective & Human Factors Design (AHE)	Required	28	22
	Elective	5	5
Engineering & Systems Design (ESD)	Required	28	22
	Elective	5	5

Classification		DHE Required	DHE Elective	Required only for 1st Track	Track Required	Track Elective	Credit (minimum)
1st track(DHE) / 2nd track(DHE)	1st track (IID, AHE, ESD)		6	6	16	5	33
	2nd track (IID, AHE, ESD)	6			16	5	27
1st track(DHE) / 2nd track (other school)	1st track (IID, AHE, ESD)	6	3	6	16	2	33
	2nd track (other school's tracks)				in conformity with the 2nd track's credit requirement		27
1st track (other school) /	1st track (other school's tracks)			in conformity with the 1st track's credit requirement			33

2nd track(DHE)	2nd track (IID, AHE, ESD)	6	3		16	2	27

☐ Curriculum

▶ DHE Common Courses (* : DHE Required, the rest: DHE Elective)

Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
*DHE201	Design Thinking	디자인적 사고	3-3-0	
*DHE402	Creative Design	창의 디자인	3-3-2	
DHE211	Engineering Economy	경제성 공학	3-3-0	
DHE311	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	
DHE312	UI / UX Design	UI / UX 디자인	3-2-2	
DHE313	Color Science & Design	색채과학과 디자인	3-2-2	
DHE315	High Touch Design	하이터치 디자인	3-2-2	
DHE411	Design Management	디자인 경영	3-3-0	

▶ DHE Required Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course
School of Design and Human Engineering	Integrated Industrial Design	MTH103	Applied Linear Algebra
		MTH211	Statistics
	Affective & Human Factors Design	MTH103	Applied Linear Algebra
		MTH211	Statistics
	Engineering & Systems Design	MTH103	Applied Linear Algebra
		MTH211	Statistics

▶ DHE Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
DHE	Engineering Programming	Design IT 3D CAD & Prototyping Interactive Technology Dynamics of IT : choose 1	Programming Lab.

▶ DHE Common Courses (* : DHE Required, the rest: DHE Elective)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	*DHE201	Design Thinking	디자인적 사고	3-3-0	
	*DHE402	Creative Design	창의 디자인	3-2-2	
Elective	DHE211	Engineering Economy	경제성 공학	3-3-0	
	DHE311	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	
	DHE312	UI / UX Design	UI / UX 디자인	3-2-2	
	DHE313	Color Science & Design	색채과학과 디자인	3-2-2	
	DHE315	High Touch Design	하이터치 디자인	3-2-2	
	DHE411	Design Management	디자인 경영	3-3-0	

▶ Integrated Industrial Design (IID)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	IID201	Design Elements and Principles	디자인 요소와 원리	3-2-2	
	IID202	Product Design Fundamentals	제품디자인기초	3-2-2	IID201
	IID301	Product Design I	제품디자인 I	3-2-2	IID202
	IID302	Product Design II	제품디자인 II	3-2-2	IID301
	IID401	Product System Design	제품시스템 디자인	3-2-2	IID302
	IID490	Interdisciplinary Project	창의시스템구현	1-0-2	
	DHE201	Design Thinking	디자인적 사고	3-3-0	
	DHE402	Creative Design	창의 디자인	3-2-2	IID401
1TR:R 2TR:E	IID211	Design Knowledge and Skill 1	디자인 지식과 기술1	3-2-2	
	IID311	Design Knowledge and Skill 2	디자인 지식과 기술2	3-2-2	
Elective	IID312	Design Knowledge and Skill 3	디자인 지식과 기술3	3-2-2	
	IID313	Design Research Methodology	디자인리서치 방법론	3-3-0	
	IID314	Interactive Technology	인터랙티브 기술	3-2-2	
	IID411	Business Design	비즈니스 디자인	3-3-0	
	IID400	Special Topics in IID (Integrated Industrial Design)	통합산업디자인특론	3-3-0	
	DHE311	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	
	DHE312	UI / UX Design	UI / UX 디자인	3-2-2	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	DHE313	Color Science & Design	색채과학과 디자인	3-2-2	
	DHE315	High Touch Design	하이터치디자인	3-2-2	
	DHE411	Design Management	디자인 경영	3-3-0	

☐ Recommended Course Schedule (IID)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	*IID201 *DHE201	*IID202 **IID211 #ESD201	**IID211 #DHE311 DHE313 DHE315		
3rd	*IID301 **IID311 IID313	*IID302 IID312 #IID314	**IID311 DHE312 DHE411		
4th	*IID401 *IID490 IID411	*DHE402 *IID490	*IID490		

▶ Affective & Human Factors Engineering (AHE)

Courses	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	AHE201	Introduction to Human Factors Eng.	인간공학개론	3-3-0	
	AHE202	Cognitive Ergonomics	인지 및 심리 인간공학	3-3-0	AHE201
	AHE203	Human Physical Capacity	인체 특성 및 한계	3-3-0	AHE201
	AHE301	Experimental Design	실험 계획법	3-3-0	MTH211
	AHE302	Affective Engineering	감성공학	3-3-0	AHE202
	AHE490	Interdisciplinary Project	창의시스템구현	1-0-2	
	DHE201	Design Thinking	디자인적 사고	3-3-0	
	DHE402	Creative Design	창의 디자인	3-2-2	
1TR:R 2TR:E	AHE311	Usability Engineering	사용성공학	3-3-0	AHE201
	AHE411	Safety Engineering	안전공학	3-3-0	AHE201
Elective	AHE312	Work Measurement Methods	작업측정 및 방법	3-3-0	
	AHE313	Color Image Engineering	색채영상공학	3-3-0	AHE201
	AHE412	Brain-Computer Interface	BCI	3-3-0	AHE202
	AHE400	Special Topics in ACE (Affect,Cognition and Ergonomics)	감성, 인지, 인간공학 특론	3-3-0	
	DHE211	Engineering Economy	경제성공학	3-3-0	
	DHE312	UI / UX Design	UI / UX 디자인	3-2-2	
	DHE313	Color Sicence & Design	색체과학과 디자인	3-2-2	
	DHE315	High Touch Design	하이터치 디자인	3-2-2	
	DHE411	Design Management	디자인 경영	3-3-0	

☐ Recommended Course Schedule (AHE)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	*AHE201 *DHE201	*AHE202 *AHE203 #ESD201	DHE211 #DHE311 DHE313 DHE315		
3rd	*AHE301 **AHE411	*AHE302 **AHE311 #IID314	DHE312 DHE411		
4th	*AHE490 AHE312 AHE313	*AHE490 *DHE402 AHE412	*AHE490 **AHE311 **AHE411		

▶ Engineering & Systems Design (ESD)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred-Lect.-Exp.	Prerequisite
Required	DHE201	Design Thinking	디자인적 사고	3-3-0	
	ESD201	Design IT	디자인 IT	3-2-2	
	SDM250	Mechanical Drawing and Lab	기계제도 및 실습	3-2-2	
	ESD301	Engineering Design Methods	공학디자인 기법	3-3-0	MTH103
	AHE301	Experimental Design	실험계획법	3-3-0	MTH211
	ESD401	Engineering Design Projects I	공학디자인실습 I	3-0-6	
	ESD490	Interdisciplinary Project	창의시스템구현	1-0-2	
	DHE402	Creative Design	창의 디자인	3-2-2	ESD401
1TR:R 2TR:E	ESD211	System Control	시스템제어	3-2-2	
	ESD311	Manufacturing System Design & Simulation	생산시스템설계 및 시뮬레이션	3-3-0	
Elective	ESD312	Design for X	공학디자인 특론	3-3-0	
	ESD411	Introduction to Vehicle Design	자동차설계 개론	3-3-0	
	ESE400	Special Topics in ESD(Engineering and Systems Design)	공학 및 시스템디자인 특강	3-3-0	
	DHE311	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	
	DHE315	High Touch Design	하이터치 디자인	3-2-2	
	DHE411	Design Management	디자인 경영	3-3-0	
	AHE201	Introduction to Human factors Engineering	인간공학개론	3-3-0	
	IID313	Design Research Methodology	디자인리서치 방법론	3-3-0	
	IID314	Interactive Technology	인터랙티브 기술	3-2-2	
	EDA201	Basic Circuit Theory	회로이론	3-3-1	

☐ Recommended Course Schedule (ESD)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	*DHE201 AHE201 EE201	#ESD201 **ESD211 *SDM250 EE201	#DHE311 DHE315 **ESD211 *SDM250		
3rd	*ESD301 AHE301 IID313	**ESD311 #IID314	DHE411 ESD312 **ESD311		
4th	*ESD401 *ESD490	ESD411 *ESD490 *DHE402	*ESD490		

3. Course Descriptions

DHE201 Design Thinking [디자인적 사고]

This course is an introductory course in 'Design' and 'Design Thinking' running by team teaching. At least three disciplines taking an important role in 'Product Development Process' join to run this course. Students will learn various Problem-
Solving Methods and roles of each discipline in Product Development Process by lecture and through conducting a small problem-solving project.

DHE402 Creative Design [창의 디자인]

This course is joined with other track for performing a term project through collaboration. Students are required to conceive a novel idea, which will be envisioned by designing, engineering and fabricating a product and proposing business model by using the best knowledge learned at undergraduate level. Lastly, students will present their work in public for evaluation.

DHE211 Engineering Economy [경제성 공학]

This course deals with the evaluation of various types of necessary economic tradeoffs made during the design and operation of engineering systems. Upon completion of this course, you will be able to perform profitability analyses of proposed engineering designs.

DHE311 3D CAD & Prototyping [3D CAD와 프로토타이핑]

This course deals with Virtual Product Design Process with 3D Computer Aided Design methods. Students learn various virtual methods related to product design from transforming sketches on a papers into 3D solid data, elaborated modeling, design engineering and visualization to workable prototyping methods with NC or RP and conduct a small project using virtual product design process.

DHE312 UI / UX Design [UI / UX 디자인]

Fundamentals of user interface / user experience design are addressed including research methods, data analysis, applications, and success stories.

DHE313 Color Science & Design [색채과학과 디자인]

In this course, students will learn color as a science and also as an art. Human visual system, color measurement systems, color order systems and psychophysical experimental methods will be taught to understand color as a science while various color combinations will be studied and applied to design works to understand color as an art. Students will conduct their projects focusing on their own interests, science or art.

DHE315 High Touch Design [하이터치 디자인]

High Touch Design is a process that tries to develop a user friendly, compatible, and aesthetic product based on human factors and psychophysiological knowledge. Variables in High Touch design include combinatorial sets of design variables among (Human x Product x Task x Environment x Culture). A hierarchical analysis of complex variables, matrix analysis of integrated variables, structural analogy in creative design will be covered. Term project will be assigned to create a non-existing product.

DHE411 Design Management [디자인 경영]

This course covers two perspectives of design management; one is design management related to design organization and business and the other is design management realted to product quality in entire product development process. Students will learn how to compose design organization and manage design process effectively in terms of design business in one perspective. In the other perspective, customer-focused quality management, quality controls along the value chain over the whole product lifecycle, and product driven supplier configuration will be discussed.

▶ Integrated Industrial Design

IID201 Design Elements and Principles [디자인 요소와 원리]

This course is a basic course of cultivating form creation and creative presentation techniques. Basic elements and principles of 2D and 3D design are learnt through lectures and practices in which the relationship between visual and functional elements of design will be understood. Also the principle of esthetic harmony will be covered in the course.

IID202 Product Design Fundamentals [제품디자인 기초]

This is an introductory course in product design. It deals with the subject from the observation technique of design problems to the design solving methods through design process. Through design projects designing low-tech products, students learn skills from solving the observed problems to constructing a prototype as a final result.

IID211 Design Knowledge and Skill 1 [디자인 지식과 기술 1]

Photoshop & Poster / Information design & illustrator / Rhinos / Photography

This course is composed of "One month – 4 modules". This course focuses on 2D, 3D computer graphic tools. While learning the techniques and design theory, this course is designed to develop students' ability on 2D & 3D design senses.

IID301 Product Design I [제품 디자인 I]

This course is a practical instruction in product design focusing on product innovation, production process and techniques, characteristics of materials, and things that should be considered regarding product design. It is designed to develop students' capacity to design products according to the mass production system through practicing on creating product concepts and improving current design.

IID302 Product Design II [제품 디자인 II]

This course is designed to practice design focusing on marketing researches related to product design such as product life cycle, classification of markets, and consumer's motivation to purchase. This course cultivates students' ability to satisfy consumers needs through learning how to survey, gathering statistics, cultural anthropological approaching and design based scenario.

IID311 Design Knowledge and skill 2 [디자인 지식과 기술 2]

Prototyping / Design Engineering / Design Material / Production Method

This course is composed of "One month – 4 modules". Student will learn engineering and manufacturing knowledge for designers. This course will deal with the engineering design issues, effective prototyping using various machines, materials for designers including production skills for product design.

IID312 Design knowledge and skill 3 [디자인 지식과 기술 3]

Portfolio / Design communication / Professional Practice / Design Venture

This course is composed of "1 month – 4 modules". The course addresses the fundamental characteristics of design theory and communication. Emphasis is also given to practical CV, portfolio design proposals through the use of various mediums. This course also aims at understanding the fundamentals of design practice in the real world, such as, how to manage a design consulting firm, corporate design groups, and how to write design contracts.

IID313 Design Research Methodology [디자인 리서치 방법론]

This course is designed to study how to effectively solve the general problems happening in the process of research, analysis, integration, and evaluation of design. Students gain ability to understand design problems and solutions, generate creative ideas, and know how to collect and use data and make a decision regarding design.

IID314 Interactive technology [인터랙티브 기술]

This studio course will focus on techniques and technologies for designing interactions. Students will learn interactivity from both a technical and an experiential perspective, and consider its application in a variety of context. In this course students will develop a variety of skills for designing, prototyping and evaluating interactions and develop a facility for commenting and critiquing interaction design.

IID401 Product System Design [제품 시스템 디자인]

The objective of this course is to investigate the integrated concept of design products and its system. Emphasis is given to applying innovative and systematic approaches to complex design problems. As a total design, it will focus on not only hardware but also software to create a holistic design solution for product system. The course will emphasize the team work and collaborative learning to solve theoretical and practical design issues.

IID490, AHE490, ESD490 Interdisciplinary [Project 창의시스템구현]

This course is in collaboration with other tracks and requires the student to perform a term project. Students are required to conceive a novel idea which will be envisioned by designing and fabricating a product using the knowledge gained during their studies. Lastly, students will present their work in public for evaluation.

IID411 Business Design [비즈니스 디자인]

This course is structured to connect design to business. It deals with diverse types of businesses that can be initiated by result of designing; business by innovative product design, community business, service business, etc. Students will go through holistic design process emphasizing on creating business. They will learn how a design idea can be transformed into a business model.

▶ Affective & Human Factors Design

AHE201 Introduction to Human Factors Eng. [인간공학개론]

This course surveys human factors engineering emphasizing the systems approach to workplace and machine design. Discussion of basic human factors research and design methods, visual processes and design methods, selection of statistical techniques for application to human factors data, visual and auditory processes, display and control design, and effects of environmental stressors on humans.

AHE202 Cognitive Ergonomics [인지 및 심리 인간공학]

This course studies on how products and systems can be improved by understanding human cognitive characteristics and applying fundamental theories of psychology to design and engineering problems.

AHE203 Human Physical Capacity [인체 특성 및 한계]

This course is designed to provide students with introduction to several physical ergonomics areas in which they will gain working knowledge including physiology of human musculoskeletal system, work capacity, occupational biomechanics and digital human movement modeling. In this course, students will learn about the structure and function of human body (bone, muscle), physiologic capacity of human body, biomechanical modeling and their application to product and environment design.

AHE301 Experimental Design [실험 계획법]

Procedures for conducting and analyzing human factors and ergonomics experiments, including fundamentals of research, design alternatives, fitting and testing statistical models, and data interpretation and presentation. Primary focus is on linear regression (simple and multiple) and analysis of variance (single and multiple factor).

AHE302 Affective Engineering [감성공학]

Translation of human affections into design features is the objective of Affective Engineering. This course is about techniques and relevant theories of Affective Engineering. Exemplar products and studies will be introduced to show that Affective Engineering plays a role in designing more attractive products.

AHE311 Usability Engineering [사용성 공학]

This course deals with definition of usability and its quantification metrics in order to make user-centered systems.

AHE312 Work Measurement & Methods [작업 측정 및 방법]

The methods for assessing and improving performance of individuals and groups in organizations is surveyed. Techniques include various basic industrial engineering tools, work analysis, data acquisition and application, performance evaluation and appraisal, and work measurement procedures.

AHE313 Color Image Engineering [색채 영상 공학]

Color reproduction characteristics and color matching methods are studied for the various imaging devices.

AHE411 Safety Engineering [안전공학]

This course provides students with a general understanding of occupational and systems

safety. Students will learn how to apply system safety methodologies to workplace design evaluation, accident analysis and consumer product design, as well as gain an understanding of human error analysis, accident potential recognition, occupational safety and health legislation, and safety considerations in consumer product design.

AHE412 Brain-Computer Interface [BCI]

Fundamentals, and application areas of brain-computer interface (BCI) are addressed together with human factors issues to solve for designing better BCI systems.

▶ Engineering & System Design

ESD201 Design IT [디자인 IT]

This course studies essential and practical software tools and methods for engineering design. Students will improve their understanding of IT applications in engineering design. Practical laboratories and projects will complement the course.

ESD211 System Control [시스템제어]

This course aims to introduce students to the fundamental principles of mechatronic systems and control. Students will study dynamics of mechanical, electrical and hybrid systems. The topics include: sensors and actuators, intelligent control systems, control theory and programming of industrial control systems including programmable logic controllers (PLC).

ESD301 Engineering Design Methods [공학디자인기법]

This course examines the essential engineering design methods for each step of the design process. Quality Function Deployment (QFD), functional flow analysis and morphological analysis will be studied for the product specification and the generation phase of design alternatives, whilst various optimisation techniques, interval arithmetic, constraint satisfaction & propagation algorithms and Multiple Criteria Decision Analysis (MCDA) will be discussed for the selection phase of design alternatives. Theoretical exercises with case studies will complement the course.

ESD311 Manufacturing System Design & Simulation [생산시스템설계 및 시뮬레이션]

This course studies manufacturing system configuration, process flow design, and their evaluation. The student will learn the basic concepts and methods of simulation techniques to design and evaluate manufacturing systems, in which all workcells including robots, material handling systems and other auxiliary equipments are functioning to maximum efficiency and productivity.

ESD312 Design for X [공학디자인특론]

This course introduces the student to some basic concepts and methods in Design for X (DFX). The student will understand Today's important design issues, and learn Multiple criteria Design Optimization (MDO) methods to make trade-offs between conflicting and non-commensurable criteria and optimize the design of a product from different points of view (assembly, manufacture, environment, changeability, modularity and other factors). The course also provides a brief introduction to sustainable design (green design), Life Cycle Assessment (LCA), Inclusive design and Integrated Product Service System (IPSS). Theoretical exercises and projects will complement the course.

ESD401 Engineering Design Projects I [공학디자인실습 I]

Students will work in design teams and undertake product design projects involving the product specification, conceptual design, detailed design and prototype-making/testing. The essential design knowledge and tools obtained throughout the Design & Human Engineering programme will be effectively applied to product design projects. The progress of each design project will be reviewed based on formal presentations at mid-semester and completed project outcomes will be demonstrated at the end of the semester.

ESD411 Introduction to Vehicle Design [자동차설계 개론]

The student studies some selected topics in vehicle design such as styling and aerodynamics in vehicle body design, modern materials for vehicle, new manufacturing challenge and crashworthiness. Future trends and some advanced topics in vehicle design including vehicle telemetry/diagnostics embedded systems are introduced.

School of Urban and Environmental Engineering

1. School Introduction

Environmental pollution and climate change caused by industrialization are directly related to the survival of human beings. Therefore, studies on these issues are gaining in importance. Urban and environmental engineering is an interdisciplinary research field focusing on environmental protection, sustainable development and improvement of human welfare.

In this division, students will gain basic knowledge related to urban and environmental issues and study more advanced courses represented by three tracks: (1) Environmental analysis and pollution control engineering (environmental analysis, water and air treatment, soil remediation); (2) Earth science and engineering (climate change, global environment, environmental modelling); (3) Urban development engineering (urban planning, structural mechanics and design, health monitoring, construction materials); and (4) Disaster and Risk Management Engineering.

The School of Urban and Environmental Engineering is committed to developing innovative technologies in the fields of urban and environmental engineering and educating leaders who will have a large impact on our profession and society.

2. Undergraduate Programs

□ Track Introduction

1) Environmental Analysis & Pollution Control Engineering (PCE)

The mission of this track is to provide the students with the highest quality technical and professional education in the analysis and treatment of environmental pollutants. This track emphasizes the basic principles of various state-of-the-art instruments, instrumental analysis, physicochemical and biological removal of pollutants, environmental remediation, waste treatment and recycling.

2) Earth Science and Engineering (ESE)

This track focuses on local environmental problems as well as global environmental issues, including climate change. Global environments, climate modelling, environmental fate models, remote sensing, air/soil/water pollution monitoring and hydrology will all be studied. On the basis of these courses, the environmental fate of various pollutants and scales will be comprehensively investigated and pollution reduction plans will be established.

3) Urban Development Engineering (UDE)

The aim of this tract (major) is to provide the students with an essential knowledge and capability as an expert in planning, design and management of urban communities. The program includes four major essential areas in urban engineering; urban planning, structural design, mechanics and construction materials. UDE intends to contribute to creating sustainable and resilient cities for our future generation, through innovative research on essential technology to develop the eco-favorable built environment to human society and to prevent serious disaster problems.

4) Disaster & Risk Management Engineering (DRE)

A disaster causes a grave disruption of the functioning of cities and it sometimes exceeds the ability of the cities to recover using only the own resources of the cities. The sustainability of cities are seriously hindered by such disasters. The Disaster & Risk Management Engineering track provides an interdisciplinary undergraduate education, integrating the diverse expertise of urban/civil engineering, environmental engineering and earth/climate engineering to mitigate the impact of unexpected disasters. The track focuses on (1) predicting serious natural hazards; (2) mitigating man-induced hazards and risks; (3) environmental protection, (4) post-disaster rehabilitation of infrastructures.

☐ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		1Track	2Track
Environmental Analysis and Pollution Control Engineering (PCE)	Required	10	10
	Elective	23	17
Earth Science and Engineering (ESE)	Required	10	10
	Elective	23	17
Urban Development Engineering (UDE)	Required	10	10
	Elective	23	17
Disaster & Risk Management Engineering (DRE)	Required	10	10
	Elective	23	17

☐ Fundamental Courses for Each Track

▶ Required Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course
School of Urban and Environmental Engineering	Environmental Analysis and Pollution Control Engineering (PCE)	MTH201	Differential Equations
		MTH103 or MTH211	**Choose One Between:** Applied Linear Algebra, Statistics
	Earth Science and Engineering (ESE)	MTH201	Differential Equations
		MTH103 or MTH211	**Choose One Between:** Applied Linear Algebra, Statistics
	Urban Development Engineering (UDE)	MTH201	Differential Equations
		MTH103 or MTH211	**Choose One Between:** Applied Linear Algebra, Statistics
	Disaster & Risk Management Engineering (DRE)	MTH201	Differential Equations
		MTH103 or MTH211	**Choose One Between:** Applied Linear Algebra, Statistics

※ Complete based on 1TR

※ Engineering field students who entered in 2009 should take 'Calculus (or I), Applied Linear Algebra, Differential Equations, Statistics' 12 credits.

▶ Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
UEE	Engineering Programming	Dynamics of IT or IT courses designated by other schools	Programming Lab.

☐ Curriculum

▶ Environmental Analysis and Pollution Control Engineering (PCE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	PCE201	Introduction to Environmental Engineering	환경공학개론	3-3-0	
	ESE201	Environmental Chemistry	환경화학	3-3-0	
	ESE301	Environmental Impact Assessment	환경영향평가	3-3-0	
	PCE490	Interdisciplinary Project	창의시스템구현	1-0-2	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Elective	PCE202	Air Pollution	대기오염	3-3-0	
	PCE203	Water Pollution	수질오염	3-3-0	
	BEN231	Microbiology	미생물학	3-3-0	
	NCS251	Physical Chemistry I	물리화학 I	3-3-0	
	NCS252	Physical Chemistry II	물리화학 II	3-3-0	
	ACE211	Chemical Reaction Engineering	반응공학	3-3-0	
	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	NCS231	Organic Chemistry II	유기화학 II	3-3-0	
	TFP220	Fluid Mechanics	유체역학	3-3-0	
	PCE301	Water Treatment Engineering	수처리공학	3-3-0	
	PCE302	Soil Pollution	토양오염	3-3-0	
	PCE303	Aquatic Chemistry Laboratory	수질화학실험	3-2-2	
	ESE302	Analysis of Pollutant	오염물질분석/실험	3-2-2	
	ACE232	Transport Phenomena	전달현상 I	3-3-0	
	TFP320	Applied Fluid Mechanics	응용유체역학	3-3-0	TFP220
	NCS301	Instrumental Analysis	기기분석	3-3-0	
	ACE332	Transport Phenomena II	전달현상 II	3-3-0	
	PCE401	Water and Wastewater Engineering	상하수도공학	3-3-0	
	PCE402	Environmental Remediation	환경복원	3-3-0	
	PCE403	Wastes Management	폐기물처리/재활용	3-3-0	
	PCE404	Environmental Bioprocess	환경생물공정	3-3-0	
	PCE405	Environmental Toxicology	환경독성학	3-3-0	
	PCE406	Special Topics in Pollution Control Engineering	첨단환경기술특론	3-3-0	
	PCE407	Hydraulics	수리학	3-3-0	

☐ Recommended Course Schedule (PCE)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course, &: Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH201 *PCE201 NCS251 NCS201	*ESE201 TFP220 NCS252 ACE211 NCS231	&MTH103 PCE202 PCE203 BEN231 ACE232		
3rd	*ESE301 PCE303	ESE302 PCE302 NCS301	PCE301 TFP320 ACE332		
4th	PCE401 PCE402 *PCE490	PCE403 PCE404 *PCE490	PCE405 PCE406 PCE407 *PCE490		

▶ Earth Science and Engineering (ESE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	ESE202	Global Environment	지구환경	3-3-0	
	PCE201	Introduction to Environmental Engineering	환경공학개론	3-3-0	
	ESE301	Environmental Impact Assessment	환경영향평가	3-3-0	
	ESE490	Interdisciplinary Project	창의시스템구현	1-0-2	
Elective	ESE201	Environmental Chemistry	환경화학	3-3-0	
	ESE203	Atmosphere and Ocean Sciences	대기해양과학	3-3-0	
	ESE204	Environmental Geology	환경지질학	3-3-0	
	ESE205	Atmospheric Chemistry	대기화학	3-3-0	
	PCE202	Air Pollution	대기오염	3-3-0	
	PCE203	Water Pollution	수질오염	3-3-0	
	BMS211	Biochemistry I	생화학 I	3-3-0	
	NCS201	Organic Chemistry I	유기화학 I	3-3-0	
	ESE302	Analysis of Pollutant	오염물질분석/실험	3-2-2	
	ESE303	Environmental Ecology	환경생태학	3-3-0	
	ESE304	Hydrology	수문학	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	ESE305	Environmental Remote Sensing I	원격환경탐사 I	3-3-0	
	ESE306	Atmospheric Dynamics	대기역학	3-3-0	
	PCE302	Soil Pollution	토양오염	3-3-0	
	PCE303	Aquatic Chemistry Laboratory	수질화학실험	3-2-2	
	UDE302	Geographic Information System	지리정보시스템	3-3-0	
	ESE404	Climate Dynamics	기후역학	3-3-0	
	ESE405	Earth Environment Numerical Analysis	지구환경전산실습	3-2-2	
	ESE406	Biogeochemistry	생지화학	3-3-0	
	ESE407	Special Topics in Earth Science Engineering I	지구환경특론 I	3-3-0	
	ESE408	Special Topics in Earth Science Engineering II	지구환경특론 II	3-3-0	
	ESE409	Environmental Remote Sensing II	원격환경탐사 II	3-3-0	
	ESE410	Climate Change Engineering	기후변화공학	3-3-0	
	PCE402	Environmental Remediation	환경복원	3-3-0	

☐ Recommended Course Schedule (ESE)

* : Required Course, &: Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH201 *ESE202 *PCE201 BMS211 NCS201	ESE201 ESE205	&MTH103 ESE203 ESE204 PCE202 PCE203		
3rd	*ESE301 ESE305 ESE304	ESE302 ESE306 PCE302	ESE303 PCE303 UDE302		
4th	*ESE490 ESE405 ESE406 ESE407 PCE402	ESE408 *ESE490	ESE404 ESE409 ESE410 *ESE490		

▶ Urban Development Engineering (UDE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	UDE201	Introduction to Civil Engineering	건설공학개론	3-3-0	
	UDE203	Introduction to Urban Planning	도시계획개론	3-3-0	
	UDE204	Mechanics of Materials	재료역학	3-3-0	UDE201
	UDE490	Interdisciplinary Project	창의시스템구현	1-0-2	
Elective	UDE202	Sustainable Design	환경설계론	3-1-4	
	UDE205	Construction Materials	건설재료공학	3-3-0	
	UDE206	Structural Engineering Lab	구조공학실험	3-1-4	UDE204
	UDE207	Urban and Regional Development	도시 및 지역개발	3-3-0	
	GMT211	Microeconomics	미시경제학	3-3-0	GMT106
	TFP220	Fluid Mechanics	유체역학	3-3-0	
	UDE301	Urban Transportation Planning	교통계획	3-3-0	
	UDE302	Geographic Information System	지리정보시스템	3-3-0	
	UDE303	Structural Analysis I	구조역학 I	3-3-0	UDE204
	UDE304	Structural Analysis II	구조역학 II	3-3-0	UDE303
	UDE305	Soil Mechanics	토질역학	3-3-0	
	UDE306	Concrete Structures	콘크리트구조공학	3-3-0	UDE204
	UDE307	Properties of Concrete	콘크리트재료공학	3-2-2	
	ESE304	Hydrology	수문학	3-3-0	
	TFP301	Numerical Analysis	수치해석	3-3-0	
	GMT322	Econometrics	계량경제학	3-3-0	
	UDE401	Steel Structures	강구조공학	3-3-0	
	UDE402	Design of Structural Systems	구조시스템설계	3-3-0	
	UDE403	Foundation Engineering	기초공학	3-3-0	
	UDE404	Urban Infrastructure Engineering	도시시설공학	3-3-0	
	UDE405	Urban Design	도시설계	3-3-0	
	UDE406	Development Finance	도시개발재무	3-3-0	
	PCE401	Water and Wastewater Engineering	상하수도공학	3-3-0	
	PCE407	Hydraulics	수리학	3-3-0	
	DRE405	Introduction to Structural Dynamics	구조동역학개론	3-3-0	
	UDE410	Special Topics in Urban Development Engineering	미래도시개발특론	3-3-0	

☐ Recommended Course Schedule (UDE)

* : Required Course, & : Required Math

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	&MTH201 *UDE201 UDE202 *UDE203	*UDE204 UDE205 TFP220 GMT211	&MTH103 UDE206 UDE207		
3rd	UDE303 UDE306 TFP301	UDE301 UDE304 ESE304 DRE405	UDE302 UDE307 UDE305		
4th	PCE401 UDE401 UDE405 *UDE490	UDE403 UDE406 DRE405 *UDE490	UDE402 UDE404 PCE407 UDE410 *UDE490		

※ GMT322 is available for registering when School of Technology Management opens courses.

▶ Disaster & Risk Management Engineering (DRE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	DRE303	Disaster Management	재난관리	3-3-0	
	DRE304	Probability Concepts in Engineering and Laboratory	공학확률 및 실습	3-2-2	
	DRE402	Disaster Risk Assessment	위험성평가	3-3-0	
	DRE490	Interdisciplinary Project	창의시스템구현	1-0-2	
Elective	PCE201	Introduction to Environmental Engineering	환경공학개론	3-3-0	
	PCE202	Air Pollution	대기오염	3-3-0	
	PCE203	Water Pollution	수질오염	3-3-0	
	UDE201	Introduction to Civil Engineering	건설공학개론	3-3-0	
	UDE203	Introduction to Urban Planning	도시계획개론	3-3-0	
	UDE204	Mechanics of Materials	재료역학	3-3-0	UDE201
	UDE205	Construction Materials	건설재료공학	3-3-0	
	DRE301	Flood and Drought, Dams and Aqueducts	재난대응수자원관리	3-3-0	
	DRE302	Anthropogenic Disasters	인적재해	3-3-0	
	DRE305	Introduction to Natural Hazards	자연재해개론	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	PCE302	Soil Pollution	토양오염	3-3-0	
	ESE301	Environmental Impact Assessment	환경영향평가	3-3-0	
	ESE304	Hydrology	수문학	3-3-0	
	UDE302	Geographic Information System	지리정보시스템	3-3-0	
	UDE303	Structural Analysis I	구조역학 I	3-3-0	UDE204
	UDE304	Structural Analysis II	구조역학 II	3-3-0	UDE303
	DRE401	Human and Nature	자연과 인간	1-1-0	
	DRE403	Introduction to Extreme Wind Resistant Engineering	내풍공학개론	3-3-0	
	DRE404	Introduction to Earthquake Resistant Engineering	내진공학개론	3-3-0	
	DRE405	Introduction to Structural Dynamics	구조동역학개론	3-3-0	
	DRE406	Introduction to Soil Dynamics	지반동역학개론	3-3-0	
	DRE407	Structural Reliability	구조신뢰성	3-3-0	
	DRE408	Advanced Course for Natural Disaster Engineering	고급자연재해공학	3-3-0	
	DRE409	Special Topics in Disaster Prevention Engineering	방재공학특론	3-3-0	
	PCE402	Environmental Remediation	환경복원	3-3-0	

☐ Recommended Course Schedule (DRE)

* : Required Course, & : Required Math, # : Strongly Recommended

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	*MTH201 UDE201 UDE203 PCE201	#UDE204 #UDE205	PCE202 PCE203 *MTH103		
3rd	UDE303 *DRE304 #ESE301	*DRE303 PCE302 #ESE304 UDE304	#DRE302 #DRE305 #DRE301 #UDE302		
4th	PCE402 #DRE403 #DRE404 *DRE402 *DRE490	DRE405 DRE406 #DRE407 *DRE490	DRE401 DRE408 DRE409 *DRE490		

- The classes with '*' are required to take for graduation.

- The classes with '#' are strongly recommended to take, but not required courses for graduation.

3. Course Descriptions

▶ Environmental Analysis and Pollution Control Engineering

PCE201 Introduction to Environmental Engineering (환경공학개론)

For students majoring in "Environmental Engineering", this course deals with basic concepts of environmental research fields, such as air, water, soil, waste and microbiology.

PCE202 Air Pollution (대기오염)

The physico-chemical characteristic of air pollutants, long-range transport, hazardous effects and emission reduction will be studied.

PCE203 Water Pollution (수질오염)

The reasons for water pollution and the characteristics of water pollutants will be studied. On the basis of this knowledge, the analytical methods for various water pollutants and removal mechanisms will be discussed.

PCE301 Water Treatment Engineering (수처리공학)

This course will provide comprehensive coverage of water treatment facility design emphasizing coagulation, flocculation, sedimentation, filtration, disinfection, redox reactions and adsorption.

PCE302 Soil Pollution (토양오염)

This course covers the wide range of soil pollution studies, including reasons for soil pollution, environmental impact of soil pollution and the remediation and treatment of polluted soils.

PCE303 Aquatic Chemistry Laboratory (수질화학실험)

This course covers basic principles and laboratory techniques for the analysis of fresh water, contaminated waters and waste waters, with an emphasis on instrumental techniques.

PCE401 Water and Wastewater Engineering (상하수도공학)

This course covers fundamental hydraulics related with pipe flows and the design of water and wastewater systems by estimating demand capacity and the optimal operations of the systems.

PCE402 Environmental Remediation (환경복원)

The purpose of this course is to learn various physical, chemical and biological remediation methods for contaminated surface and underground environmental compartments (soil, sediment

and ground water etc.). Through this course, students will learn how to determine which remediation method is most appropriate for a given contamination/case.

PCE403 Wastes Management (폐기물처리/재활용)

This course covers (1) waste generation, collection and transportation, (2) waste treatment and (3) waste recycling and recovery technologies.

PCE404 Environmental Bioprocess (환경생물공정)

This course examines biological wastewater processes used to remove organic materials and nutrients from various wastewater. Sorption of pollutants using microorganisms and plants, aerobic and anaerobic degradation of organic contaminants, sludge treatment and the production of biofuels will be studied.

ESE405 Environmental Toxicology (환경독성학)

Environmental toxicology deals with metabolism of hazardous chemicals and exposure assessment for human and other living organisms. During this course, the toxicity of various pollutants (persistent organic pollutants, heavy metals, pesticides and pharmaceuticals), risk assessment, such as through the use of biosensors, and regulation policies will be covered.

PCE406 Special Topics in Poiiution Control Engineering (첨단환경기술특론)

This course introduces new research topics in pollution control engineering.

PCE490 Interdisciplinary Project (창의시스템구현)

This course is in collaboration with other tracks and requires the student to perform a term project. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product using the knowledge gained during their studies. Lastly, students will present their work in public for evaluation.

▶ Earth Science and Engineering

ESE201 Environmental Chemistry [환경화학]

The goal of this course is to study basic knowledge of chemistry to identify natural phenomena in air, water and soil systems and to develop students' ability to apply this knowledge for the remediation of the environment contaminated by toxic chemical compounds.

ESE202 Global Environment [지구환경]

The aim of this course is to comprehensively understand various environmental problems, such as geophysical and chemical phenomena, on the basis of environmental sciences. Human influences such as urbanization, industrialization and the increased use of fossil energy will be

studied as major causes of environmental pollution, stratospheric ozone depletion and the desertification process.

ESE203 Atmosphere and Ocean [대기해양과학]

This course is an introduction to the dynamics and phenomenology of Earth''s atmosphere and ocean circulations. Special emphasis is placed in understanding how energy and momentum transports are effected in the atmosphere and oceans, and how they influence Earth''s climate.

ESE204 Environmental Geology [환경지질학]

This course offers an introduction to geological processes and materials, and how they affect people and the environment. Specific topics include earthquakes, volcanism, mass wasting, floods, coastal hazards, and climatic change. Optional topics may include such items as energy and water resources, subsidence, and waste disposal.

ESE205 Atmospheric Chemistry [대기화학]

The aim of this course is to understand the chemical composition and fate of gases and particulate matters in the atmosphere. This course focuses on various environmental issues such as acid rain, photochemical reactions, ozone depletion, and air pollutants associated with climate change.

ESE301 Environmental Impact Assessment [환경영양평가]

An environmental impact assessment (EIA) is a tool to evaluate the impact of urban development on the surrounding environment. EIA can be directly used for decision making, suggesting a modified development plan, or its eventual cancellation. In this course, practical methods for EIA will be studied.

ESE302 Analysis of Pollutant [오염물질분석/실험]

In this course, the principle of instrumental analysis for various pollutants from different environmental media will be studied. Furthermore, experimental skills for the analysis of pollutants will be obtained.

ESE303 Environmental Ecology [환경생태학]

This course deals with basic ecological principles (properties of populations and communities) and study interaction between environmental change (stress or pollution) and the distribution and diversity of organisms in different habitats.

ESE304 Hydrology [수문학]

This course covers the movement and distribution of water and principles of hydrologic cycle, with a particular emphasis in the areas of water management.

ESE305 Environmental Remote Sensing I [원격환경탐사 I]

This course deals with the basic principle of remote sensing and its applications for environmental science and engineering. Among remote sensing methods, satellite remote sensing will be focused.

ESE306 Atmospheric Dynamics [대기역학]

Atmospheric dynamics is the study of atmospheric motions associated with weather and climate. For all such motions, the atmosphere can be regarded as a continuous fluid medium, and the fundamental laws of fluid mechanics and thermodynamics, which govern the motions of the atmosphere, are expressed in terms of partial differential equations involving the filed variables such as momentum, temperature, pressure, and humidity as dependent variables and space and time as independent variables. Solving these partial differential equations with systematic simplifications, this course provides the physical insights for understanding the role of atmospheric motions in determining the observed weather and climate.

ESE404 Climate Dynamics [기후역학]

This is an introductory course on the scientific background and mechanisms for the climate change and global warming. Course topics include the global energy balance of the Earth's climate system, atmospheric and oceanic energy transports and the impacts of greenhouse gases on the climate system. Limitations and uncertainty about future climate predictions will be also discussed in the class for an unbiased view to this debating phenomenon.

ESE405 Earth Environment Numerical Analysis [지구환경전산실습]

The goals of this course are to provide a working knowledge of the basic methods of objective analysis of meteorological, oceanographic, and related data. The topics concentrate on techniques for extracting information from data directly, such as compositing, time series analysis, singular value decomposition, principal component analysis, and filtering. Both theories and application skills via a computer program such as Matlab, Fortran, Grads will be covered.

ESE406 Biogeochemistry [생지화학]

Biogeochemistry is the scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment. This course focuses on stable isotope biogeochemistry with emphasis on carbon, oxygen, and nitrogen. Theoretical principles, isotope fractionation, and variation of isotopes in nature with emphasis on the ocean, atmosphere, and biosphere will be presented and discussed. Stable isotope techniques, applications of stable isotopes in research, and introduction to mass spectrometry will form the applied component of the course.

ESE407 Special Topics in Erarth Science Engineering I [지구환경특론I]

This course introduces new research topics in earth science and engineering.

ESE408 Special Topics in Erarth Science Engineering II [지구환경특론II]

This course introduces new research topics in earth science and engineering.

ESE409 Environmental Remote Sensing II [원격환경탐사 II]

This course is to provide the theory, science, and applied technology of satellite remote sensing of Earth resources and environment. Among many areas of remote sensing, this course specifically focuses on the terrestrial and oceanic environments, including information of natural and built surfaces, forest and biosphere, hydrology, and water resources.

ESE410 Climate Change Engineering [기후변화공학]

In response to the global climate change, this course covers the area of modern technologies developed and being developed for adapting and mitigating to climate change. Energy-efficient and low-carbon emission technologies will be introduced, as well as the recent technologies for the carbon capture and sequestration.

ESE490 Interdisciplinary Project [창의시스템구현]

This course is in collaboration with other tracks and requires the student to perform a term project. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product using the knowledge gained during their studies. Lastly, students will present their work in public for evaluation.

▶ Urban Development Engineering

UDE201 Introduction to Civil Engineering (건설공학개론)

This core course introduces the oldest interdisciplinary engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment. The topics covered here include structural engineering and materials, geotechnical engineering, hydraulics and hydrology. In addition, engineering mechanics emphasized on statics will be discussed.

UDE202 Sustainable Design (환경설계론)

This courses covers the disciplines of designing natural and human environments, focusing on fashioning physical and social interventions informed by human behavior and environmental processes.

UDE203 Introduction to Urban Planning (도시계획개론)

This course is an introduction to the methods and history of urban planning. Students will learn the methods used in various sub-fields of planning and will develop an ability to critically

evaluate different techniques and approaches used within these disciplines.

UDE204 Mechanics of Materials (재료역학)

This course introduces a branch of engineering mechanics that focuses on the internal effects of stress and strain in a solid body subjected to external loads. It covers critical fundamentals for the strengths of materials and the deformations of solid bodies, which include stress and strain; mechanical properties of materials; various external actions such as axial load, torsion, bending, and shear; stress and strain transformations; and stability problems for axially loaded members.

UDE205 Construction Materials (건설재료공학)

The selection of proper construction materials is essential to build sustainable and resilient infrastructures. This course is designed to provide integrated knowledge of construction materials properties with emphasis on two major construction materials (i.e., steel and concrete) covering from elastic, plastic and fracture properties to porosity and thermal and environmental responses.

UDE206 Structural Engineering Lab (구조공학실험)

This course is intended for students to conducts a series of hands on experiments to better understand fundamental concepts in structural mechanics. The experiments include warping phenomenon, prestressed concrete, failure of truss structure, bridge building competition, etc.

UDE207 Urban and Regional Development (도시 및 지역개발)

Fundamental concepts and theories applied to local economic development including growth, trade, product-cycle, flexible specialization, and entrepreneurship theories.

UDE301 Urban Transportation Planning (교통계획)

Fundamental characteristics of the urban transportation system as a component of urban structure. Methodologies for the analysis of transportation problems, planning urban transportation, and the transportation planning process.

UDE302 Geographic Information System (지리정보시스템)

Provide fundamental theoretical knowledge relevant to development and use of geographic information systems, including data models, spatial representation, and cartographic principles Expose students to a wide-spread GIS software and provide hands-on practice in database development, data retrieval, and analysis.

UDE303 Structural Analysis I (구조역학 I)

This course is intended to provide students with theory and application of modern structural analysis as it applies trusses, beam, and frames. This class places particular emphasis on

developing students' intuition to understand how structures react with applied loadings and the abilities how to model and analyze civil and architectural structures

UDE304 Structural Analysis II (구조역학 II)

This course is intended to provides students with fundamental concepts in the methods of matrix structural analysis used in current practice. This course covers formation of global analysis equations, stiffness analysis, virtual work principles, and introduction to nonlinear analysis.

UDE305 Soil Mechanics (토질역학)

This course is intended to provide a general introduction to soils and geotechnical engineering. Students will learn the physical properties of soils and the behavior soil under various different types of forces. This course primarily covers classification of soil, compaction, permeability and seepage, effective stress, compressibility, and shear strength of soil.

UDE306 Concrete Structures (콘크리트구조공학)

This course discusses the material properties, strength, behavior, and design of reinforced and prestressed concrete members subjected to moment, shear, axial, and torsional forces, and also introduces domestic and international design code provisions applying to concrete structures.

UDE307 Properties of Concrete (콘크리트재료공학)

Concrete is one of the most important building materials. In lectures and labs, we will learn concrete mixture proportioning and its mechanical behavior including strength, cracking, creep and shrinkage.

UDE401 Steel Structures (강구조공학)

This course introduces the design of steel structures and the behavior of steel members and their connections, when subjected to axial load, bending, shear, torsion, and combined loads. Theoretical, experimental, and practical principles for proportioning members (e.g., beams, girders, columns) and their connections (bolted, welded) are discussed. Emphasis is given to the design of plate girders, composite beams, slender columns, and eccentric shear connections.

UDE402 Design of Structural Systems (구조시스템설계)

Theories of structural analysis are applied to urban infrastructure systems such as buildings, bridges, and underground structures. Emphasis is placed on developing the student's ability to both model and analyze challenging engineering structures that may be encountered in professional practice. Classical methods are reviewed to develop a deeper understanding of

fundamental sciences of engineering mechanics, and matrix structural analysis is also covered with assistance of computer-based practice.

UDE403 Foundation Engineering (기초공학)

This course is concerned with design of foundations for super structures and non-foundation problems such as design of retaining walls, bulkheads, cofferdams, tunnels, and earth dams. The required techniques for the design will be also discussed, which includes site investigation and ground improvements.

UDE404 Urban Infrastructure Engineering (도시시설공학)

This course provides an introduction to the urban technological side; water resources, water supply and drainage system, environment, structure, subway, waste treatment plants. This course will help the students to gain a better understanding of urban infrastructure.

UDE405 Urban Design (도시설계)

Introduction of fundamental urban design theory and practice. Students are expected to critically look at built environment and how architecture defines and delimits physical space, and study local and historical examples of urban design.

UDE406 Development Finance (도시개발 재무)

Community development of financial institutions and loan funds for local asset building and wealth creation. Investment analysis to structure and finance local projects. Real estate and business development cases.

UDE410 Special Topics in Urban Development Engineering (미래도시개발특론)

This is a special course designed for motivating and fostering creative and interdisciplinary research models targeting on climate change. For a comprehensive understanding on the climate change, the class will review important highlights from the recent assessment reports from the Intergovernmental Panel on Climate Change (IPCC). The class will be asked to develop their own research projects during the course.

UDE490 Interdisciplinary Project (창의시스템구현)

This course is in collaboration with other tracks and requires the student to perform a term project. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product using the knowledge gained during their studies. Lastly, students will present their work in public for evaluation.

▶ Diaster & Risk Management Engineering

DRE301 Flood and drought, dams and aqueducts (재난대응수자원관리)

This class will introduce engineering design concepts for water resources, potable and non-potable water use, irrigation, rural and urban water supply systems, rain or storm water management, etc.

DRE302 Antropogenic Disasters (인적재해)

This class covers causes and impacts of antropogenic disasters using case study examples. Also discussed are options available to mitigate the damages from the disasters.

DRE303 Disaster Management (재난관리)

This course examines the social, engineering, psychological, economic, and political aspects of hazards mitigation and disaster preparedness. Topics include vulnerability and risk assessments, sustainable hazards mitigation, government and private sector roles and responsibilities, disaster planning, social justice and economic issues

DRE304 Probability Concepts in Engineering and Laboratory (공학확률 및 실습)

This class is designed to provide an in-depth understanding of the fundamental principles for proper decision-making on engineering problems with high uncertainties; particularly for disaster reduction. This course covers applied probability and statistics, including the modeling of engineering problems and evaluation of system performance under high uncertainty, development of design criteria and logical framework for quantitative risk assessment.

DRE305 Introduction to Naturnal Hazards (자연재해개론)

This course is to study the causes, effects, and options available to mitigate natural hazards, such as earthquakes, volcanic eruptions, tsunami, landslides, flooding, and severe weather.

DRE401 Human and Nature (자연과 인간)

This class is introductory Seminar, especially for sophomores and Juniors. Disasters including Flood, Hurricanes, Fires, Oil spill, Earthquake will be talked, and the effect of disasters on people and human society will be discussed in this class.

DRE402 Disaster Risk Assessment (위험성평가)

This class provide practical knowledge for disaster risk management principles such as characteristics of hazards for making safer cities and important assessments tools such as hazard scenario analysis, risk mapping, vulnerability assessments, consequence analysis, training or reconstruction needs assessments. Case studies will be discussed.

DRE403 Introduction to Extreme Wind Resistant Engineering (내풍공학개론)

Extreme wind in accompany with typhoon or pressure change sometimes destroy urban systems. In order to figure out the extreme-wind effects on infrastructures, it is required to understand

wind-structure interaction. In lectures, we will study wind loads, bluff-body aerodynamics, wind tunnel modeling, local wind environment, and wind effects on large scale structures.

DRE404 Introduction to Earthquake Resistant Engineering (내진공학개론)

An earthquake is the sudden release of energy stored in the Earth's faults and causes huge catastrophe to human societies. This course enables students to learn how to prepare buildings, bridges and other infrastructures to withstand earthquakes. This course has an interdisciplinary contents, integrating technologies from various engineering sectors and new findings from science areas for designing safe structures against the earthquake.

DRE405 Introduction to Structural Dynamics (구조동역학개론)

This introductory course is designed to provide students with fundamental concepts in structural dynamics and its application to civil engineering. Students gain a basic understanding of vibration characteristics of single and multi degree-of-freedom systems. This course includes hands on experiments for students to better understand theories of structural dynamics in physical systems.

DRE406 Introduction to Soil Dynamics (지반동역학개론)

This course will deal with the response of soil and soil-structure interaction under the low-amplitude dynamic loadings such as that generated by machinery, traffic loading, and construction vibration, and under high amplitude dynamic loading such as that generated by earthquake excitation.

DRE407 Structural Reliability (구조신뢰성)

The decision making is the most important responsibility for engineers; however, the uncertainties and lack of information on an infrastructure make it complicated for engineers to make a decision on the capacity of a constructed facility against disasters. Students will learn how to make a proper decision on structural and system reliability of infrastructures using probabilistic fundamentals with insufficient structural information .

DRE408 Advanced Course for Naturnal Disaster Prevention Engineering (고급자연재해공학)

This course is to provide the state-of-the-art engineering technologies to prepare, monitor, predict, and mitigate for the naturally occuring disasters such as earthquakes, volcanic eruptions, tsunami, landslides, flooding, and severe weather. This course also provides the generalized strategies and methods for managing and minimizing risks from natural hazards.

DRE409 Special Topics in Disaster Prevention Engineering (방재공학특론)

This undergraduate-level course is designed for subject offerings of new and developing areas in disaster prevention engineering intended to augment the existing curriculum. See class schedule or course information for further information.

DRE490 Interdisciplinary Project (창의시스템구현)

This course is joined with another track for the completion of a term project through collaboration. Students are required to conceive a novel idea, which will be realized by designing and fabricating a product by using the best knowledge learned at the undergraduate level. Lastly, students will present their work in public for evaluation.

Interdisciplinary School of Green Energy

1. School Introduction

There are various environmentally friendly renewable energy resources available which have the potential to mitigate the consequences of using fossil fuels and the associated pollution caused by them. These power generation techniques are described as renewable because they are not depleting limited natural resources such as oil and gas which are finite.

The Interdisciplinary School of Green Energy has committed itself to pursuing research into these green technologies as a way of shifting our dependence on fossil fuels towards the production of more sustainable and economically sound energy source, particularly in the fields of manufacture, supply, storage, transmission, and usage.

The Interdisciplinary School of Green Energy is currently carrying out research into the next generation solar cells and photovoltaic systems to harness the infinite potential of the suns energy. In the field of energy conversion and storage, ground breaking research is being conducted on the development of high density energy storage batteries as well as fuel cells to convert hydrogen into an electrical current. The application of which will lead to cleaner burning less polluting vehicles.

In addition, a more effective use of hydrogen energy will be studied by developing better ways to produce and store hydrogen. Nuclear energy is the largest carbon-free non-fossil energy source as well as the lowest cost supplier for electricity production in the world. The research field in nuclear energy at UNIST includes the advancement of safety in operating nuclear power plants, the development of generation fourth (Gen-IV) small and medium-sized nuclear reactors, the hydrogen production utilizing nuclear energy conversion, and the development of nuclear fusion reactors.

2. Undergraduate Programs

☐ Track Introduction

1) Energy Conversion & Storage (ECS)

This course will cover the principles and application of the fuel cell, solar cell, and energy storage devices such as lithium ion and polymer cells. In addition, the effective production, use, and storage of hydrogen and its application will be explored.

2) Nuclear Energy (NUE)

This course will cover the operational and safety requirements of nuclear power plants, the development of advanced small and medium-sized nuclear reactors, and hydrogen production utilizing nuclear energy conversion and the development of nuclear fusion reactors.

☐ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		1Track	2Track
Energy Conversion & Storage	Required	15	15
	Elective	18	12
Nuclear Energy	Required	16	16
	Elective	17	11

▶ Required Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course	Semester
Interdisciplinary School of Green Energy	Energy Conversion & Storage	MTH103	Applied Linear Algebra	2-2
		MTH201	Differential Equations	2-1
	Nuclear Energy	MTH103	Applied Linear Algebra	2-2
		MTH201	Differential Equations	2-1

▶ Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
Interdisciplinary School of Green Energy	Engineering Programming	Dynamics of IT or IT Courses designated by other schools : choose 1	Engineering Programming Lab.

☐ Curriculum

▶ Energy Conversion & Storage(ECS)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required Group	*ECS211	Organic Chemistry I	유기화학 I	3-3-0	
	*ECS214	Analytical Chemistry	분석화학	3-3-0	
	*ECS221	lab for Energy Materials	에너지 재료 실험	2-0-4	
	*ECS222	Inorganic chemistry I	무기화학 I	3-3-0	
	*ECS313	Polymer Material Science	고분자재료과학	3-3-0	
	*ECS241	Physical Chemistry I	물리화학 I	3-3-0	
	*ECS242	Physical Chemistry II	물리화학 II	3-3-0	
	*ECS314	Electrochemistry	전기화학	3-3-0	
	*ECS321	Solid State chemistry I	고체화학I	3-3-0	
	*ECS333	Instrumental Analysis	기기분석	3-3-0	
	*ECS341	Energy conversion and storage lab	에너지변환 및 저장실험	2-0-4	
Required	**ECS490	Interdisciplinary Project	창의시스템구현	1-0-2	
Elective	ECS236	Organic Chemistry II	유기화학 II	3-3-0	
	ECS237	Polymer Concepts	고분자과학개론	3-3-0	
	ECS316	Fundamentals of energy materials	에너지재료 개론	3-3-0	
	ECS318	Electronic Devices	전자소자	3-3-0	
	ECS319	Introduction to Solar cells	태양전지공학입문	3-3-0	
	ECS326	Physical Chemistry III	물리화학 III	3-3-0	
	ECS336	Inorganic Chemistry II	무기화학 II	3-3-0	
	ECS337	Solar cells lab	태양전지실험	2-0-4	
	ECS339	Solid State chemistry II	고체화학II	3-3-0	
	ECS422	Introduction to nanoscience and nanotechnology	나노과학 및 기술	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	ECS400	Special topics on Energy Engineering	에너지공학 특론	3-3-0	
	ACE431	Introduction to Catalysis	촉매개론	3-3-0	
	CSE202	Advanced Programming	고급 프로그래밍	3-2-2	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	DPH201	Electromagnetics I	전자기학 I	3-3-0	
	DPH303	Quantum mechanics I	양자역학 I	3-3-0	
	DPH305	Thermal and statistical physics	열 및 통계역학	3-3-0	
	DPH401	Solid state physics	고체물리학	3-3-0	
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	MSE230	Introduction to Crystallography	결정학개론	3-3-0	
	MSE250	Modern Physics of Materials	재료현대물리	3-3-0	
	MSE302	Semiconducting Materials Lab	반도체재료실험	3-1-4	
	MSE350	Solid State Physics of Materials	재료고체물리	3-3-0	
	MSE353	Introduction to Nanomaterials	나노재료개론	3-3-0	
	MSE354	Introduction to Semiconductor	반도체개론	3-3-0	
	MSE470	Polymer Physics	고분자물리	3-3-0	
	TFP301	Numerical Analysis	수치해석	3-3-0	

☐ Recommended Course Schedule (ECS)

* : Required Course Group, ** : Required Course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	*ECS211 *ECS241 ECS237 CSE202 DPH201 EE201 MSE202	*ECS221 *ECS222 *ECS242 ECS236 MSE202	MSE230 MSE250		
3rd	*ECS314 ECS318 ECS319 DPH303 MSE350 TFP301	*ECS314 *ECS321 *ECS341 DPH305 MSE353 MSE354	*ECS333 *ECS313 ECS336 ECS339 MSE302		
4th	DPH401 ACE431 **ECS490	ECS422 **ECS490	MSE470 **ECS490		

▶ Nuclear Energy (NUE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required Group	*NUE213	Fundamentals of Nuclear Engineering	원자력 공학 개론	3-3-0	
	*NUE221	Nuclear Radiation Engineering & Experiment	원자력방사선공학 및 실험	3-2-2	
	*NUE222	Nuclear Materials Engineering & Experiment	원자력재료공학 및 실험	3-2-2	
	*NUE231	Introduction to Nuclear Reactor Theory	원자로이론 개론	3-3-0	
	*NUE325	Nuclear System Engineering & Experiment	원자로계통공학 및 실험	3-2-2	
	*NUE214	Introduction to Nuclear Fuel Cycle Engineering	핵주기공학 개론	3-3-0	
	*NUE314	Nuclear Engineering Design and Lab I	원자력공학설계프로젝트 I	3-0-6	
	*NUE324	Nuclear Engineering Design and Lab II	원자력공학설계프로젝트 II	3-0-6	
	*NUE342	Nuclear Reactor Lab	원자로실험	3-0-6	
Required	**NUE490	Interdisciplinary Project	창의시스템구현	1-0-2	
Elective	NUE316	Fundamentals of Electromagnetics	전자역학개론	3-3-0	
	NUE326	Nuclear Reactor Numerical Analysis	원자로 수치해석	3-3-0	
	NUE327	Introduction to Nuclear Fuel Engineering	핵연료공학 개론	3-3-0	
	NUE416	Introductory Quantum Physics	초급 양자물리학	3-3-0	
	NUE426	Quantum Physics	양자물리학	3-3-0	
	NUE427	Fundamentals of Nuclear Fusion	핵융합개론	3-3-0	
	NUE400	Special topics on Nuclear Engineering	원자력공학 특론	3-3-0	
	ECS241	Physical Chemistry I	물리화학 I	3-3-0	
	ECS333	Instrumental Analysis	기기분석	3-3-0	
	ECS422	Introduction to nanoscience and nanotechnology	나노과학 및 기술	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스개론	3-3-0	
	CSE232	Discrete Mathematics	이산수학	3-3-0	
	CSE211	Introduction to Programming Languages	프로그래밍언어	3-3-0	CSE202
	DPH201	Electromagnetics I	전자기학I	3-3-0	
	DPH303	Quantum mechanics I	양자역학I	3-3-0	
	DPH305	Thermal and statistical physics	열 및 통계역학	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
	DPH401	Solid state physics	고체물리학	3-3-0	
	SDM230	Solid Mechanics I	고체역학 I	3-3-0	
	SDM270	Dynamics	동역학	3-3-0	
	TFP210	Thermodynamics	열역학	3-3-0	
	TFP220	Fluid Mechanics	유체역학	3-3-0	
	TFP211	Applied Thermodynamics	응용열역학	3-3-0	TFP210
	TFP301	Numerical Analysis	수치해석	3-3-0	
	TFP310	Heat Transfer	열전달	3-3-0	TFP210,
	TFP320	Applied Fluid Mechanics	응용유체역학	3-3-0	TFP220
	TFP457	Introduction to Electric-Electronic Engineering	전기전자공학개론	3-3-0	PHY103
	MSE202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	MSE203	Physical Chemistry of Materials I : Thermodynamics	재료물리화학 I : 열역학	3-3-0	

☐ Recommended Course Schedule (NUE)

* : Required Course Group, ** : Required Course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session(Summer)	Remark
2nd	*NUE213 *NUE214 EE201 DPH201 SDM230 TFP210 MSE202 MSE203	*NUE221 *NUE222 EE211 CSE232 TFP220 TFP211	*NUE231 CSE211 MSE211 SDM270		
3rd	*NUE314 *NUE342 NUE316 DPH303 TFP301	*NUE324 *NUE325 *NUE342 NUE326 NUE327 DPH305 TFP310	*NUE314 *NUE324 TFP320		
4th	NUE416 **NUE490 DPH401 TFP457	**NUE490	NUE426 NUE427 **NUE490		

3. Course Descriptions

▶ Energy Conversion & Storage

ECS211 Organic Chemistry I (유기화학 I)

Introduction to the classification, structure, reactions, and reaction mechanisms of carbon compounds. The objective of the course is that students will understand the classification, structure, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds including halocarbons, alkenes, and alcohols. Thereby, this course can provide a solid foundation in the fundamentals of organic chemistry essential for the rational study of polymers, materials, biochemistry and molecular biology.

ECS214 Analytical Chemistry (분석화학)

The course handles general separation, spectroscopical identification, and quantification of the chemical components of interest. Qualitative analysis gives a rough identity of the chemical species in a sample and quantitative analysis gives more specific amount of one or more of these components. This course also treats the methods for qualitative and quantitative analyses including any instrumental approaches. This course helps you prepare analytical ability and design your experiments in chemistry.

ECS221 lab for Energy Materials (에너지재료실험)

This course offers a hands-on opportunity of basic organic, inorganic, and physical chemistry experiments that are essential for students majoring in energy conversion and storage. We will particularly emphasize the basic lab skills related to the understanding and characterizations of energy materials.

ECS222 Inorganic chemistry I (무기화학 I)

This course presents the concepts and models of chemistry. Topics include atomic and molecular structure, nomenclature, chemical reaction and stoichiometry, thermochemistry, periodicity, atomic structures and chemical bonding. This course is designed for students who plan to major in one of the engineering schools.

ECS236 Organic Chemistry II (유기화학 II)

This course deals with the structure, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds that contain oxygen and nitrogen. This is the second part of a two-semester organic chemistry course offered to introduce students to the principles of organic chemistry and to communicate the excitement of scientific discovery. The basic objective of organic chemistry II is to continue to lay a solid foundation of organic chemistry for

students of future advanced studies in chemistry and other important areas such as biochemistry, medical fields, applied life sciences that require thorough understanding of organic chemistry.

ECS237 Polymer Concepts (고분자과학개론)

This course offers general concepts of polymers. Understanding synthesis, characterization, and processing of polymers are important issues in contemporary materials science and engineering. Solid concepts on the structure-property relationship of synthetic polymers allow us to design new structures of polymers for application-specific purposes. Specifically, photo- and electro-active polymers will be discussed in details.

ECS241 Physical Chemistry I (물리화학 I)

The course is a general study of thermodynamics in the areas of physical chemistry covering the classical nature of energy conversion between heat, mechanical work, and the macroscopic variables such as temperature, volume and pressure in chemical systems. Thermodynamics provides the essential strategies for (1) calculating energy conversion, for example, in engines and (2) for determining the equilibrium composition of chemically reacting systems.

ECS242 Physical Chemistry II (물리화학 II)

This course is designed to provide an understanding of kinetics as it applies to chemical reactions from the microscopic viewpoint and the theoretical foundation required for designing chemical reactors for controlling chemical reactions. Chemical kinetics includes investigations of how different experimental conditions can influence the speed of a chemical reaction and yield information about the reaction's mechanism and transition states, as well as the construction of mathematical models that can describe the characteristics of a chemical reaction.

ECS313 Polymer Material Science (고분자재료과학)

This course covers fundamental concepts and physical properties of polymers to provide knowledge on the structure analysis of polymers and thus, one can understand structural characteristics of polymers depending upon chemical structures, molecular weights, molecular structures and morphologies. Specifically, the close relationship between chemical structures and physical properties will be discussed in details.

ECS314 Electrochemistry (전기화학)

This course covers fundamentals related to electrochemical science and engineering as well as its applications. These include: redox reactions, electrochemical cells, thermodynamics related to electrochemistry, and electrode kinetics. In the second half of the course participants will explore how the aforementioned principles can be applied to electrochemical energy conversion, characterization of materials, and electrochemical sensors.

ECS316 Fundamentals of energy materials (에너지재료개론)

This course covers the fundamentals of energy materials related to energy conversion and storage devices, such as batteries, supercapcitors and fuel cells. In addition, this course will explore the scientific principles underlying various storage and conversion principles and wed them to experimental procedures to be carried out in the laboratory.

ECS318 Electronic Devices (전자소자)

This course will cover the basic concepts, mechanisms, and applications of electronics devices. Topics will include band structure, electrical properties, optical properties of semiconductors, and its applications such as p-n junction diodes, field-effect transistors, light emitting diodes, and solar cells.

ECS319 Introduction to Solar cells (태양전지입문)

Human need energy for a living. Although we obtain energy from food to sustain our body, we need more and more energy to keep our life comfortable. The first thing we can keep in mind for this might be electricity. Since the electrical energy can be converted almost every other energy form (heat, light etc.), direct conversion from sun light to electricity is very important. Based on the same reason, producing electrical energy through photovoltaic energy conversion by solar cells is the human counterpart. This course provides a fundamental understanding of the functioning of solar cells. The discussion includes the solar cell structures, various kinds of them, their theoretic parts, and analysis tools.

ECS321 Solid State chemistry I (고체화학 I)

This course focuses on the basic principles of solid state chemistry. Structural, chemical, and physical aspects of inorganic solids, such as ionic solids, metal, and molecular solids, will be discussed. The course explores the relationship between electronic structure, chemical bonding, and atomic order. It also investigates the characterization of atomic arrangements in crystalline and amorphous solids: metals, ceramics, semiconductors, and polymers. Topics include: symmetry, basic crystallography, crystal structure, bonding in solids, characterization techniques (X-ray diffraction, microscopy, and spectroscopy) and crystal defects.

ECS326 Physical Chemistry III (물리화학 III)

Topics in quantum mechanics, statistical mechanics, molecular dynamics, and molecular spectroscopy will be covered in this course. Through the study of quantum mechanics, students will further apply their knowledge of QM to understand how spectroscopy can be used to probe molecular systems. Through the study of molecular dynamics and molecular spectroscopy, students will discover how empirical reaction rates and molecular-based models can be used to gain insight into both simple and complex chemical systems.

ECS333 Instrumental Analysis (기기분석)

This course introduces the principles of analytical instruments which are needed in the characterization of various materials, and provides students with the opportunity to learn how to operate them in laboratories. This course deals with many integuments for spectroscopic analysis (NMR, FTIR, Raman, UV/VIS), x-ray analysis (XRD, XRF), surface analysis (AFM, XPS, SIMS) , thermal analysis (DSC, TGA), Mass spectrometry, and electron microscopy (SEM, TEM).

ECS336 Inorganic Chemistry II (무기화학 II)

Electronics structures, spectroscopic and magnetic properties of the coordination compounds will be discussed based on the crystal field theory and molecular orbital theory. In addition to the reactions and properties of the coordination compounds, and the catalytic properties of the organometallic compounds also will discussed.

ECS337 Solar cells lab (태양전지실험)

This course builds upon the fundamental principles of solar cells, their composition and structures. The course will delve into the inner workings and composition of solar cell structures, photovoltaic applications and advanced theories and next generation applications of solar cell structures. Particular attention will be given to the use and assessment of laboratory instruments used in solar cell analysis.

ECS339 Solid State chemistry II (고체화학 II)

This course is the second part of a two-quarter solid state chemistry course offered to introduce students to the basic principles of solid state chemistry and its application to engineering systems. The techniques commonly used to synthesize and study solid materials are introduced in the second part. Topics cover phase diagrams, electrical, magnetic and optical properties of solids. Examples are drawn from energy generation and storage devices such as batteries, fuel cells, and superconductors.

ECS341 Energy conversion and storage lab (에너지 변환 및 저장 실험)

This 2 credit lab course deals with experiments related to energy conversion and storage devices such as batteries and fuel cells. The synthesis and characterization of its devices will be performed. Finally, students will be assessed on the results of their electrochemical conversation and storage performance tests.

ECS416 Fundamentals of fuel cell (systems) (연료전지개론 (시스템))

This class is dealing with the system of the lithium ion batteries and fuel cells, such as proton exchange membrane(PEM), molten carbon fuel cells (MCFC), solid oxide fuel cells (SOFC), and phosphorous fuel cells (PFC).

ECS422 Introduction to nanoscience and nanotechnology (나노과학 및 기술)

This course deals with subjects in modern nanoscience and nanotechnology. As such, it will present the essential principles and application of the unique characteristics observed in materials of nanometer size

▶ Nuclear Energy

NUE213 Fundamentals of Nuclear Engineering (원자력 공학 개론)

This course deals with physical basics and engineered application of the nuclear energy and the main objective is to provide the student with general understanding and knowledge of the nuclear engineering. The fundamentals of nuclear physics and interaction of radiation with matters are studied. The basic principles of nuclear reactor are investigated and various nuclear reactor concepts are discussed. The nuclear energy conversion and radiation protection are studied as well.

NUE214 Introduction to Nuclear Fuel Cycle Engineering (핵주기공학 개론)

This course introduces the nuclear fuel cycle which is the progression of nuclear fuel through a series of differing stages. It consists of steps in the front end, which are the preparation of the fuel, steps in the service period in which the fuel is used during reactor operation, and steps in the back end, which are necessary to safely manage, contain, and either reprocess or dispose of spent nuclear fuel. Depending on the reprocessing of the spent fuel, the specific topics include an open fuel cycle (or a once-through fuel cycle) and a closed fuel cycle considered in terms of sustainability of nuclear energy and nonproliferation. In particular, nuclear waste disposal (spent fuel) techniques will be discussed in terms of economics, safety and public acceptance.

NUE221 Nuclear Radiation engineering & Experiment (원자력방사선공학 및 실험)

The basic concepts and definition about radiation dosimetry are introduced and the biological effects on cells and human body organs are discussed. It also covers the generation, amplification, transfer and measurement of the electronic signal from various radiation detector based on the physics theory of the electronics signal and noise. The course also explores methods of radiation counting, timing and imaging system.

NUE222 Nuclear Materials Engineering & Experiment (원자력재료공학 및 실험)

This subject introduces basic concepts and applications of materials science and engineering to nuclear energy systems, while laboratory practices are designed for experiencing property tests of the lectured materials. Lectures include the essential knowledge of materials science and engineering as well as the effects of radiation and environments on material properties. The

experiments are concerned with mechanical test and data analysis, phase transformation, observation by optical and electron microscopes, corrosion tests and irradiation effects.

NUE231 Introduction to Nuclear Reactor Theory (원자로이론 개론)

This course covers fundamental theory of nuclear fission reactors. Specific topics includes the followings: nuclear fission phenomenon, the chain nuclear reaction, diffusion/ moderation/absorption of neutron, multi-group neutron diffusion equations, heterogeneous reactor, reactor dynamics, reactivity and its change, perturbation theory and adjoint solutions, etc.

NUE325 Nuclear System Engineering & Experiment (원자로계통공학 및 실험)

In this course, a variety of design constraints such as design principles, requirements, functions and technical specifications that govern the overall phases of design processes will be introduced to point out drawbacks and enhancement directions of nuclear systems. In addition, through implementations of small-scale mockups, an engineering chance realizing new ideas that are created by students would be provided.

NUE314 Nuclear Engineering Design and Lab I (원자력공학설계 및 실험 I)

In this course, students select specific topics for their own experiments or simulations among current issues in various nuclear system designs which need improvement or enhancement. Through implementations by experiments or simulations, a chance for enhancement directions that are suggested by students would be provided.

NUE324 Nuclear Engineering Design and Lab II (원자력공학설계 및 실험 II)

This course covers specific topics for students' further experiments or research in nuclear field including nuclear radiation, thermohydraulics, reactor material, fuel cycle, reactor physics, liquid metal magnetohydrodynamics and so on. Through implementations by experiments or simulations, a chance for enhancement directions that are suggested by students would be provided.

NUE316 Fundamentals of Electromagnetics (전자역학 개론)

This course focuses on the electromagnetic theories as a basis for plasma engineering, nuclear fusion, radiation and nuclear engineering. The basic concepts on electricity and magnetism are included. Specific topics will include vector algebra and calculus; electrostatics in material media for Coulomb's Law, Gauss's Law, and boundary-value problems; steady electric currents for Ohm's law and Kirchhoff's law; magnetostatics in magnetic media for Ampere's Law, Biot-Savart law, and vector potential; time-varying electromagnetics for Faraday's Law and Maxwell's equation.

NUE326 Nuclear Reactor Numerical Analysis (원자로 수치해석)

The partial differential equations to be solved for real world nuclear engineering applications such as the nuclear reactor core design, core transient analysis, and core depletion calculations, cannot be solved analytically in most cases. Instead, computer can be utilized to obtain approximate solutions of the PDEs. This course covers techniques which can solve numerically the PDEs found in nuclear engineering, e.g., finite difference, finite element, and advanced nodal methods.

NUE327 Introduction to Nuclear Fuel Engineering (핵연료공학 개론)

This course covers the basic principles and structures of various nuclear fuels and their actual applications and future fuel developments. The structure, characteristics and materials of different types of fuel wil be introduced and their general irradiation behavior will be discussed. Fuel modelling, testing, design and fabrication will be covered. General in-reactor performance and failure experiences of current generation fuels and future fuel development activities will be introduced.

NUE342 Nuclear Reactor Lab (원자로실험)

Experiments are performed for production of radioisotopes, neutron activation analysis, neutron radiography, and fuel burnup measurement utilizing Research Reactor. The reactor system is described with reference to the Kori Units 3 & 4, Westinghouse three- loop pressurized water reactors. Their Final Safety Analysis Report (FSAR) is reviewed to examine the thermal and hydraulic system behavior spanning from an abnormal condi- tion to a loss-of-coolant accident condition. The Compact Nuclear Simulator (CNS) is utilized to study the reactor dynamics involving startup and shutdown practice, to examine the thermal hydraulic behavior of the system after a component malfunction or an operator error, and to compare the results against the licensing calculation reported in the FSAR.

NUE416 Introductory Quantum Physics (초급 양자물리학)

This course is a gentle introductory course on quantum mechanics aimed at the beginning undergraduate level. In the beginning part, the classical mechanics will be briefly summarized. Then, the basic concepts including wave-particle duality will be discussed. General physics and electro-magnetism are prerequisite for this course. However, students who took the introductory modern physics course can follow this class.

NUE426 Quantum Physics (양자물리학)

As the beginning introduction to Quantum mechanics is given in Quantum Mechanics I, this course aims to give more practical experience with Quantum Mechanics. Concept of angular momentum, identical particle, perturbation theory, and scattering theory will be introduced. At the later part of the course, the relativistic Quantum mechanics is shortly introduced.

NUE427 Fundamentals of Nuclear Fusion (핵융합개론)

This course focuses on the concept for nuclear fusion. It introduces basic principles and technological issues relevant to plasma and fusion energy generations and their practical uses as a limitless large-scale electric power source in the future. Through this class, students learn plasma, principle of nuclear fusion, the kinds of nuclear fusion, plasma confinement, nuclear fusion device and current status of the nuclear fusion technology.

School of Technology Management

1. School Introduction

The School of Technology Management educates students both in technology and management to be creative global business leaders in today's dynamic economy.

The School offers academic courses on various business areas including Technology Management, Information Systems, Finance, International Business, Marketing and Entrepreneurship.

2. Undergraduate Programs

□ Track Introduction

1] General Management (GM)

Students in the General Management area are trained both in technology and management to be creative global business leaders in domestic and international corporations as well as in academia. The General Management area is designed to provide general management education and is committed to enhancing the knowledge of business and management issues in all major functional areas. Courses covered in General Management include Organizational Behavior, International Business, Marketing, Financial Accounting, Managerial Accounting, Financial Management, Strategic Management, Operations Management, Economics, and Data Analysis & Decision Making.

2] Technology Management/ Information System/ Entrepreneurship (TIE)

Technology Management addresses the major issues necessary to understand production and service operations and provides a framework for the analysis of a wide range of managerial decision making processes in today's global economy. Courses in Technology Management include Technology Management, Process & Quality Management, Case Studies in Technology Management and other related courses.

Information Systems is designed to provide the necessary understanding in both technical and business issues relating to the business use of information technology. Courses in Information Systems include Database and Data Mining, E-Business, Strategic Management of IT and other related courses on the management of information systems and use of information technology.

Entrepreneurship is about identifying, valuing and capturing business opportunities in a new or existing organization. Entrepreneurship provides the understanding of the entrepreneurial process and the knowledge and skills of successful entrepreneurs. The courses include Innovation and Entrepreneurship, Managing Innovation and Change, and other related subjects in Technology Management.

3] Finance/ Accounting (F/A)

Students in Finance/Accounting are trained for careers in domestic and international corporations and financial institutions as well as careers in academia.

Finance allows students to study the ways in which individuals, corporations, and other business organizations allocate resources and make financial decisions in capital markets. Courses in Finance include Financial Management, Investment Analysis, Money & Banking and Financial Engineering which cover various academic areas as well as practical techniques with both broad and specific perspectives.

Accounting helps managers to create and disseminate financial accounting information to communicate effectively with investors and capital market participants, and apply managerial accounting information internally to make more efficient financial and economic decisions. Courses in Accounting include Intermediate Accounting, Managerial Accounting, and Auditing which cover the principles and practices of accounting.

4] Marketing/ International Business (MIB)

Students in Marketing/International Business areas are trained for careers in domestic and international corporations and government agencies as well as careers in academia.

Marketing studies the issues on acquiring and retaining customers for products and services so as to create a mutually beneficial exchange between a company and its customers. Courses in Marketing include Consumer Behavior, Digital Marketing and Marketing Strategy.

With the globalization of the world economy, International Business ensures students prepare for the challenges of operating businesses in the international environment. International Business is typically taken along with other areas in Technology Management from a global perspective. Courses in International Business include International Marketing, International Finance and Global Business Strategy.

☐ Credit Requirement

Track	Required/ Elective	Credit (minimum)	
		1Track	2Track
General Management	Required	31	31
	Elective	2	-
Technology Management/ Information System/ Entrepreneurship	Required	19	19
	Elective	14	8
Finance/ Accounting	Required	16	16
	Elective	17	11
Marketing/ International Business	Required	22	22
	Elective	11	5

※ The General Management track includes 10 basic courses in Technology Management, and can be selected, as well as the other 3 tracks, if students are fulfilling only one tract in the School of Technology Management. Students who choose 2 tracks within the School of Technology Management must select tracks among 3 other than the General Management track. Ten required courses in General Management are required for the students to fulfill who choose 2 tracks within Technology Management.

▶ Required Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course
School of Technology Management	General Management	MTH103	Applied Linear Algebra
		MTH211	Statistics
	Technology Management/ Information System/ Entrepreneurship	MTH103	Applied Linear Algebra
		MTH211	Statistics
	Finance/ Accounting	MTH103	Applied Linear Algebra
		MTH211	Statistics
	Marketing/ International Business	MTH103	Applied Linear Algebra
		MTH211	Statistics

▶ Required IT Courses

School	Programming	Dynamics of IT or designated course by the school	Practical IT
TM	Business Programming	Dynamics of IT	Dynamics of IT Lab.

▶ Required Courses to take when Change the Field
Engineering Field -> Management Field

Category	Courses	Remarks
Accepted	Calculus I = Calculus	
	Engineering Programming = Business Programming	
	General Physics I = General Physics	
	General Chemistry I = General Chemistry	
Identical	Applied Linear Algebra = Applied Linear Algebra	
	Statistics = Statistics	
	General Biology = General Biology	

☐ Curriculum

▶ General Management (GM)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	GMT202	Organizational Behavior	조직행동론	3-3-0	
	GMT203	International Business	국제 경영	3-3-0	
	GMT204	Marketing Management	마케팅 관리	3-3-0	
	GMT205	Financial Accounting	재무회계	3-3-0	
	GMT206	Managerial Accounting	관리회계	3-3-0	
	GMT207	Financial Management	재무관리	3-3-0	
	GMT208	Strategic Management	경영전략	3-3-0	
	GMT209	Operations Management	생산관리	3-3-0	
	GMT210	Data Analysis &Decision Making	경영통계 분석	3-3-0	ISM202 MTH211
	GMT211	Microeconomics	미시경제학	3-3-0	GMT106
	GMT490	Interdisciplinary Project	창의시스템 구현	1-0-2	
Elective	GMT321	Macroeconomics	거시경제학	3-3-0	GMT211
	GMT322	Econometrics	계량경제학	3-3-0	GMT211
	GMT323	Game Theory	게임 이론	3-3-0	
	GMT341	Business Ethics	기업경영 윤리	3-3-0	
	GMT351	Legal Environment of Business	경영과 법률환경	3-3-0	
	GMT491	Independent Study	개별연구	3-3-0	
	GMT492	Capstone Projects	졸업프로젝트	3-3-0	

☐ Recommended Course Schedule (GM)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	*GMT 203 *GMT 205 *GMT 207	*GMT 203 *GMT 204 *GMT 205 *GMT 207 *GMT 208	*GMT 204 *GMT 208		
3rd	*GMT 202 *GMT 210	*GMT 202 *GMT 206 *GMT 209 *GMT 211	*GMT 206 *GMT 209 *GMT 210 GMT 321		
4th	*GMT 490	*GMT 490	*GMT 490		

※ Elective courses can be changed by the faculty.

▶ Technology Management/ Information System/ Entrepreneurship (TIE)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	GMT202	Organizational Behavior	조직행동론	3-3-0	
	GMT205	Financial Accounting	재무회계	3-3-0	
	GMT207	Financial Management	재무관리	3-3-0	
	GMT208	Strategic Management	경영전략	3-3-0	
	GMT209	Operations Management	생산관리	3-3-0	
	GMT210	Data Analysis &Decision Making	경영통계분석	3-3-0	ISM202 MTH211
	TIE490	Interdisciplinary Project	창의시스템 구현	1-0-2	
Elective	GMT323	Game Theory	게임이론	3-3-0	
	GMT341	Business Ethics	기업경영윤리	3-3-0	
	GMT351	Legal Environment of Business	경영과 법률환경	3-3-0	
	GMT491	Independent Study	개별연구	3-3-0	
	GMT492	Capstone Projects	졸업프로젝트	3-3-0	
	TIE301	Technology Management	기술 경영	3-3-0	

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Prerequisite
	TIE302	Process & Quality Management	생산과 품질 관리	3-3-0	GMT209
	TIE303	Operations Research	계량경영학	3-3-0	
	TIE321	Database and Data Mining	데이터 베이스 및 데이터 마이닝	3-3-0	ISM202
	TIE322	Internet Business and Marketing	인터넷 비지니스	3-3-0	
	TIE323	Strategic Management of IT	정보기술과 경영전략	3-3-0	GMT208, ISM201
	TIE324	Mobile Business	모바일 비지니스	3-3-0	
	TIE325	System Analysis and Design	경영정보시스템분석 및 설계	3-3-0	
	TIE410	Special Topics in Technology Management	기술경영 특강	3-3-0	
	TIE430	Special Topics in Knowleedge & Information Management	지식경영 특강	3-3-0	
	TIE441	Managing innovation and Change	혁신과 변화의 관리	3-3-0	
	TIE443	Entrepreneurship and Venture Management	창업과 벤처	3-3-0	
	TIE450	Special Topics Entrepreneurship	기업가정신 특강	3-3-0	

☐ Recommended Course Schedule (TIE)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	*GMT 205 *GMT 207 *GMT 210	*GMT 205 *GMT 207 *GMT 208	*GMT 208 *GMT 210		
3rd	*GMT 202 TIE 301 TIE 322	*GMT 202 *GMT 209 TIE 303	*GMT 209 TIE 321 TIE 325		
4th	*TIE 490	*TIE 490 TIE 443	*TIE 490		

※ Elective courses can be changed by the faculty.

※ School of Technology Management students who choose both 1, 2 tracks should take General Management track 10 required courses.

▶ Finance/ Accounting (FIA)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	GMT205	Financial Accounting	재무회계	3-3-0	
	GMT206	Managerial Accounting	관리회계	3-3-0	
	GMT207	Financial Management	재무관리	3-3-0	
	GMT210	Data Analysis &Decision Making	경영통계 분석	3-3-0	ISM202 MTH211
	GMT211	Microeconomics	미시경제학	3-3-0	GMT106
	FIA490	Interdisciplinary Project	창의시스템 구현	1-0-2	
Elective	GMT321	Macroeconomics	거시경제학	3-3-0	GMT211
	GMT322	Econometrics	계량경제학	3-3-0	GMT211
	GMT341	Business Ethics	기업경영윤리	3-3-0	
	GMT351	Legal Environment of Business	경영과 법률환경	3-3-0	
	GMT491	Independent Study	개별연구	3-3-0	
	GMT492	Capstone Projects	졸업프로젝트	3-3-0	
	FIA301	Investment analysis	투자분석	3-3-0	GMT207
	FIA302	Money and Banking	금융시장론	3-3-0	GMT207
	FIA303	Futures and Option	파생금융상품	3-3-0	GMT207
	FIA321	Intermediate Accounting 1	중급회계 1	3-3-0	GMT205
	FIA322	Intermediate Accounting 2	중급회계 2	3-3-0	GMT205 GMT206
	FIA324	Tax Accounting	세무회계	3-3-0	GMT205
	FIA325	Strategic Cost Management	전략적 원가 관리	3-3-0	GMT206
	FIA401	Financial Engineering	금융공학	3-3-0	GMT207
	FIA409	Case Studies in Finance	재무사례연구	3-3-0	GMT207
	FIA410	Special Topics in Finance	재무 특강	3-3-0	GMT205
	FIA421	Auditing	회계감사	3-3-0	FIA322
	MIB322	International Finance	국제재무관리	3-3-0	

☐ Recommended Course Schedule (FIA)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	*GMT 205 *GMT 207	*GMT 205 *GMT 206 *GMT 207	*GMT 206		
3rd	*GMT 210 FIA 324	*GMT 211 FIA 303 FIA 321	*GMT 210 GMT 321 FIA 322 FIA 325 MIB 322		
4th	*FIA 490	* FIA 490	*FIA 490 FIA 410 FIA 421		

※ Elective courses can be changed by the faculty.

※ School of Technology Management students who choose both 1, 2 tracks should take General Management track 10 required courses.

▶ Marketing/ International Business (MIB)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	GMT203	International Business	국제 경영	3-3-0	
	GMT204	Marketing Management	마케팅 관리	3-3-0	
	GMT207	Financial Management	재무관리	3-3-0	
	GMT208	Strategic Management	경영전략	3-3-0	
	GMT210	Data Analysis &Decision Making	경영통계 분석	3-3-0	ISM202 MTH211
	GMT211	Microeconomics	미시경제학	3-3-0	GMT106
	MIB301	Consumer Behavior	소비자 행동	3-3-0	GMT204
	MIB490	Interdisciplinary Project	창의시스템 구현	1-0-2	
Elective	GMT321	Macroeconomics	거시경제학	3-3-0	GMT211
	GMT322	Econometrics	계량경제학	3-3-0	GMT211
	GMT341	Business Ethics	기업경영윤리	3-3-0	
	GMT351	Legal Environment of Business	경영과 법률환경	3-3-0	
	GMT491	Independent Study	개별연구	3-3-0	
	GMT492	Capstone Projects	졸업프로젝트	3-3-0	
	TIE321	Database and Data Mining	데이터베이스 및 데이터마이닝	3-3-0	ISM202
	TIE322	Internet Business and Marketing	인터넷 비지니스	3-3-0	
	MIB303	Quantitative Marketing Decision Making	계량마케팅 의사결정	3-3-0	GMT204
	MIB321	International Marketing	국제마케팅	3-3-0	GMT204
	MIB322	International Finance	국제재무관리	3-3-0	
	MIB323	Brand Management	브랜드관리론	3-3-0	MIB301
	MIB402	Marketing Research	마케팅 조사론	3-3-0	GMT204
	MIB403	Advertising Management	광고관리론	3-3-0	GMT204
	MIB404	Experimental Design with Applications in Marketing	마케팅실험설계	3-3-0	MIB301
	MIB409	Case Studies in Marketing	마케팅사례연구	3-3-0	MIB301
	MIB410	Special Topics in Marketing	마케팅특강	3-3-0	MIB301
	MIB421	Global Business Strategy	글로벌경영전략	3-3-0	
	MIB429	Case Studies in International Business	국제경영사례연구	3-3-0	
	MIB430	Special Topics in International Business	국제경영특강	3-3-0	

☐ Recommended Course Schedule (MIB)

* : Required Course, ** : Required only for 1track, # : 'Dynamics of IT' course

Year/Sem	I (Spring)	II (Fall)	III (Winter)	Session (Summer)	Remark
2nd	*GMT 207 *GMT 210	*GMT 204 *GMT 207 *GMT 208	*GMT 204 *GMT 208 *GMT 210		
3rd	*GMT 203 TIE 322	*GMT 203 *GMT 211 MIB 323	*MIB 301 GMT 321 TIE 321 MIB 322		
4th	*MIB 490	*MIB 490 MIB 404	*MIB 490		

※ Elective courses can be changed by the faculty.

※ School of Technology Management students who choose both 1, 2 tracks should take General Management track 10 required courses.

3. Course Descriptions

▶ General Management

GMT202 Organizational Behavior (조직행동)

Organizational behavior is about the study and application of knowledge about how individual or group of people acts within organization. This course introduces the basic concepts, theories, models, and cases of behavioral phenomena such as personality, learning, motivation, group process, leadership, organization design and culture, and organizational change.

GMT203 International Business (국제경영)

Companies compete in the international markets with the globalized of world economy. This course in International Business enables students to be equipped with the ability to analyze global issues in economics and to cope well with the rapidly changing international business environment. With the combination of theories and realistic international business cases, students are prepared to understand and deal effectively with the international business issues.

GMT204 Marketing Management (마케팅 관리)

This course is an introduction to the theory and application of contemporary marketing. Marketing topics covered include customer needs, company skills, competition, collaborators, and context in marketing and product development (5Cs)and product, price, place, and, promotion (4Ps). The course combines cases, discussions, and theories to provide a mix of integrating concepts and hands-on problem solving.

GMT205 Financial Accounting (재무회계)

Financial Accounting examines basic concepts of accounting and provides a basic framework to understand the financial statement in users'point of view. This course also provides overview of basic financial statements such as balance sheets, income statement and cash flow statement for financial and accounting decision making.

GMT206 Managerial Accounting (관리회계)

This course covers the basic concepts and foundations for the management decision-making using accounting information and cost and benefit analysis. The topics include cost structure and cost concepts, strategic decision making, design of various costing systems, and performance measurement systems.

GMT207 Financial Management (재무관리)

This course introduces various issues in financial management. It provides the student with an

introduction to the problems faced by corporate financial managers and investment bankers, and suggests methods for resolving the financial problems including capital structure and capital budgeting problems.

GMT208 Strategic Management (경영전략)

This course introduces the basic concepts, process, and various skills and techniques of strategy formulation, implementation and evaluation. Practical cases of Korean and American corporations will be analyzed and discussed.

GMT209 Operations Management (생산관리)

Operations management is basically concerned with the production of quality goods and services, and how to make efficient and effective business operations. It involves subjects in the analysis of production planning, inventory and quality control, cost and performance analysis, and supply chain management.

GMT210 Data analysis & Decision Making (경영통계분석)

The main goal of this course is to understand statistical analysis of data and to apply to various management issues in forecasting and planning. The topics include the basic concept of probability and statistics with the application of practical cases.

GMT211 Microeconomics (미시경제학)

Microeconomics is concerned with the behaviors of individual consumers and businesses. This course provides an introduction to the analytical tools to understand how individuals and societies deal with the fundamental economic problem of scarcity. This course also provides discussions in applied fields such as environment economics, international trade, industrial organization, labor economics, and public finance.

GMT321 Macroeconomics (거시경제학)

Macroeconomics is concerned with economic aggregates such as GDP, inflation and unemployment. This course provides an overview of macroeconomic issues such as the determination of output, employment, interest rates, and inflation. Policy issues and applications of basic models will be discussed with special reference to monetary and fiscal policy.

GMT322 Econometrics (계량경제학)

This course focuses on the application of statistical methods to the testing and estimation of economic relationships. After developing the theoretical constructs of classical least squares, students will learn how to treat common problems encountered when applying the ordinary least squares approach, including serial correlation, heteroscedasticity and multicollinearity.

GMT323 Game Theory (게임이론)

Game theory studies an analytical approach to the study of strategic interaction. Students will learn the development of basic theory, including topics such as the Nash equilibrium, repeated games, credibility, and mixed strategies. Applications will include markets and competition, auction design, voting, and bargaining.

GMT341 Business Ethics (기업경영윤리)

This course examines business ethics from both an organizational and managerial perspective. Students will examine the goal of business organizations, as well as individual conduct in business settings. Ethical reasoning and ethical leadership will guide students through debates on various topics such as: creating an ethical climate in an organization, honesty, affirmative action, environmental ethics, ethics in advertising and sales, financial management, personnel management, and the role of character and virtues in effective leadership.

GMT351 Legal Environment of Business (경영과법률환경)

The legal environment represents a significant segment of the decision-maker's landscape. This course provides an overview of laws and regulations as they pertain to the business atmosphere. Key topics include forms of business enterprise, international law, contracts, intellectual property, and financial reporting and disclosure regulations. Case analysis and ethical implications are discussed in each area.

GMT490 Interdisciplinary Project (참의시스템 구현)

This course is joined with other tracks for performing a term project through collaboration. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product by using the best knowledge learned at an undergraduate level. Lastly, students will present their work in public for evaluation.

GMT491 Independent Study (개별연구)

This course is intended for students who wish to pursue a discipline in greater depth than possible through the regular curriculum. The course is designed to provide the student with an opportunity to expand current knowledge, develop or enhance necessary skills in a specific area of interest related to management.

GMT492 Capstone Projects (졸업프로젝트)

This capstone course offers each student the opportunity to develop a special project in his or her specific area of interest. This includes researching the topic, identifying an issue, developing a strategy and a workplan, establishing a timeline, and implementation of the work schedule. Students will also develop a plan for evaluation.

▶ Technology Management/ Information system/ Accounting

TIE301 Technology Management (기술경영)

This course provides a strategic framework for managing technologies in businesses. As a basis, this course focuses on how technologies, technological structures, and systems affect organizations and the behaviors of their members. Then, this course aims to help students understand the complex co-evolution of technological innovation and identify new opportunities, business ecosystems, and decision-making execution within the business.

TIE302 Process & Quality Management (생산과 품질관리)

This course covers the approaches in quality improvement and implications in management responsibilities. Practical cases involving business processes will be analyzed and discussed in class.

TIE303 Operations Research (계량경영학)

This course is an introduction to the key aspects of operations research methodology. Students will model and solve a variety of problems using deterministic and stochastic operations research techniques. Topics include basic theory, modeling, the use of computer tools, and interpreting results.

TIE321 Database and Data Mining (데이터베이스 및 데이터마이닝)

This course studies the basic theory and application of databases, and presents techniques for identifying patterns in data.

TIE322 Internet Business and Marketing (인터넷 비지니스)

This course intends to introduce students to the concept and practice of e-business. The principal topics include the internet and mobile e-business, e-business models, architecture of web systems, and communications and networking.

TIE323 Strategic Management of IT (정보기술과 경영전략)

This course will focus on exploring and articulating the framework and methodology associated with the deployment of Information Technology to help formulate and execute business strategy.

TIE324 Mobile Business (모바일비지니스)

By taking a journey into the history of mobile technologies/services and their current trends, this course investigates how mobile technologies have transformed and will continue to transform the world. The course explores various mobile technologies, their business applications, successful and failed cases, and related issues such as mobile policy or convergence among wired, wireless, and broadcasting services.

TIE325 System Analysis and Design (경영정보 시스템분석 및 설계)

This course is designed to explore the functions and methods of information systems development from both a practical and theoretical perspective. Upon successful completion of the course, students should be able to analyze and design information systems in a real-world setting and to compare and choose intelligently from among methods, tools, and techniques of systems analysis and design.

TIE410 Special Topics in Technology Management (기술경영 특강)

This course is designed to discuss contemporary topics in technology management. Actual topics and cases will be selected by the instructor and may vary from term to term.

TIE430 Special Topics in Knowledge & Information Management (지식경영 특강)

This course is designed to discuss contemporary topics in knowledge management. Actual topics and cases will be selected by the instructor and may vary from term to term.

TIE441 Managing Innovation and Change ((혁신과 변화의 관리)

This course covers current issues and theories on the management of innovation and change in new and existing organizations. It prepares students to understand practical business cases.

TIE443 Entrepreneurship and Venture Management (창업과 벤처)

This course is designed to help students understand the challenges and learn how to approach the process of creating and managing a new venture, which includes recognizing and analyzing an opportunity, mobilizing resources, financing a new venture, and managing growth. To achieve this goal, the course will introduce important concepts and cover a number of cases involving different entrepreneurial challenges and settings. It also serves as the capstone course for those pursing a degree in business management and entrepreneurship.

TIE450 Special Topics in Entrepreneurship (기업가정신 특강)

This course is designed to discuss contemporary topics in entrepreneurship. Actual topics and cases will be selected by the instructor and may vary from term to term.

TIE490 Interdisciplinary Project (창의시스템구현)

This course is joined with other track for performing a term project through collaboration. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product by using the best knowledge learned at an undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Finance/ Accounting

FIA301 Investment Analysis (투자분석)

The course in Investment Analysis introduces the students with conceptual framework in the theory and practice of financial investment decisions. The topics include portfolio theory, Capital Asset Pricing Model, market efficiency, and derivative securities pricing.

FIA302 Money and Banking (금융시장론)

The purpose of this course is to introduce the basic principles of money, credit, banking and to discuss the application of these principles to the issues of current financial policy. It also involves the practical influences of macroeconomic policy on the real sector of the economy and financial markets.

FIA303 Futures and Options (파생금융상품)

This course covers some of the main topics in futures, options and other derivative securities. It provides a working knowledge of how derivatives are analyzed, and covers the financial derivative markets, trading strategies and valuation issues involving options and futures/forwards.

FIA321 Intermediate Accounting I (중급회계1)

This course is an intensive study of the theories and practices of financial accounting. The primary goal of this course is to understand both current accounting standards and the conceptual framework that is the foundation of current accounting standards. Specifically, this course is designed to acquaint the student with current accounting theories and practices.

FIA322 Intermediate Accounting II (중급회계2)

While this course is similar to the Intermediate Accounting I course, its topics are more specific and complicated. It focuses on accounting for assets and liabilities, accounting standard processes and economic influence of accounting standards on stockholders.

FIA324 Tax Accounting (세무회계)

This course is designed to introduce basic concepts and theories of tax accounting. The course will focus primarily on corporate income tax laws and regulations and related corporate tax accounting issues. Other tax issues that corporations are facing in their tax accounting will be discussed as well in the class.

FIA325 Strategic Cost Management (전략적 원가관리)

Explores critical issues facing accounting and financial managers in the current business environment. Topics include: introduction to state-of-the-art managerial accounting practices, in-depth understanding of cost management, product and service costing methods, performance evaluation and managerial compensation systems. Global and ethical issues are examined. Written assignments, case studies and team discussions comprise much of classroom interaction.

FIA401 Financial Engineering (금융공학)

Financial Engineering is a cross-disciplinary field which covers mathematical and computational finance, statistics, and numerical methods that are useful for trading, hedging and investment decisions, as well as facilitating the risk management of those decisions.

FIA409 Case Studies in Finance (재무사례연구)

This course is designed to apply the theories of financial management to the practical business cases faced by corporations and financial institutions. Students will have opportunities to practice the problems of capital structure, capital budgeting, valuation of financial assets, and risk management.

FIA410 Special Topics in Finance (재무특강)

This course covers the recent special issues of Corporate Finance, Money and Banking, Investments, Financial Engineering, Derivative Securities and Risk Management. This is an advanced course with an introduction into some empirical and quantitative methods.

FIA421 Auditing (회계감사)

This course is designed to introduce basic concepts of financial audits, generally accepted auditing standards, key audit procedures and audit techniques. This course also covers audit quality, auditors' responsibilities, and other hot issues including regulatory systems over the audit profession.

FIA490 Interdisciplinary Project (창의시스템구현)

This course is joined with other track for performing a term project through collaboration. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product by using the best knowledge learned at an undergraduate level. Lastly, students will present their work in public for evaluation.

▶ Marketing/ International Business

MIB301 Consumer Behaviors (소비자행동)

This course deals with issues related to the purchase and consumption by consumers, and how marketing managers make effective decisions using this information. It also focuses on understanding and predicting consumer behavior based on theories of consumer psychology and cognitive theory.

MIB303 Quantitative Marketing Decision Making Engineering (계량마케팅 의사결정)

Marketers are seeing increasingly faster changes in the marketplace and are barraged with an ever increasing amount of information. While many view traditional marketing as art and some view it as science, new marketing increasingly looks like engineering. This course provides students with the know-how and tools to collect the right information and perform analysis to make better marketing plans, better product designs, and better decisions. The goal of this course is to train marketing engineers to translate concepts into context-specific operational decisions and actions using analytical, quantitative, and computer modeling techniques.

MIB321 International Marketing (국제마케팅)

This course introduces basic concepts and theories of marketing management of international business. It focuses on international marketing environment and opportunities, global marketing strategy, and overcoming the barriers in different economic environments.

MIB322 International Finance (국제재무관리)

This course deals with the financial issues of corporations and financial institutions in international markets. It covers foreign exchange markets, international stock and bond markets and other related issues in risk and returns.

MIB323 Brand Management (브랜드관리론)

The goal of this course is to understand how to create a comprehensive brand architecture that will provide strategic direction and develop brand building programs. Relevant theories, models, and tools for the making of brand decisions will be discussed.

MIB402 Marketing Research (마케팅조사론)

This course offers a study of the application of scientific methods to the definition and solution of marketing problems with attention to research design, sampling theory, methods of data collection and the use of statistical techniques in the data analysis. It concerns the use of marketing research as an aid in making marketing decisions. In particular, this course addresses how the information used to make marketing decisions is gathered and analyzed. Accordingly, this course is appropriate for both prospective users of research results and prospective marketing researchers.

MIB403 Advertising Management (광고관리론)

An analysis of marketing communications from business, social, economic, and political perspectives, this course provides an in-depth discussion of advertising and promotion as key tools in marketing new and established products. This course examines advertising planning and management, research, creative development, media selection, direct response, and advertising agencies. Emphasis is on new media

MIB404 Experimental Design with Applications in Marketing (마케팅실험설계)

This course teaches the principles of experimental design for the study of consumer behavior. Experiments may be administered through surveys and on the Internet as well as in laboratory settings. The goal of this course is to become familiar with experimental research techniques and data analysis. Specifically, we will discuss various experimental designs, how to manipulate independent variables and measure dependent variables, how to control for the influence of extraneous variables, and how to eliminate alternative hypotheses. Further, we will discuss the methods to statistically analyze data obtained from experimental research (e.g., analysis of variance, regression), and the specific problems that can occur when analyzing the experimental data.

MIB409 Case Studies in Marketing (마케팅사례연구)

his course helps students understand the subjects in Marketing, and gives opportunities to discuss the managerial and academic issues through practical cases in Marketing.

MIB410 Special Topics in Marketing (마케팅특강)

This course is designed to discuss contemporary topics and issues in marketing including marketing in nonprofit organizations, marketing of services, marketing in the public sector, and marketing in an economy of scarcity. In principle, only one topic area is addressed in any one semester. Course content reflects contemporary developments and the current interests of instructors and students.

MIB421 Global Business Strategy (글로벌경영전략)

This course provides a theoretical framework for strategic management to gain sustainable competitive advantage over rivals for a long period. Using various business cases of multinational companies, this course allows students to obtain strategic mind and capabilities for strategic analysis that can readily be applicable to real international business.

MIB429 Case Studies in International Business (국제경영사례연구)

This course helps students understand the subjects in International Business within a globalized economy, and gives opportunities to discuss the managerial and academic issues through practical cases in International Business.

MIB430 Special Topics in International Business (국제경영특강)

This is an advanced course on selected issues in the theory and application of international business. Actual topics and cases will be chosen by the instructor and may vary from each

semester.

MIB490 Interdisciplinary Project (창의시스템구현)

This course is joined with other tracks for performing a term project through collaboration. Students are required to conceive a novel idea, which will be envisioned by designing and fabricating a product by using the best knowledge learned at an undergraduate level. Lastly, students will present their work in public for evaluation.