2015
COURSE CATALOG

UNIST

ULSAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY

UNIST
Vision and Goal

VISION

World Leading University to Advance Science and Technology for the Prosperity of Humankind

Cultivating creative global leaders who will usher in new scientific paradigms
through convergence in science and technology

GOALS

To be Ranked within the Top 10 Science and Technology University by 2030

Education

Cultivation of creative leaders that excel in science and technology

Research

Realization of convergence science and technology, indicating the new paradigm

STRATEGIES

Creativity, Interdisciplinary Education, Globalization, and Research-Intensive

Creativity

IT-based student-centered discussion classes (Flipped learning)

Interdisciplinary Education

Mandatory requirement to complete two or more areas of concentration

All professors are appointed to undertake two or more schools

Globalization

All courses at UNIST are conducted in 100% English

Expansion of foreign professors and students by 20%

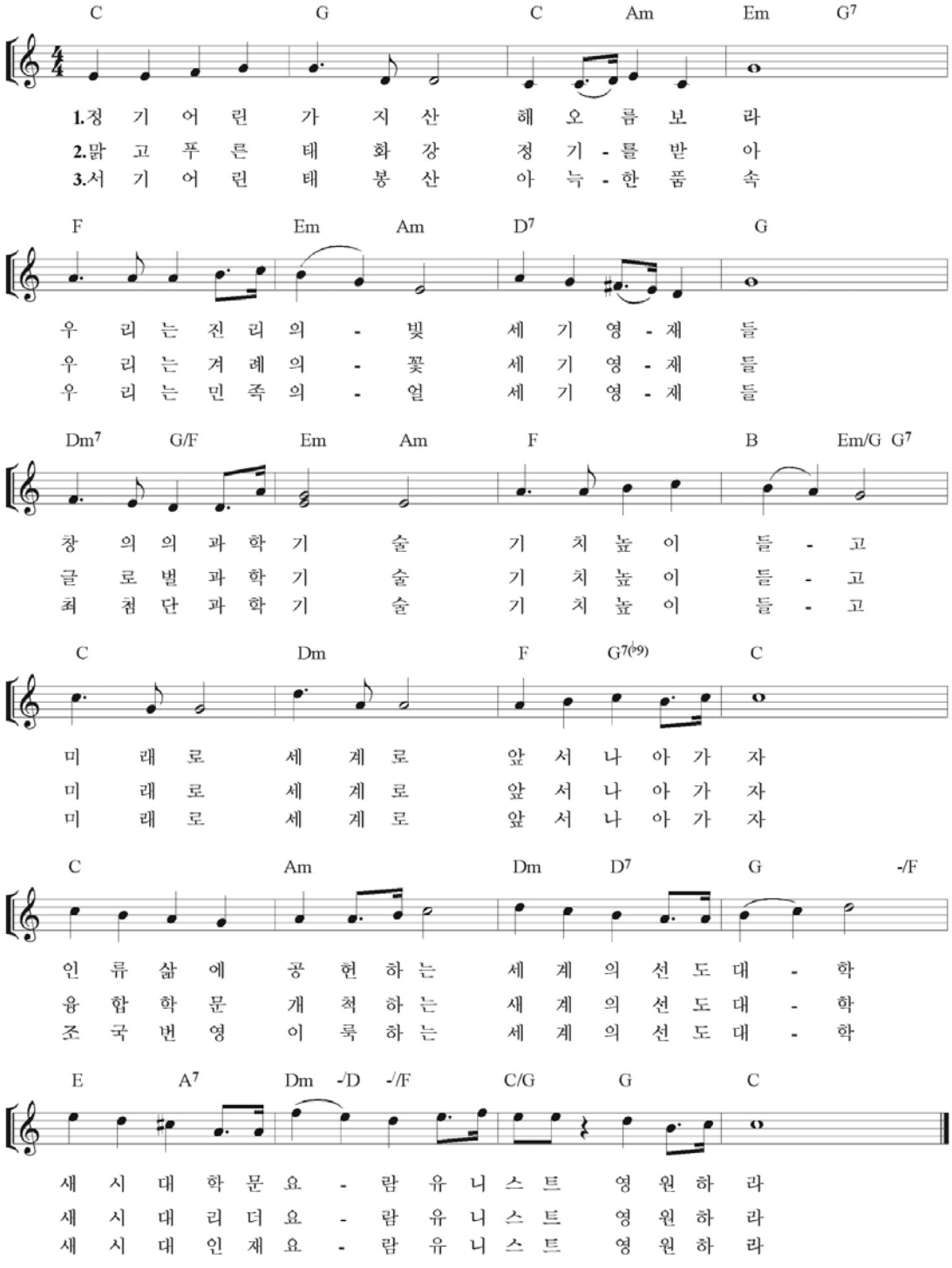
Research Intensive

Research topics for thrust area

- Next-Generation Energy
- Advanced Materials

교 가

박종해 글
김준범 곡


C G C Am Em G7
1.징 기 어 린 가 지 산 해 오 름 보 라
2.맑 고 푸 른 태 화 강 정 기 - 를 받 아
3.서 기 어 린 태 봉 산 아 늑 - 한 품 속
F Em Am D7 G
우 리 는 진 리 의 - 빛 세 기 영 - 재 들
우 리 는 겨 레 의 - 꽃 세 기 영 - 재 들
우 리 는 민 족 의 - 얼 세 기 영 - 재 들
Dm7 G/F Em Am F B Em/G G7
창 의 의 과 학 기 술 기 치 높 이 들 - 고
글 로 벌 과 학 기 술 기 치 높 이 들 - 고
최 첨 단 과 학 기 술 기 치 높 이 들 - 고
C Dm F G7(♭9) C
미 래 로 세 계 로 앞 서 나 아 가 자
미 래 로 세 계 로 앞 서 나 아 가 자
미 래 로 세 계 로 앞 서 나 아 가 자
C Am Dm D7 G -/F
인 류 삶 에 공 헌 하 는 세 계 의 선 도 대 - 학
융 합 학 문 개 척 하 는 세 계 의 선 도 대 - 학
조 국 번 영 이 룩 하 는 세 계 의 선 도 대 - 학
E A7 Dm -/D -/F C/G G C
새 시 대 학 문 요 - 람 유 니 스 트 영 원 하 라
새 시 대 리 더 요 - 람 유 니 스 트 영 원 하 라
새 시 대 인 재 요 - 람 유 니 스 트 영 원 하 라

2015 UNIST Academic Calendar

Year	Month	Date	Schedules
2015 Spring Semester	3	1(Sun)	2015 Spring Semester Begins, Holiday - Independence Movement Day
		2(Mon)	Beginning of instruction
		2(Mon) ~ 6(Fri)	Course Changes and confirmation
		20(Fri)	Course Drop deadline
		27(Fri)	End of first quarter of the semester
	4	20(Mon) ~ 24(Fri)	Mid-term Exams
		24(Fri)	End of second quarter of the semester, Submission deadline for Courses list of the summer session, Leave of Absence application deadline(General)
		30(Thu)	Course Withdrawal deadline
	5	5(Tue)	Holiday - Children's Day
		22(Fri)	End of third quarter of the semester, Confirmation deadline for Courses list of the fall semester, [Graduate school]Deadline for "Nomination of Thesis Committee" submission
		25(Mon)	Holiday - Buddha's birthday
		26(Tue) ~ 28(Thu)	Return application for the summer session
	6	3(Wed) ~ 5(Fri)	Course Registration for the summer session
		6(Sat)	Holiday - Memorial Day
		8(Mon) ~ 12(Fri)	Application for Interdisciplinary major
		15(Mon) ~ 19(Fri)	Final Exams
		22(Mon) ~ 8.30(Sun)	Summer Vacation (10 weeks)
		29(Mon) ~ 8.7(Fri)	Summer Session (6 weeks)
	7	1(Wed) ~ 10(Fri)	[Graduate school]Submit the application for the program change
		3(Fri)	Grades due for the spring semester
		20(Mon) ~ 30(Thu)	Leave of absence/Return application for the fall semester (on portal-site)
	8	5(Wed) ~ 7(Fri)	Undergraduate Course Registration for the fall semester
		15(Sat)	Holiday - Independence Day
		18(Tue)	Grades due for the summer session
		21(Fri)	Conferral of degrees
		24(Mon) ~ 26(Wed)	Tuition fee payment for the fall semester

Year	Month	Date	Schedules
2015 Fall Semester	8	31(Mon)	2015 Fall semester Begins, Beginning of instruction
	9	8.31(Mon) ~ 9.4(Fri)	Course changes and confirmation
		13(Sun)	UNIST Foundation Day
		18(Fri)	Course Drop deadline
		25(Fri)	End of first quarter of the semester
		26(Sat) ~ 28(Mon), 29(Tue)	Holiday - Chuseok(Korean Thanksgiving Day) Holiday - Substitution Holiday
	10	3(Sat)	Holiday - National Foundation Day
		9(Fri)	Holiday - Hangul Proclamation Day
		19(Mon) ~ 23(Fri)	Mid-term exams
		23(Fri)	End of second quarter of the semester, Submission deadline for Courses list of the winter session, Leave of Absence application deadline(General)
		30(Fri)	Course Withdrawal deadline
	11	20(Fri)	End of third quarter of the semester, Submission deadline for Courses list of 2016 [Graduate school]Deadline for "Nomination of Thesis Committee"submission
		23(Mon) ~ 25(Wed)	Return application for the winter session
	12	2(Wed) ~ 4(Fri)	Course Registration for the winter session
		7(Mon) ~ 11(Fri)	Application for Interdisciplinary major
		14(Mon) ~ 18(Fri)	Final Exams
		21(Mon) ~ 2.29(Mon).2016	Winter Vacation (10 weeks)
		25(Fri)	Holiday - Christmas
		28(Mon) ~ 2.5(Fri).2016	Winter Session (6 weeks)
		31(Thu)	Grade due for the fall semester
	2016 1	1(Fri)	Holiday - New Year's Day
		4(Mon) ~ 15(Fri)	[Graduate school]Submit the application for the program change
		11(Mon) ~ 20(Wed)	Leave of absence/Return application for the spring semester, 2016 (on portal-site)
	2	3(Wed) ~ 5(Fri)	Undergraduate Course Registration for the spring semester, 2016
		7(Sun) ~ 9(Tue),10(Wed)	Holiday - Lunar New Year's Day Holiday - Substitution Holiday
		19(Fri)	Grade due for the winter session
		23(Tue)	Commencement Ceremony
		22(Mon) ~ 24(Wed)	Tuition fee payment for the spring semester, 2016

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

Undergraduate

Undergraduate
Contents

Required Credit for Graduation

□ Engineering Field

Engineering Field				
Major	Major	1st Track/2nd Track	48/18	66
		Internship	3	
		Interdisciplinary Project	P	
Subtotal				69
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 I, II	2	
		General Chemistry I, II	6	
		General Chemistry Lab I, II	2	
		General Biology	3	
	IT	Engineering Programming I	3	
		Engineering Programming II	2	
	MGT	Innovation and Entrepreneurship	3	
Subtotal				39
Liberal Arts	English	Group1 English Foundation, English Forward,	4	
		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[1)]	Arts and Creativity / Topics in Arts	21	Choose seven
		Literature and Creativity / Topics in Literature		
		Globalization and Economy		
		Society and Culture / Topics in Anthropology		
		Evolution of Civilization / Topics in History		
		What is “I”? / Topics in Philosophy		
		Effective Communication / Topics in Communication Studies		
		Music and Creativity / Topics in Music		
		Korean History		
		Understanding Korea		
		Introduction to Psychology		
		Special Topics I		
Subtotal				27
Leadership	ULP	UNIST Leadership Program		8AU
Subtotal				8AU
Total 135 credits / 8AU				

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

1) Student should only choose either of the two courses among AHS each section. If He/She has taken both, one of them in the same section will not be recognized as an AHS completion but added up to the total credits for graduation.

□ Business Administration Field

Business Administration Field					
Major	Major	1st Track/2nd Track		48/18	66
		Internship		3	
		Interdisciplinary Project		P	
Subtotal					69
Fundamental	Math & Science	Calculus		3	
		Statistics/Applied Linear Algebra		6	
		General Physics		3	
		General Chemistry		3	
		General Biology		3	
	IT	Business Programming		3	
		Business IT		2	
	MGT	Innovation and Entrepreneurship		3	
		Economics		3	
Subtotal					29
Liberal Arts	English	Group1	English Foundation, English Forward,	4	
		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[1)]	Arts and Creativity / Topics in Arts		21	Choose seven
		Literature and Creativity / Topics in Literature			
		Globalization and Economy			
		Society and Culture / Topics in Anthropology			
		Evolution of Civilization / Topics in History			
		What is “I”? / Topics in Philosophy			
		Effective Communication / Topics in Communication Studies			
		Music and Creativity / Topics in Music			
		Korean History			
		Understanding Korea			
		Introduction to Psychology			
		Special Topics I			
Subtotal					27
Free Elective	Free Elective			9	
Subtotal					9
Leadership	ULP	UNIST Leadership Program			8AU
Subtotal					8AU
Total 134 credits / 8AU					

※ Students who entered UNIST in 2009 should take 'UNIST Leadership Program', 4 AU(Activity Unit, 1AU=1Hour/week)
1) Student should only choose either of the two courses among AHS each section. If He/She has taken both, one of them in the same section will not be recognized as an AHS completion but added up to the total credits for graduation.

□ Credit Requirement for Each track

School	Track	Interdisciplinary Major (Requirement/Elective)		
		1st Track	2nd Track	Total
Mechanical and Nuclear Engineering	Mechanical Engineering (MEN)	33/15	9/9	48/18
	Nuclear Science and Engineering (NSE)	27/21	12/6	48/18
Urban and Environmental Engineering	Environmental Science and Engineering (ESE)	21/27	9/9	48/18
	Urban Infrastructure Engineering (UIE)	18/30	9/9	48/18
	Disaster Management Engineering (DME)	18/30	9/9	48/18
Design and Human Engineering	Industrial Design (ID)	30/18	0/18	48/18
	Human and System Engineering (HSE)	18/30	0/18	18/48
Materials Science and Engineering	Advanced Materials Science (AMS)	21/27	9/9	48/18
	Nano Materials Engineering (NME)	21/27	9/9	48/18
Energy and Chemical Engineering	Energy Engineering (ENE)	28/20	12/6	48/18
	Chemical Engineering (ACE)	21/27	15/3	48/18
Electrical and Computer Engineering	Electrical Engineering (EE)	36/12	18/-	48/18
	Computer Science & Engineering (CSE)	36/12	9/9	48/18
Life Sciences	Biomedical Engineering (BME)	30/18	12/6	48/18
	Biological Sciences (BIO)	23/25	15/3	48/18
Natural Science	Physics (PHY)	30/18	12/6	48/18
	Chemistry (CHEM)	28/20	12/6	48/18
	Mathematical Sciences (MTH)	30/18	12/6	48/18
Business Administration	Management (MGT)	33/15	18/-	48/18
	Finance & Accounting (FIA)	24/24	15/3	48/18
	Entrepreneurship(EPS)*	-/-	12/6	12/6

* Students can choose Entrepreneurship track only as a 2nd track, not for the 1st track.

□ Degree conferred for Each Track

School	Degree	Track	Remark
School of Mechanical and Nuclear Engineering 기계및원자력공학부	B.S. in Mechanical and Nuclear Engineering 공학사	Mechanical Engineering (MEN) 기계공학	
		Nuclear Science and Engineering (NSE) 원자력 공학 및 과학	
School of Urban and Environmental Engineering 도시환경공학부	B.S. in Urban and Environmental Engineering 공학사 or 이학사	Environmental Science and Engineering (ESE) 환경과학공학	
		Urban Infrastructure Engineering (UIE) 도시건설공학	
		Disaster Management Engineering (DME) 재난관리공학	
School of Design and Human Engineering 디자인및인간공학부	B.S. in Design and Human Engineering 공학사	Industrial Design (ID) 산업디자인	
		Human and Systems Engineering (HSE) 인간 및 시스템공학	
School of Materials Science and Engineering 신소재공학부	B.S. in Materials Science and Engineering 공학사	Advanced Materials Science (AMS) 신소재과학	
		Nano Materials Engineering (NME) 나노재료공학	
School of Energy and Chemical Engineering 에너지및화학공학부	B.S. in Energy and Chemical Engineering 공학사	Energy Engineering (ENE) 에너지공학	
		Chemical Engineering (ACE) 화학공학	
School of Electrical and Computer Engineering 전기전자컴퓨터공학부	B.S. in Electrical and Computer Engineering 공학사	Electrical Engineering (EE) 전기 및 전자공학	
		Computer Science and Engineering (CSE) 컴퓨터공학	
School of Life Sciences 생명과학부	B.S. in Biomedical Engineering 공학사	Biomedical Engineering (BME) 생명공학	
	B.S. in Biological Sciences 이학사	Biological Sciences (BIO) 생명과학	
School of Natural Science 자연과학부	B.S. in Natural Science 이학사	Physics (PHY) 물리학	
		Chemistry (CHEM) 화학	
		Mathematical Sciences (MTH) 수리과학	
School of Business Administration 경영학부	Bachelor of Business Administration (B.B.A.) 경영학사	Management (MGT) 경영학	
		Finance & Accounting (FIA) 재무·회계학	

□ 2014 Curriculum Applicability and Interim Measures

○ The Curriculum is applied to following students:

- School entrants since 2014
- School entrants before 2014 who changed new tracks in and after 2014

Students who entered before 2014 are eligible to graduate in accordance with the 2013 curriculum and can also graduate in their new school. Students who changed into new tracks should take the courses in accordance with the 2014 curriculum.

○ Interim Measures

- Interdisciplinary Project is a non-credit project (S/U) for graduation.
- Each course of Dynamics of IT(3) and Leadership and Teamwork(3) is changed into a major of business administration. Students who take or do not take the courses must follow the directions of [Table 1].
- In case particular courses or tracks have been abolished, students should take designated alternative courses in place of the discontinued courses.

[Table 1]

<table>
<tr><th>Classification</th><th>DIT
(IT course designated by school)</th><th>Leadership and Teamwork</th><th>Interdisciplinary Project</th></tr>
<tr><td rowspan="2">2009~2012 entrants in accordance with 2013 curriculum (33/27)</td><td colspan="2">If you have not taken</td><td rowspan="2">Track Required
(1 credit for each)
Total 2 credits</td></tr>
<tr><td>Take IT courses required by each school(Refer to Table 2)</td><td>Earn 3 credits from any courses after 2014</td></tr>
<tr><td rowspan="2">2009~2013 entrants in accordance with 2014 curriculum (48/18)</td><td colspan="2">If you have taken</td><td rowspan="2">Non-credit project (S/U)</td></tr>
<tr><td>Credited as Major</td><td>Engineering:
Credited as AHS
Management:
Credited as Major</td></tr>
</table>

[Table 2]

▸ Required IT Courses (For students who entered 2009~2012 and majored track before 2014)

School	Programming	Practical IT	Designated course by the school		
			Track	Course No.	Title
Mechanical and Nuclear Engineering	Engineering Programming I	Engineering Programming II	SDM, TFP	MEN250	Mechanical drawing and Lab
			Nuclear Science and Engineering	NSE480	Introduction to Nuclear Engineering IT
Urban and Environmental Engineering	Engineering Programming I	Engineering Programming II	Numerical Modeling and Analysis		
Design & Human Engineering	Engineering Programming I	Engineering Programming II	Interactive Technology Computational Tools for Engineers : choose 1		
			Track	Course No.	Title
Materials Science and Engineering	Engineering Programming I	Engineering Programming II	MSE	AMS390	Introduction to Computational Materials Science
			Track	Course No.	Title
Energy and Chemical Engineering	Engineering Programming I	Engineering Programming II	Energy Engineering	ENE480	Scientific Expression with IT
			Chemical Engineering	ACE301	Computational Methods for Chemical Engineering
Electrical and Computer Engineering	Engineering Programming I	Engineering Programming II	CSE201 Digital Logic (= CSE201 Digital System Lab)		
			Track	Course No.	Title
Life Sciences	Engineering Programming I	Engineering Programming II	Biomedical Engineering	BME301	Computational Methods for Biosciences and Bioengineering
			Biological Sciences	ACE301 or BME301	Computational Methods for Chemical Engineering or Computational Methods for Biosciences and Bioengineering
			Track	Course No.	Title
Natural Science	Engineering Programming I	Engineering Programming II	NCS	ACE301 or BME301	Computational Methods for Chemical Engineering or Computational Methods for Biosciences and Bioengineering

School	Programming	Practical IT	Designated course by the school
Business Administration	Business Programming	Business IT	Dynamics of IT

※ Complete based on 1T

○ Interdisciplinary Project

1. Description

This course is joined with other tracks for completing a term project through collaboration. Students are required to conceive of 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.

2. Process

◊ When : During the final semester before graduating

※ It may be started in the 1st semester of senior year depending on each schools

◊ How-to :

- Apply for the Interdisciplinary Project on Portal site during the course registration period
- Consulting the advisor you selected for the subject of the Interdisciplinary Project
- Evaluation will be implemented with a experiment report, a poster, a presentation, etc.

◊ Credit : non-credit (P/F)

◊ Process :

Project Assignment → <Interdisciplinary Project> Implementation → Presentation and Evaluation → Grading → Credit given during the grade entry period every semester

□ 2015 Curriculum Applicability and Interim Measures

○ English Courses according to the Placement Test

- Student must choose two courses as below (According to the Placement Test)

Level	Course Title	Remark
Level 1	English Foundation, English Forward	The English Level is determined prior to admission by english placement test
Level 2	English Forward, Building writing / Building Speaking & Grammar : Choose 1	
Level 3	Building writing , Building Speaking & Grammar	

○ AHS Courses

- Student should only choose either of the two courses among AHS each section. If He/She has taken both, one of them in the same section will not be recognized as an AHS completion but added up to the total credits for graduation.

Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark
AHS101 (AHS201)	1. Arts and Creativity 2. Topics in Arts	1. 예술과 창의성 2. 예술 특강	3-3-0	
AHS102 (AHS202)	1. Literature and Creativity 2. Topics in Literature	1. 문학과 창의성 2. 문학 특강	3-3-0	
AHS103	Globalization and Economy	세계화와 글로벌경제	3-3-0	
AHS104 (AHS204)	1. Society and Culture 2. Topics in Anthropology	1. 사회와 문화 2. 인류학 특강	3-3-0	
AHS105 (AHS205)	1. Evolution of Civilization 2. Topics in History	1. 문명의 발전 2. 역사 특강	3-3-0	
AHS106 (AHS206)	1. What is "I"? 2. Topics in Philosophy	1. 나의 정체성 2. 철학 특강	3-3-0	
AHS107 (AHS207)	1. Effective Communication 2. Topics in Communication Studies	1. 효과적 커뮤니케이션 2. 커뮤니케이션 특강	3-3-0	
AHS108 (AHS208)	1. Music and Creativity 2. Topics in Music	1. 음악과 창의성 2. 음악 특강	3-1-2	
AHS109	Korean History	한국사	3-3-0	
AHS110	*Understanding Korea	한국의 이해	3-3-0	
AHS113	Introduction to Psychology	심리학 개론	3-3-0	
AHS230	Special Topics I	특강 I	3-3-0	

* Required course for only international students who entered from 2014 onwards.

○ Korean Language Courses

- Changing to improve the ability of Korean for international students

Before			After			Remark
Course No	Title	Credit	Course No	Title	Credit	
LNG203	Korean Language I	1-1-0	LNG203	Korean Foundation	2-2-0	
LNG204	Korean Language II	1-1-0	LNG204	Korean for Everyday	2-2-0	

○ New Track : Entrepreneurship(EPS) is newly open in 2015 curriculum.

- Entrants who was selected as Entrepreneurship Talent Admission in 2015 must choose EPS track as a 2nd track
- Other students in 2014 curriculum are also eligible for choosing EPS track only for 2nd track
- Curriculum

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Prerequisite
Required	MGT204	Marketing Management	마케팅 관리	3-3-0	
	MGT308	Strategic Management	경영전략	3-3-0	
	MGT361	Technology Management	기술경영	3-3-0	
	MGT473	Entrepreneurship and Venture Management	창업과 벤처	3-3-0	
Elective	MGT474	Social Entrepreneurship	사회적 기업의 창업	3-3-0	
	EPS491	Capstone Projects I	캡스톤 디자인 I (창업프로젝트)	3-3-0	
	EPS492	Capstone Projects II	캡스톤 디자인II (창업프로젝트)	3-3-0	
	IID404	Product Service System Design	제품 서비스 시스템 디자인	3-2-2	
	IID232	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	

Division of General Studies

1. School Introduction

Students enter UNIST into Science/Technology Group and Management Group. DGS is responsible for their basic science and cultural education during their freshmen year. Upon completing freshmen curricula at DGS successfully, students choose their special field (division/department/track) according to the UNIST regulation for the next level education.

DGS offers courses in Mathematics and basic sciences (Physics, Chemistry, Biology) as well as basic IT and management courses that would provide solid foundation for students when they study major fields of their choice.

In order to cultivate a wide intellectual horizon, an innovative creativity, and a harmonious personality through cooperative endeavor for each student we offer essential courses in Humanities, Social sciences, English, and Arts.

2. Undergraduate 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 works.

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 Innovation and Entrepreneurship and Economics.

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

Course	Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
Fundamental	M&S	MTH101	Calculus	미적분학	3-3-1	
		MTH111	Calculus I	미적분학 I	3-3-1	
		MTH112	Calculus II	미적분학 II	3-3-1	MTH111
		MTH201	Differential Equations	미분방정식	3-3-0	MTH111
		MTH203	Applied Linear Algebra	응용선형대수	3-3-0	

Course	Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
		MTH211	Statistics	통계학	3-3-0	
		PHY105	General Physics	일반물리학	3-3-0	
		PHY101 (PHY102)	General Physics I (General Physics I H)	일반물리학 I (고급일반물리학 I)	3-3-0	() is a honor course
		PHY103 (PHY104)	General Physics II (General Physics II H)	일반물리학 II (고급일반물리학 II)	3-3-0	() is a honor course
		PHY107	General Physics Lab I	일반물리학실험 I	1-0-2	
		PHY108	General Physics Lab II	일반물리학실험 II	1-0-2	
		CHM103	General Chemistry	일반화학	3-3-0	
		CHM101	General Chemistry I	일반화학 I	3-3-0	
		CHM102	General Chemistry II	일반화학 II	3-3-0	
		CHM105	General Chemistry Lab I	일반화학실험 I	1-0-2	
		CHM106	General Chemistry Lab II	일반화학실험 II	1-0-2	CHM101 and CHM105
		BIO101	General Biology	일반생물	3-3-0	
	IT	ITP108	Business Programming	Business Programming	3-3-0	
		ISM202	Business IT	Business IT	2-2-0	
		ITP107	Engineering Programming I	공학프로그래밍 I	3-2-2	
		ITP117	Engineering Programming II	공학프로그래밍 II	2-1-2	
	MGT	MGT102	Innovation and Entrepreneurship	기업가정신과 혁신	3-3-0	
		MGT106	Economics	경제원론	3-3-0	
Liberal Arts	ENG	ENG100	English Foundation	English Foundation	2-2-0	
		ENG107	English Forward	English Forward	2-2-0	ENG100
		ENG108	Building Writing	Building Writing	2-2-0	ENG107
		ENG109	Building Speaking & Grammar	Building Speaking & Grammar	2-2-0	ENG107
	LNG	LGN201	Chinese Foundation	Chinese Foundation	2-2-0	
		LNG202	Chinese Forward	Chinese Forward	2-2-0	
		LNG203	Korean Foundation	Korean Foundation	2-2-0	only for internationals (substitute for Chinese)
		LNG204	Korean for Everyday	Korean for Everyday	2-2-0	
	AHS	AHS101 (AHS201)	1. Arts and Creativity 2. Topics in Arts	1. 예술과 창의성 2. 예술 특강	3-3-0	
		AHS102 (AHS202)	1. Literature and Creativity 2. Topics in Literature	1. 문학과 창의성 2. 문학 특강	3-3-0	
		AHS103	Globalization and Economy	세계화와 글로벌경제	3-3-0	
		AHS104 (AHS204)	1. Society and Culture 2. Topics in Anthropology	1. 사회와 문화 2. 인류학 특강	3-3-0	
		AHS105 (AHS205)	1. Evolution of Civilization 2. Topics in History	1. 문명의 발전 2. 역사 특강	3-3-0	
		AHS106 (AHS206)	1. What is "I"? 2. Topics in Philosophy	1. 나의 정체성 2. 철학 특강	3-3-0	

Course	Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Prerequisite
		AHS107 (AHS207)	1. Effective Communication 2. Topics in Communication Studies	1. 효과적 커뮤니케이션 2. 커뮤니케이션 특강	3-3-0	
		AHS108 (AHS208)	1. Music and Creativity 2. Topics in Music	1. 음악과 창의성 2. 음악 특강	3-1-2	
		AHS109	Korean History	한국사	3-3-0	
		AHS110	*Understanding Korea	한국의 이해	3-3-0	
		AHS113	Introduction to Psychology	심리학 개론	3-3-0	
		AHS230	Special Topics I	특강 I	3-3-0	
Free Elective	English	ENG201	Introduction to English Styles	Introduction to English Styles	3-3-0	ENG107
		ENG202	English Language & Culture	English Language & Culture	3-3-0	ENG107
		ENG203	English for Business	English for Business	3-3-0	ENG107
		ENG204	English for Science and Technology	English for Science and Technology	3-3-0	ENG107
		ENG205	Academic Reading and Writing	Academic Reading and Writing	3-3-0	ENG107
		ENG206	English Language Information and Data	English Language Information and Data	3-3-0	ENG107
	AHS	AHS111	Sports and Health	스포츠와 건강	1-0-2	

* Required course for only international students who enter from 2014 onwards.
* International students are recommended to take one of Korean courses instead of taking Chinese courses

4. Recommended Course Schedules

1) Math&Science

Year/Term	I (Spring)	II (Fall)	Remark
1	BIO101 CHM101 CHM105 MTH101 MTH111 PHY101 PHY105 PHY107	BIO101 CHM102 CHM103 CHM106 MTH112 PHY103 PHY108	

2) IT

Year/Term	I (Spring)	II (Fall)	Remark
1	ITP107 ITP108 ITP117 ISM202	ITP107 ITP117 ISM202	

3) Management

Year/Term	I (Spring)	II (Fall)	Remark
1	MGT102 MGT106	MGT102	

4) English

Year/Term	I (Spring)	II (Fall)	Remark
1~2	ENG100 ENG107 ENG108 ENG109	ENG100 ENG107 ENG108 ENG109	

5) Language

Year/Term	I (Spring)	II (Fall)	Remark
1~2	LNG201 LNG202 LNG203 LNG204	LNG201 LNG202 LNG203 LNG204	

6) AHS

Year/Term	I (Spring)	II (Fall)	Remark
1~2	AHS101 AHS102 AHS103 AHS104 AHS105 AHS106 AHS107 AHS108 AHS110	AHS101 AHS102 AHS103 AHS104 AHS105 AHS106 AHS107 AHS108 AHS110 AHS230	Topics in Literature and Topics in philosophy will be offered from 2016

7) Free elective

Year/Term	I (Spring)	II (Fall)	Remark
1~2	ENG203 ENG205	ENG201 ENG202 ENG204 ENG206	

5. Recommended Mathematics Course for Each Track

School	Track	Course No.	Required Mathematics course	Semester
Mechanical and Nuclear Engineering	Mechanical Engineering	MTH203	Applied Linear Algebra	2-2
		MTH201	Differential Equations	2-1
	Nuclear Science and Engineering	MTH203	Applied Linear Algebra	2-2
		MTH201	Differential Equations	2-1
Urban and Environmental Engineering	Environmental Science and Engineering	MTH201	Differential Equations	2-1
		MTH203 or MTH211	Choose One Between: Applied Linear Algebra, Statistics	2-2
	Urban Infrastructure Engineering	MTH201	Differential Equations	2-1
		MTH203 or MTH211	Choose One Between: Applied Linear Algebra, Statistics	2-2
	Disaster Management Engineering	MTH201	Differential Equations	2-1
		MTH203 or MTH211	Choose One Between: Applied Linear Algebra, Statistics	2-2
Design & Human Engineering	Industrial Design	MTH203	Applied Linear Algebra	2-1
		MTH211	Statistics	2-2
	Human & Systems Engineering	MTH203	Applied Linear Algebra	2-1
		MTH211	Statistics	2-2
Materials Science and Engineering	Advanced Materials Science	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
	Nano Materials Engineering	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
Energy and Chemical Engineering	Energy Engineering	MTH203	Applied Linear Algebra	2-2
		MTH201	Differential Equations	2-1
	Chemical Engineering	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
Electrical and Computer Engineering	Electrical Engineering	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
	Computer Science & Engineering	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
Life Sciences	Biomedical Engineering	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
	Biological Sciences	MTH203	Applied Linear Algebra	2-1
		MTH211	Statistics	2-2
Natural Science	Chemistry	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
	Mathematical Sciences	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
	Physics	MTH203	Applied Linear Algebra	2-1
		MTH201	Differential Equations	2-2
Business Administration	Management	MTH203	Applied Linear Algebra	1-2
		MTH211	Statistics	1-2
	Finance & Accounting	MTH203	Applied Linear Algebra	1-2
		MTH211	Statistics	1-2

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

▸ Fundamentals required to Business administration field students when they choose Engineering field tracks as 2nd track

Course Title	School of Mechanical and Nuclear Engineering		School of Urban and Environmental Engineering			School of Design & Human Engineering		School of Materials Science and Engineering	
	MEN	NSE	ESE	UIE	DME	ID	HSE	AMS	MNE
Calculus I									
Calculus II	R	R					R		
Differential Equations	R	R	R	R	R			R	R
General PhysicsI	R	R							
General Physics II	R	R						R	R
General Chemistry I								R	R
General Chemistry II								R	R
General Physics Lab I	R	R						R	R
General Physics Lab II	R	R						R	R
General Chemistry Lab I								R	R
General Chemistry Lab II								R	R

Course Title	School of Energy and Chemical Engineering		School of Electrical and Computer Engineering		School of Life Sciences		School of Natural Science		
	ENE	ACE	EE	CSE	BME	BIO	PHY	CHEM	MTH
Calculus I	R								
Calculus II	R						R		R
Differential Equations		R	R	R	R		R		R
General PhysicsI	R						R		
General Physics II	R	R	R	R	R		R		
General Chemistry I	R	R			R	R			
General Chemistry II	R	R			R	R		R	
General Physics Lab I			R	R			R		
General Physics Lab II			R	R			R		
General Chemistry Lab I		R						R	
General Chemistry Lab II		R						R	

▸ Fundamentals required to Engineering field students when they choose Business administration field tracks as 2nd track

Course Title	School of Business Administration		
	MGT	FIA	EPS
Economics	R	R	R
Statistics	R	R	-

R : Required

▸ For Business administration field 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. Business administration field ⇒ Engineering Field

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

2. Engineering Field ⇒ Business administration field

Category	Course	Remarks
Accepted	Calculus I = Calculus	
	Engineering Programming I = 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	

7. History of Courses Change of 2009-2015 [Correspondence/Substitution]

Acad. Yr.	2009		2010		2015
Math	MTH101 Calculus (3)	⇨	MTH101 Calculus (3)		
			MTH111 Calculus I (3)		
			MTH112 Calculus II (3)		
			MTH103 Applied linear algebra(3)	⇨	MTH203 Applied linear algebra(3)

※ Student already took Calculus in 2009 should take 'Applied Linear Algebra, Differential Equations, Statistics' 3 courses.

Acad. Yr.	2009		2013
Science	CHE104 General Chemistry Lab (2)	⇨	CHE105 General Chemistry Lab I (1)
			CHE106 General Chemistry Lab II (1)
	PHY106 General Physics Lab (2)	⇨	PHY107 General Physics Lab I (1)
			PHY108 General Physics Lab II (1)

Acad. Yr.	2009		2010		2011
GMT	GMT105 Economics (3)	⇨	GMT105 Microeconomics (3)	⇨	GMT106 Economics (3)

Acad. Yr.	2009-1		2009-2		2010		2013
IT	ITP103 Java (2)	⇨	ITP106 Intro. to Programming (3)	⇨	ITP107 Engineering Programming (3)	⇨	ITP107 Engineering Programming I (3)
	ITP104 C++ (2)				ITP108 Business Programming (3)	⇨	ITP108 Business Programming (3)

Acad. Yr.	2009-1		2009-2		2011		2013
IT	ITP101 Excel (2)	⇨	ITP105 Practical IT (2)	⇨	ITP117 Engineering Programming Lab (2)	⇨	ITP117 Engineering Programming II (2)
	ITP102 Access (2)				ISM202 Dynamics of IT Lab (2)	⇨	ISM202 Business IT (2)

Acad. Yr.	2009		2012		2013
IT	ISM201 Dynamics of IT (3)	⇨	ISM201 Dynamics of IT (3) or designated course by ENG school	⇨	IT course designated by ENG school (3)
					ISM201 Dynamics of IT (3)

Acad. Yr.	2009		2010		2015
English			ENG100 English Foundation(0)	⇨	ENG100 English Foundation(2)
	ENG101 Intermediate English (2)	⇨	ENG107 English Forward (2)		
	ENG102 Advanced English (2)	⇨	ENG108 Building Writing (2) ENG109 Building Speaking & Grammar (2)		
Free Elec.	ENG103 Building English Writing (2)	⇨	ENG110 English Language & Culture (3)	⇨	ENG202 English Language & Culture (3)
	ENG104 Building English Grammar for Speaking (2)	⇨	ENG111 English for Business (3)	⇨	ENG203 English for Business (3)
	ENG105 English24 (3)	⇨	ENG106 Intro. to English Styles (3)	⇨	ENG201 Introduction to English Styles (3)

Acad. Yr.	2014		2015
Free Elec.	ENG112 English for Science and Technology (3)	⇨	ENG204 English for Science and Technology (3)
	ENG113 Academic Reading and Writing (3)	⇨	ENG205 Academic Reading and Writing (3)
			ENG206 English Information and Data(3) (New)
Language	LNG203 Korean Language I (1)	⇨	LNG203 Korean Foundation (2)
	LNG204 Korean Language II (1)	⇨	LNG204 Korean for Everyday (2)

8. Course Descriptions

1) 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 I 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.

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.

MTH203 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.

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 [일반물리학 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 [고급일반물리학 I]

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 I.

PHY103 General Physics II [일반물리학 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 [고급일반물리학 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 [일반물리학]

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.

PHY107 General Physics Lab I [일반물리학실험Ⅰ], PHY108 General Physics Lab II [일반물리학실험Ⅱ]

This laboratory has been designed to assist students in the General Physics I & II. Laboratory work constitutes an essential part of all physics courses. This lab does not only give an opportunity to the engineering students to establish a bridge between the theoretical concept that they learn in classroom and the real physics experiments, but also helps them to improve their application skills. Experiments in this lab have been specifically designed to cover the fundamental aspects of General Physics I & II. General Physics I lab covers nine mechanical experiments and General Physics II lab covers nine experiments of electricity and magnetism.

CHM101 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, atomic structure and periodicity, chemical bonding, physical and chemical equilibrium, and thermochemistry. This course is designed for students who plan to major in science and engineering.

CHM102 General Chemistry II [일반화학 II]

As the continuation of General Chemistry I, this course includes acid and base, chemical kinetics, electrochemistry, transition metal chemistry, nuclear chemistry, and organic chemistry. This course is designed for students who plan to major in science and engineering.

CHM103 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 business administration.

CHM105 General Chemistry Lab I [일반화학실험 I]

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.

CHM106 General Chemistry Lab II [일반화학실험 II]

This course is a continuation of CHM105 with emphasis upon solution properties, kinetics, equilibrium, acids and bases, and quantitative analysis.

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.

2) Management

MGT102 Innovation and Entrepreneurship [기업가정신과 혁신]

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.

MGT106 Economics [경제원론]

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.

3) IT

ITP107 Engineering Programming I [공학프로그래밍 I]

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, algorithm design, and so on. Students will also learn how to design, compile, test, and debug C++ programs, through relevant laboratory sessions.

ITP117 Engineering Programming II [공학프로그래밍 II]

In this course, students will gain hands-on experience in C++ programming at real software and hardware platforms. This course includes lecture session and a laboratory session that take place once a week, respectively. Lecture sessions will provide the basic programming skills that are not covered by Engineering Programming, but are necessary for the given platforms. Laboratory sessions will emphasize the implementation of C++ programs in the given platforms. Students will plan and design their own term project through the laboratory sessions, and aiming at interdisciplinary and creative work.

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.

ISM202 Business IT

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.

4) English

ENG100 English Foundation

This course is offered for students who need training in four English skills (listening, reading, speaking, and writing) at the low intermediate level (level 1 from the placement test). Through engaging in authentic tasks, the students will build English proficiency required for academic communication. The class will address diverse topics designed for online and offline activities.

ENG107 English Forward

This course is the general English class which focuses on training in production skills at the high-intermediate level. The major goal of the course is to help the students placed to level 2 grow more autonomous in learning English through online and offline integrated learning activities. By

actively participating in various tasks, the students will improve their English skills mainly for academic purposes.

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.

5) Foreign Languages

LNG201 Chinese Foundation [초급 중국어]

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]

Chinese Forward is intended for students who have finished Chinese Foundation, or students who already have listening and speaking skills in Mandarin at elementary levels. The objective of this course is to help the students enhance all basic Chinese language skills (speaking, listening, reading, and writing), as well as understand practical Chinese in a business situation. Students will learn and practice Chinese appropriately and effectively by doing presentations and group work.

LNG203 Korean Foundation

The aim of this class is developing abilities of non-native speakers. In the beginner level 1 the aim is that of fundamental communication in Korean, beginning with learning vowels and consonants, self-introductions, shopping, express of numbers, phone numbers, dates and prices, ask and give for direction, talking about your friend's schedule etc. Vocabulary related to time and location and students can also make sentences by themselves using basic verbs. Also, students will understand and express themselves in every day life situations.

LNG204 Korean for Everyday

The purpose of the lecture is to improve Korean language ability of learners who are educated Korean language for more than 75 hours or has Korean language ability corresponding to the above. The lecture will make learners perform basic language functions required to daily life such as

expressing a plan, ability, symptoms, describing, asking opinions, making suggestions, promising and expressing experience.

6) 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.

AHS201 Topics in Arts [예술 특강]

This course focuses on seminal issues in a particular field of arts. Students will discuss main topics in one of the core branches of arts. The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

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.

AHS202 Topics in Literature [문학 특강]

This course focuses on seminal issues in a particular field of literature. Students will discuss main topics in one of the core branches of literary studies. The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

AHS103 Globalization and Economy [세계화와 글로벌경제]

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.

AHS204 Topics in Anthropology [인류학 특강]

This course focuses on seminal issues in a particular field of anthropology. Students will discuss main topics in one of the core branches of anthropology. The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

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.

AHS205 Topics in History [역사 특강]

This course focuses on seminal issues in a particular field of western history. Students will discuss main topics in one of the core branches of western history. The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

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.

AHS206 Topics in Philosophy [철학 특강]

This course focuses on seminal issues in a particular field of philosophy. Students will discuss main topics in one of the core branches of contemporary philosophy. The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

AHS107 Effective Communication [효과적 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.

AHS207 Topics in Communication Studies [커뮤니케이션 특강]

This course focuses on seminal issues in a particular field of rhetoric and communication studies. Students will discuss main topics in one of the core branches of rhetoric and communication studies.

The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

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.

AHS208 Topics in Music [음악 특강]

This course focuses on seminal issues in a particular field of music. Students will discuss main topics in one of the core branches of music. The particular contents of this course will be chosen by the instructor each semester when it is opened. Consequently, they may differ from the previous semesters.

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 Understanding Korea [한국의 이해]

Korea is often known as “the hermit kingdom” or “the land of morning calm” to Westerners. Contrary to the static and even passive images in such expressions, Korea has gone through swift changes internally and externally. As an introduction of Korea particularly designed for UNIST's international students, this course aims to examine various issues regarding what makes the current shape of Korea by dealing with specific topics in society, culture, history, literature, and others. In order to keep an academic depth while covering the topics comprehensively, instructors in the Division of General Studies will take turns to teach individually or collaboratively. Thus, this course is subject to change according to the expertise of the instructor. Course materials are English translations and class discussion will also be conducted in English.

AHS111 Sports and Health [스포츠와 건강]

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

AHS113 Introduction to Psychology [심리학 개론]

This course explores the introductory topics in psychology, such as perception, learning, memory,

sleep, and mental illness. There will be an overview of history of psychology, cognitive psychology, evolutionary psychology, social psychology, developmental psychology, educational psychology, clinical psychology, counselling psychology, and so forth.

AHS230 Special Topics I [특강 I]

This course focuses on seminal issues in a various field of AHS(Arts, Humanity and Social Science). Students will discuss main topics in one of the core branches of AHS. The particular contents of this course will be chosen by the instructor each semester when it is opened.

7) Free elective

ENG201 Introduction to English Styles

This course is an introduction to various English styles. Through reading and listening to varieties of English(informal and formal English; newspaper; correspondence; stories etc.), students will understand appropriate uses of English styles to different time and place.

ENG202 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.

ENG203 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.

ENG204 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.

ENG205 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.

ENG206 English Language Information and Data

“English Language, Information, and Data" introduces and discusses the theory of language underlying the large-scale collection of texts designed for research purposes, To this end, the course focuses on the principles of the theory and practice of the corpus linguistic approach to language with computerized text analysis programs. Specifically, the statistical quantitative analysis of language and the quantitative analysis of semantic prosody are discussed to account for understanding human cognition, interaction, behaviour and discourses. The course also discusses the application of analysis results in the diverse areas of scientific disciplines.

8) Leadership Program

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 Mechanical and Nuclear Engineering

1. School Introduction

The School of Mechanical and Nuclear Engineering (SMNE) consists of two tracks such as Mechanical Engineering (MEN) and Nuclear Science and Engineering (NSE). The SMNE focuses on world-class research and education in order to nurture creative experts and scholars who can contribute to the development and advancement of cutting-edge industries. interdisciplinary approaches with the state-of-the-art facilities by concentrating on a variety of research fields, including design, manufacturing, thermofluid engineering, system control, robotics, system analysis, energy, nuclear reactions, nuclear fuels and nuclear fuel cycle, nuclear fuel cladding and structural materials, nuclear reactor/system, and many nuclear applications. Although the SMNE provides two disciplines with students it together emphasizes the creativity and ingenuity of the education.

2. Undergraduate Programs

□ Track Introduction

1) Mechanical Engineering (MEN)

Mechanical Engineering deals with numerous systems and has a variety of important applications such as automobiles, aircraft, ships, home appliances, electronic devices, power plants and so on. The mechanical systems and the fundamental science and technology of mechanical engineering have made dramatic advances and high impacts on the global economies and the standard of living. In the track of mechanical engineering, students are educated and trained to learn the underlying principles of mechanical engineering and to apply the knowledge to real-world examples and case studies hands-on. Disciplines include thermodynamics, fluid mechanics, solid mechanics, dynamics, machine design, advanced materials processing, laser-assisted manufacturing, micro/nano machining, MEMS, biomedical products, controls and mechatronics, acoustics, tribology and so on.

2) Nuclear Science and Engineering (NSE)

The science and engineering principles for nuclear engineering are provided, which are related to

using the energy released from nuclear fission or fusion such as nuclear power generation, nuclear propulsion, nuclear radiation applications. Education and research topics include design principles and analyses for nuclear reactions, commercial light water reactors and next-generation nuclear reactors such as liquid-metal-cooled fast reactor and gas-cooled reactor for hydrogen generation, nuclear fusion reactor, fuel cycle and nuclear waste disposal, systems and components for nuclear reactors, reactor theory, nuclear thermo-hydraulics, nuclear fuel and cladding, nuclear structural materials, magnetohydrodynamics, and nuclear radiation applications.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		Remark
		Interdisciplinary Major		
		1st Track	2nd Track	
Mechanical Engineering	Required	33	9[1)]	
	Elective	15	9	
Nuclear Science and Engineering	Required	27	12	
	Elective	21	6	

1) Students who choose MEN as their 2nd track are required to take at least three out of eight courses: Thermodynamics, Fluid mechanics, Solid MechanicsI, Solid MechanicsII, Dynamics, Mechanical Engineering Lab, Mechanical Drawing and Lab, and Heat Transfer.

3. Curriculum

□ Mechanical Engineering (MEN) :

Course is		Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	Core requirements	MEN210	Thermodynamics	열역학	3-3-0	
		MEN220	Fluid Mechanics	유체역학	3-3-0	
		MEN230	Solid MechanicsI	고체역학Ⅰ	3-3-0	
		MEN231	Solid MechanicsII	고체역학Ⅱ	3-3-0	MEN230
		MEN250	Mechanical Drawing and Lab	기계제도 및 실습	3-2-2	
		MEN270	Dynamics	동역학	3-3-0	
		MEN300	Mechanical Engineering Lab	기계공학실험	3-1-4	
		MEN310	Heat Transfer	열전달	3-3-0	MEN210, MEN220
	Selective requirements 2)	MEN211	Applied Thermodynamics	응용열역학	3-3-0	MEN210
		MEN301	Numerical Analysis	수치해석	3-3-0	
		MEN320	Applied Fluid Mechanics	응용유체역학	3-3-0	MEN220
		MEN350	Manufacturing Processes and Lab	기계공작법 및 실습	3-2-2	MEN230
		MEN351	Machine Element Design	기계요소설계	3-3-0	MEN230
		MEN370	Dynamic Systems and Control	시스템제어	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Elective	MEN302	Introduction to Finite Element Method	유한요소법개론	3-3-0	MEN230
	MEN303	Applied Engineering Mathematics	응용공학수학	3-3-0	
	MEN311	Internal Combustion Engine	내연기관	3-3-0	MEN210
	MEN312	Mechatronics and Thermofluid Control	메카트로닉스 및 열유동제어	3-3-0	신설
	MEN352	Creative Engineering DesignI	창의적공학설계 I	3-1-4	
	MEN411	Combustion	연소공학	3-3-0	MEN210, MEN220
	MEN412	Air-Conditioning and Refrigeration	공기조화냉동	3-3-0	MEN210
	MEN431	Introduction to Plastic Deformation	소성학개론	3-3-0	MEN230
	MEN451	Introduction to MEMS	MEMS개론	3-3-0	
	MEN452	Creative Engineering DesignII	창의적공학설계 II	3-1-4	MEN352
	MEN453	Computer Aided Engineering	컴퓨터이용공학	3-2-2	
	MEN454	Optimal Design	최적설계	3-2-2	
	MEN455	Multiscale System Design	멀티스케일시스템설계	3-3-0	MEN220
	MEN456	Energy System Design	에너지 시스템설계	3-3-0	MEN210, MEN220
	MEN457	Introduction to Electric-Electronic Engineering	전기전자공학개론	3-3-0	PHY103
	MEN461	Introduction to Robotics	로봇공학	3-3-0	
	MEN462	Introduction to Biomechanics	생체역학	3-3-0	
	MEN470	Mechanical Vibration	기계진동학	3-3-0	MEN270
	MEN472	Introduction to Sensors	센서개론	3-3-0	
	MEN473	Acoustics	음향학	3-3-0	
	MEN497	Special Topics in Mechanical Engineering I	기계공학 특론 I	3-3-0	
	MEN498	Special Topics in Mechanical Engineering II	기계공학 특론 II	3-3-0	
	MEN499	Special Topics in Mechanical Engineering III	기계공학 특론 III	3-3-0	
	ACE331	Transport Phenomena I	전달현상 I	3-3-0	MTH201, ENE212 or CHM231
	BME421	Nano-Bioengineering	나노바이오공학	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	EE201	Basic Circuit Theory	회로이론	3-3-0	
	EE231	Electromagnetics I	전자기학 I	3-3-0	
	EE301	Microelectronics I	전자회로 I	3-3-0	EE201
	HSE308	System Control	시스템 제어	3-3-0	
	HSE402	Engineering Design Methods	공학디자인기법	3-3-0	
	IID221	Design History & Contexts	디자인 역사와 맥락	3-3-0	
	IID201	Design Elements and Principles	디자인요소와 원리	3-2-2	
	AMS202, NME202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	AMS311	Introduction to Metallic Materials	금속재료개론	3-3-0	
	NME354	Introduction to Semiconductor	반도체개론	3-3-0	
	NME370	Introduction to Polymer Materials	고분자재료개론	3-3-0	

2)Selective requirements for the 1st track students: Take at least three out of six courses: Applied Thermodynamics, Numerical Analysis, Applied Fluid Mechanics, Manufacturing Processes and Lab, Machine Element Design, and Dynamic Systems and Control.

▸ Recommended Course Tracks(MEN)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Thermodynamics	3-3-0		Mechnical Engineering Lab		3-1-4				
	Fluid Mechanics		3-3-0	Heat Transfer	3-3-0					
	Solid Mechanics I	3-3-0		Numerical Analysis[1)]	3-3-0					
	Solid Mechanics II		3-3-0	Applied Fluid Mechanics[1)]	3-3-0					
	Mechanical Drawing and Lab	3-2-2	3-2-2	Manufacturing Processes and Lab[1)]	3-2-2					
	Dynamics		3-3-0	Machine Element Design[1)]		3-3-0				
	Applied Thermodynamics[1)]		3-3-0	Dynamic Systems and Control[1)]	3-3-0					
Total		9	15		15	6				45
Elective	Basic Circuit Theory		3-3-0	Intro. to Finite Element Method		3-3-0	Combustion	3-3-0		
	Electromagnetics I	3-3-0		Internal Combustion Engine		3-3-0	Air-Conditioning and Refrigeration	3-3-0		
	Introduction to Materials Science and Engineering	3-3-0		Mechatronics and Thermofluid Control		3-3-0	Introduction to Plastic Deformation		3-3-0	
	Design Elements and Principles	3-2-2		Creative Engineering DesignI		3-1-4	Intro. to MEMS	3-3-0		
	Design History & Contexts	3-3-0		Applied Engineering Mathematics	3-3-0		Creative Engineering Design II	3-1-4		
				Transport Phenomena I	3-3-0		Computer Aided Engineering	3-2-2		
				Introduction to Metallic Materials		3-3-0	Optimal Design		3-2-2	
				Microelectronics I	3-3-0		Multi-scale System Design	3-3-0		
				System Control		3-3-0	Energy System Design		3-3-0	
				Introduction to Semiconductor		3-3-0	Intro. to Electric-Electronic Engineering	3-3-0		
				Introduction to Polymer Materials	3-3-0		Intro. to Robotics		3-3-0	
							Intro. to Biomechanics		3-3-0	
							Mechanical Vibration		3-3-0	
							Intro. to Sensors		3-3-0	
							Acoustics	3-3-0		
							Nano-Bioengineering	3-3-0		
							Engineering Design Methods	3-3-0		
Total		12	3		12	21		30	21	99
Sum Total		21	18		27	27		30	21	144

1) Selective requirements for the 1st track students : Take at least three out of six courses

□ Nuclear Science and Engineering (NSE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required Group	NSE213	Fundamentals of Nuclear Engineering	원자력 공학 개론	3-3-0	
	NSE214	Introduction to Nuclear Fuel Cycle Engineering	핵주기공학 개론	3-3-0	
	NSE221	Nuclear Radiation Engineering & Experiment	원자력방사선공학 및 실험	3-2-2	
	NSE222	Nuclear Materials Engineering & Experiment	원자력재료공학 및 실험	3-2-2	
	NSE311	Introduction to Nuclear Reactor Theory	원자로이론 개론	3-3-0	
	NSE314	Nuclear Engineering Design and Lab I	원자력공학종합설계프로젝트 I	2-0-4	Capstone Design
	NSE324	Nuclear Engineering Design and Lab II	원자력공학종합설계프로젝트 II	2-0-4	Capstone Design
	NSE334	Nuclear Engineering Design and Lab III	원자력공학종합설계프로젝트 III	2-0-4	Capstone Design
	NSE325	Nuclear System Engineering & Experiment	원자로계통공학 및 실험	3-2-2	
	NSE421	Nuclear Reactor Lab	원자로실험	3-0-6	
	NSE480	Introduction to Nuclear Engineering IT	원자력 IT 개론	3-2-2	
Elective	NSE216	Fundamentals of Electromagnetics	전자역학개론	3-3-0	
	NSE326	Nuclear Reactor Numerical Analysis	원자로 수치해석	3-3-0	
	NSE400	Special Topics on Nuclear Engineering and Science I	원자력공학 및 과학 특론 I	3-3-0	
	NSE401	Special Topics on Nuclear Engineering and Science II	원자력공학 및 과학 특론 II	3-3-0	
	NSE402	Special Topics on Nuclear Engineering and Science III	원자력공학 및 과학 특론 III	3-3-0	
	NSE403	Special Topics on Nuclear Engineering and Science IV	원자력공학 및 과학 특론 IV	3-3-0	
	NSE404	Special Topics on Nuclear Engineering and Science V	원자력공학 및 과학 특론 V	3-3-0	
	NSE417	Fundamentals of Nuclear Fusion	핵융합개론	3-3-0	
	NSE418	Fundamentals of Magnetohydrodynamics	자기유체역학 개론	3-3-0	
	CSE232	Discrete Mathematics	이산수학	3-3-0	
	CSE241	Object Oriented Programming	객체 지향 프로그래밍	3-3-0	
	CSE221	Data Structures	데이터구조	3-3-0	
	CSE331	Introduction to Algorithms	알고리즘	3-3-0	
	CSE311	Introduction to Operating Systems	운영체제	3-3-0	
	CSE341	Principles of Programming Languages	프로그래밍언어	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	CSE421	Introduction to Database	데이터베이스	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-1	
	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스개론	3-3-0	
	EE231	Electromagnetics I	전자기학 I	3-3-0	
	ENE212	Physical Chemistry I	물리화학 I	3-3-0	
	ENE322	Instrumental Analysis	기기분석	3-3-0	
	ENE416	Introduction to Nanoscience and Nanotechnology	나노과학 및 기술	3-3-0	
	ENE480	Scientific Expression with IT	공학IT개론	3-2-2	
	PHY204	Electromagnetics II	전자기학 II	3-3-0	PHY203
	PHY301	Quantum Physics I	양자물리학 I	3-3-0	PHY101, PHY102
	PHY303	Thermal and Statistical Physics	열 및 통계물리학	3-3-0	PHY101, PHY102
	PHY315	Solid State Physics	고체물리학	3-3-0	PHY301
	MEN230	Solid MechanicsI	고체역학 I	3-3-0	
	MEN270	Dynamics	동역학	3-3-0	
	MEN210	Thermodynamics	열역학	3-3-0	
	MEN220	Fluid Mechanics	유체역학	3-3-0	
	MEN211	Applied Thermodynamics	응용열역학	3-3-0	MEN210
	MEN301	Numerical Analysis	수치해석	3-3-0	
	MEN310	Heat Transfer	열전달	3-3-0	MEN210, MEN220
	MEN320	Applied Fluid Mechanics	응용유체역학	3-3-0	MEN220
	MEN457	Introduction to Electric-Electronic Engineering	전기전자공학개론	3-3-0	
	NME202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	NME203	Thermodynamics of Materials	재료열역학	3-3-0	

▸ Recommended Course Tracks (NSE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Fundamentals of Nuclear Engineering	3-3-0		Nuclear Engineering Design and Lab I	2-0-4		Nuclear Reactor Lab		3-0-6	
	Introduction to Nuclear Fuel Cycle Engineering	3-3-0		Introduction to Nuclear Reactor Theory		3-3-0	Introduction to Nuclear Engineering IT[1]		3-2-2	
	Nuclear Radiation Engineering & Experiment		3-2-2	Nuclear Engineering Design and Lab II		2-0-4				
	Nuclear Materials Engineering & Experiment		3-3-2	Nuclear Engineering Design and Lab III		2-0-4				
				Nuclear System Engineering & Experiment		3-2-2				
Total		6	6		2	10		0	6	30
Elective	Fundamentals of Electromagnetics	3-3-0		Nuclear Reactor Numerical Analysis	3-3-0		Fundamentals of Nuclear Fusion	3-3-0		
	Data Structure		3-3-0	Introduction to Operating Systems		3-3-0	Fundamentals of Magnetohydrodynamics	3-3-0		
	Discrete Mathematics	3-3-0		Introduction to Algorithms	3-3-0		Introduction to Database	3-3-0		
	Object Oriented Programming	3-3-0		Principles of Programming Languages	3-3-0		Introduction to Nanoscience and Nanotechnology	3-3-0		
	Basic Circuit Theory		3-3-1	Instrumental Analysis		3-3-0	Scientific Expression with IT		3-2-2	
	Probability and Introduction to Random Processes		3-3-0	Numerical Analysis	3-3-0		Introduction to Electric-Electronic Engineering	3-3-0		
	Electormagnetics I	3-3-0		Heat Trasnfer	3-3-0					
	Physical Chemistry I	3-3-0		Applied Fluid Mechanics	3-3-0					
	Introduction to Materials Science and Engineering	3-3-0	3-3-0	Quantum Physics I	3-3-0					
	Thermodynamics of Materials	3-3-0		Thermal and Statistical Physics		3-3-0				
	Solid Mechanics I	3-3-0		Solid State Physics I		3-3-0				
	Dynamics		3-3-0							
	Thermodynamics	3-3-0								
	Fluid Mechanics		3-3-0							
	Applied Thermodynamics		3-3-0							
	Electromagnetics II		3-3-0							
Total		27	24		21	12		15	3	102
Sum Total		33	30		23	22		15	9	132

1) Regardless of whether 'Dynamics of IT' han been taken or not, in case the student of NUE completes the course, the required group of the major courses is considered as complete.

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Mechanical Engineering			MEN303 Applied Engineering Mathematics (New)
Nuclear Science and Engineering	NSE342 Nuclear Reactor Lab	⇨	NSE421 Nuclear Reactor Lab
	NSE429 Intro. to Nuclear Fuel Engineering (Close)		
			NSE418 Fundamentals of Magnetohydrodynamics (New)

5. Course Descriptions

1) Mechanical Engineering (MEN)

MEN210 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.

MEN211 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.

MEN220 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.

MEN230 Solid MechanicsI [고체역학Ⅰ]

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.

MEN231 Solid MechanicsII [고체역학Ⅱ]

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.

MEN250 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.

MEN270 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.

MEN300 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.

MEN301 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.

MEN302 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.

MEN303 Applied Engineering Mathematics [응용공학수학]

This course provides a comprehensive, thorough, and up-to-date treatment of engineering mathematics. It is intended to introduce applied mathematics that are most relevant for solving practical problems to students of engineering, physics, mathematics, computer science, and related fields. A course in elementary calculus is the sole prerequisite.

MEN310 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.

MEN311 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.

MEN312 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.

MEN320 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.

MEN350 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.

MEN351 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.

MEN352 Creative Engineering DesignI [창의적공학설계Ⅰ]

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.

MEN370 Dynamic Systems 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.

MEN411 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.

MEN412 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.

MEN431 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.

MEN451 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.

MEN452 Creative Engineering DesignII [창의적공학설계Ⅱ]

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.

MEN453 Computer Aided Engineering [컴퓨터이용공학]

In this course, students study the theories and algorithms of 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 CAE techniques.

MEN454 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.

MEN455 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.

MEN456 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.

MEN457 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.

MEN461 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

MEN462 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

MEN470 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.

MEN472 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.

MEN473 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.

MEN497~499 Special Topics in Mechanical Engineering I~ III [기계공학 특론 Ⅰ ~ Ⅲ]

In this course, special topics in mechanical engineering are discussed based on the knowledge of the principles of solid mechanics, dynamics, thermodynamics, fluid mechanics, heat transfer, manufacturing process, system design, and power system engineering. Topics may include machine design, advanced materials processing, laser-assisted manufacturing, micro/nano machining, MEMS, biomedical products, controls and mechatronics, acoustics and dynamics, tribology, heat problems in microchips and light emitting diodes, wind power, blood flow, micro/nanofluidics, heat exchanger design in nuclear power plants, and combustion in engines.

2) Nuclear Science and Engineering (NSE)

NSE213 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.

NSE214 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.

NSE221 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.

NSE222 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.

NSE311 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.

NSE314 Nuclear Engineering Design and Lab I [원자력공학종합설계프로젝트 I]

In this course, students will have a chance to get the practical experience in nuclear fuels and fuel cycle, and nuclear fuel cladding and structural materials. In the nuclear fuels and fuel cycle area, students will first learn the fuel, fuel design criteria, fuel performance analysis code and then have a chance to analyze the in-reactor performance of the fuel. Then they will learn how to manufacture the fuel and have a chance to actually fabricate the fuel pellet with simulated material. Then they will be asked to analyze the results. In nuclear fuel cladding and structural materials area, students will learn the basic principles for the design and analysis of fuel cladding and structural components with commercial structural analysis code. And, material properties of fuel cladding and structural components will be reviewed and the proper material design and analysis using computational thermodynamics software will be practiced.

NSE216 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.

NSE324 Nuclear Engineering Design and Lab II [원자력공학종합설계프로젝트 II]

Design of various nuclear fission energy systems and fast reactor technology require a variety of knowledge such as reactor physics, neutron data, radiation measurement and liquid metal magnetohydrodynamics. Through this course, students will learn how to design and develop nuclear systems based on the above-mentioned knowledge. Students will participate in comprehensive design and lab activities such as 1) set up a design goal, 2) identify design parameters of the system and sketch the performance of the proposed system, 4) establish quantitative models and/or setup experimental devices that show the performance of the system, 5) identify multiple constraints in the project, and develop an optimized solution.

NSE325 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.

NSE326 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.

NSE334 Nuclear Engineering Design and Lab III [원자력공학종합설계프로젝트 III]

Advanced design of next-generation nuclear fission and fusion systems requires interdisciplinary knowledges between thermal-hydraulics and materials in terms of safety and economics. Through this course, students learn about how to design and develop nuclear systems based on the above-mentioned major knowledges. Students participate in a comprehensive design and lab activity based on given proposals: Read a proposal for the project; Set up a design goal; Identify design parameters of the system and sketch the performance of the proposed system; Establish quantitative models that show the performance of the system by taking charge of their own learning, and analyze the system performance quantitatively; Identify multiple design constraints in the project, and develop an optimized solution or solutions. The system design project is based on Axiomatic Design principles.

NSE400~404 Special Topics on Nuclear Engineering and Science I~ V [원자력공학 및 과학 특론 I ~ V]

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

NSE417 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.

NSE418 Fundamentals of Magnetohydrodynamics [자기유체역학 개론]

The basic concept on the electromagnetic transportation and its magnetohydrodynamic (MHD) characteristics of electrically conducting liquid metal is introduced. The course focuses on the fundamental approach in therms of the electromagnetics and fluid mechanics for the understanding the liquid metal flow in the magnetic environment and MHD/electromagnetic pumps, which are used for sodium coolant circulation in a sodium fast reactor (SFR), one of the future generation IV reactors, and liquid lithium circulation in the blanket of a nuclear fusion reactor. Students learn the magnetohydrodynamic principle of the metal fluid flow and its application.

NSE421 Nuclear Reactor Lab [원자로실험]

Basic introduction to small research reactor will firstly given. Then experiments on important basic principles and to measure important physics parameters will be followed; basic reactor operation and criticality, measurement of reactor period and reactivity, experiment to measure critical mass, experiment to measure control rod worth, experiment to measure temperature coefficient of reactivity and experiment on neutron activation analysis.

NSE480 Introduction to Nuclear Engineering IT [원자력 IT 개론]

This course covers basic computer and IT technology necessary for nuclear reactor physics analysis, thermal hydraulics system design, nuclear fuel performance analysis, nuclear material, radiation protection analysis, nuclear reactor safety analysis: Operating System (Windows, Linux), Computing Tools (Matlab, Mathematica, Labview), Programming Language (FORTRAN, C, JAVA), Script Language (Perl, Python, Batch File), Parallel Programming (OpenMP, MPI)

School of Urban and Environmental Engineering

1. School Introduction

Environmental pollution and climate change caused by industrialization and urbanization are directly related to the survival of human society. With no surprise, studies on these issues are gaining in importance. Urban and environmental engineering is an interdisciplinary research field focusing on environmental protection and sustainable urban development with ultimately aiming toward the improvement of human welfare. In this division, students will gain fundamental knowledge related to urban and environmental issues, and will study more advanced courses represented by three tracks: Environmental Science and Engineering (environmental analysis, water and air treatment, climate change, global environment, environmental modeling), Urban Infrastructure Engineering (urban planning, structural mechanics and design, health monitoring, construction materials), and Disaster 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 Science and Engineering (ESE)

This track focuses on local as well as global issues related to environmental pollution and climate change. We provide a comprehensive collection of courses on important environmental subjects including pollution control and analysis, climate modelling, environmental fate models, remote sensing, and hydrology. Our mission is to educate students with the highest quality technical and professional standards and produce qualified professionals committed to challenge the environmental issues we face today.

2) Urban Infrastructure Engineering [UIE]

The mission of the UIE track is to develop engineers with essential expertise in planning, design, construction, and management of urban built environment, who have the enthusiastic nature of their

special role in the future of human society. The UIE program consists of major disciplines in urban and civil engineering, such as urban planning, construction materials, structural mechanics and design, smart sensing and control, and geotechnical engineering. Through innovative education and research, the students will develop dynamic abilities on creating sustainable and resilient urban infrastructure systems for our future generations.

3) Disaster Management Engineering (DME)

The Disaster 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) natural hazard monitoring/prediction; (2) sustainable and resilient infrastructure; (3) disaster risk reduction/prevention; and (4) water resources and flood management.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		Remark
		Interdisciplinary Major		
		1st Track	2nd Track	
Environmental Science and Engineering(ESE)	Required	21	9	
	Elective	27	9	
Urban Infrastructure Engineering(UIE)	Required	18	9	
	Elective	30	9	
Disaster Management Engineering (DME)	Required	18	9	
	Elective	30	9	

3. Curriculum

□ Environmental Science and Engineering (ESE)

	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required (1TR: All courses 2TR: Choose 3 courses)	ESE201	Introduction to Environmental Engineering	환경공학개론	3-3-0	
	ESE202	Environmental Chemistry	환경화학	3-3-0	
	ESE203	Global Environment	지구환경	3-3-0	
	ESE204	Water Pollution	수질오염	3-3-0	
	ESE205	Air Pollution	대기오염	3-3-0	
	ESE337	Environmental Thermodynamics	환경열역학	3-3-0	
	ESE333	Introduction to Remote Sensing	원격탐사개론	3-3-0	

	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Elective	DME321	Numerical Modeling and Analysis	수치모델링 및 분석	3-3-0	
	ESE231	Atmospheric Chemistry	대기화학	3-3-0	
	ESE232	Atmosphere and Ocean Sciences	대기해양과학	3-3-0	
	ESE233	Environmental Geology	환경지질학	3-3-0	
	UIE210	Geographic Information System	지리정보시스템	3-3-0	
	DME201	Introduction to Natural Hazards	자연재해개론	3-3-0	
	ACE331	Transport Phenomena	전달현상 I	3-3-0	MTH201, ENE212 or CHM231
	BIO331	Microbiology	미생물학	3-3-0	
	CHM211	Organic Chemistry I	유기화학 I	3-3-0	
	CHM212	Organic Chemistry II	유기화학 II	3-3-0	
	CHM231	Physical Chemistry I	물리화학 I	3-3-0	
	CHM232	Physical Chemistry II	물리화학 II	3-3-0	
	MEN220	Fluid Mechanics	유체역학	3-3-0	
	ESE311	Water Treatment Engineering	수처리공학	3-3-0	
	ESE312	Soil Pollution	토양오염	3-3-0	
	ESE313	Aquatic Chemistry Laboratory	수질화학실험	3-2-2	
	ESE331	Analysis of Pollutants	오염물질분석/실험	3-2-2	
	ESE332	Hydrology	수문학	3-3-0	
	ESE334	Atmospheric Dynamics	대기역학	3-3-0	
	ESE335	Biogeochemistry	생지화학	3-3-0	
	ESE336	Environmental Impact Assessment	환경영향평가	3-3-0	
	DME311	Probability Concepts in Engineering	공학확률	3-3-0	
	ACE311	Chemical Reaction Engineering	반응공학	3-3-0	
	ACE332	Transport Phenomena II	전달현상 II	3-3-0	
	CHM391	Instrumental Analysis	기기분석	3-3-0	
	ESE411	Water and Wastewater Engineering	상하수도공학	3-3-0	
	ESE412	Environmental Remediation	환경복원	3-3-0	
	ESE413	Wastes Management	폐기물처리/재활용	3-3-0	
	ESE414	Environmental Bioprocess	환경생물공정	3-3-0	
	ESE415	Environmental Toxicology	환경독성학	3-3-0	
	ESE416	Hydraulics	수리학	3-3-0	

	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	ESE421	Special Topics in Environmental Engineering I	환경공학특론 I	3-3-0	
	ESE422	Special Topics in Environmental Engineering II	환경공학특론 II	3-3-0	
	ESE423	Special Topics in Environmental Engineering III	환경공학특론 III	3-3-0	
	ESE431	Climate Dynamics	기후역학	3-3-0	ESE232, ESE334
	ESE432	Earth Environment Numerical Analysis	지구환경전산실습	3-2-2	
	ESE433	Satellite Remote Sensing	위성원격탐사	3-3-0	
	ESE434	Climate Change Engineering	기후변화공학	3-3-0	
	ESE435	GIS-Based Modeling	GIS 기반 모델링	3-3-0	
	ESE436	Statistics in Earth and Environmental Sciences	지구환경통계학	3-3-0	
	ESE437	Multimedia environmental modelling	다매체환경모델링	3-3-0	ESE331
	ESE441	Special Topics in Earth Science I	지구환경특론 I	3-3-0	
	ESE442	Special Topics in Earth Science II	지구환경특론 II	3-3-0	
	ESE443	Special Topics in Earth Science III	지구환경특론 III	3-3-0	
	DME421	Weather Analysis and Prediction	날씨분석 및 예측	3-3-0	

▸ Recommended Course Tracks (ESE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Introduction to Environmental Engineering	3-3-0		Environmental Thermodynamics	3-3-0					
	Environmental Chemistry	3-3-0		Introduction to Remote Sensing		3-3-0				
	Global Environment	3-3-0								
	Water Pollution		3-3-0							
	Air Pollution		3-3-0							
Total		9	6		3	3				21
Elective	Atmospheric Chemistry		3-3-0	Numerical Modeling and Analysis		3-3-0	Water and Wastewater Engineering	3-3-0		
	Atmospheric and Ocean Sciences		3-3-0	Transport Phenomenal	3-3-0		Environmental Remediation	3-3-0		
	Environmental Geology		3-3-0	Microbiology	3-3-0		Wastes Management		3-3-0	
	Geographic Information System		3-3-0	Water treatment Engineering		3-3-0	Environmental Bioprocess		3-3-0	
	Introduction to Natural Hazards	3-3-0		Soil Pollution		3-3-0	Environmental Toxicology		3-3-0	
	Organic Chemistry I	3-3-0		Aquatic Chemistry Laboratory		3-2-2	Hydraulics	3-3-0		
	Organic Chemistry II		3-3-0	Analysis of Pollutants	3-2-2		Special Topics in Environmental Engineering I	3-3-0		
	Physical Chemistry I	3-3-0		Hydrology		3-3-0	Special Topics in Environmental Engineering II	3-3-0		
	Physical Chemistry II		3-3-0	Atmospheric Dynamics		3-3-0	Special Topics in Environmental Engineering III		3-3-0	
	Fluid Mechanics		3-3-0	Biogeochemistry	3-3-0		Climate Dynamics	3-3-0		
				Environmental Impact Assessment	3-3-0		Earth Environment Numerical Analysis	3-2-2		
				Probability Concepts in Engineering		3-3-0	Satelite Remote Sensing		3-3-0	
				Chemical Reaction Engineering	3-3-0		Climate Change Engineering		3-3-0	
				Transport Phenomena II		3-3-0	GIS-Based Modeling	3-3-0		
				Instrumental Analysis	3-3-0		Statistics in Earth and Environmental Sciences		3-3-0	
							Multimedia environmental Modeling	3-3-0		
							Special Topics in Earth Science I	3-3-0		
							Special Topics in Earth Science II	3-3-0		
							Special Topics in Earth Science III		3-3-0	
							Weather Analysis and Prediction		3-3-0	
Total		9	21		21	24		33	27	135
Sum Total		**18**	**27**		**24**	**27**		**33**	**27**	**156**

□ Urban Infrastructure Engineering (UIE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	UIE201	Introduction to Civil Engineering	건설공학개론	3-3-0	
	UIE203	Introduction to Urban Planning	도시계획개론	3-3-0	
	UIE204	Mechanics of Materials	재료역학	3-3-0	UIE201
	UIE210	Geographic Information System	지리정보시스템	3-3-0	
1TR: R 2TR: E	UIE303	Structural Analysis	구조역학	3-3-0	UIE204
	DME311	Probability Concepts in Engineering	공학확률	3-3-0	
Elective	DME321	Numerical Modeling and Analysis	수치모델링 및 분석	3-3-0	
	UIE202	Sustainable Design	환경설계론	3-1-4	
	UIE205	Construction Materials	건설재료공학	3-3-0	
	UIE207	Urban and Regional Development	도시 및 지역개발	3-3-0	
	ESE201	Introduction to Environmental Engineering	환경공학개론	3-3-0	
	MGT211	Microeconomics	미시경제학	3-3-0	MGT106
	MEN220	Fluid Mechanics	유체역학	3-3-0	
	UIE301	Urban Transportation Planning	교통계획	3-3-0	
	UIE304	Matrix Structural Analysis	매트릭스구조해석	3-3-0	UIE303
	UIE305	Soil Mechanics	토질역학	3-3-0	
	UIE306	Concrete Structures	콘크리트구조공학	3-3-0	UIE204
	UIE307	Properties of Concrete	콘크리트재료공학	3-2-2	
	UIE308	Structural Engineering Lab	구조공학실험	3-1-4	UIE204
	ESE332	Hydrology	수문학	3-3-0	
	ESE333	Introduction to Remote Sensing	원격탐사개론	3-3-0	
	DME331	Disaster Management	재난관리	3-3-0	
	DME332	Disaster Analysis	재난분석	3-3-0	
	MGT315	Econometrics	계량경제학	3-3-0	MGT211, MTH211
	UIE401	Steel Structures	강구조공학	3-3-0	UIE204
	UIE402	Design of Structural Systems	구조시스템설계	3-3-0	
	UIE403	Foundation Engineering	기초공학	3-3-0	
	UIE404	Infrastructure Engineering	사회기반시설공학	3-3-0	
	UIE405	Urban Design	도시설계	3-3-0	
	UIE406	Development Finance	도시개발재무	3-3-0	
	UIE408	Introduction to Structural Dynamics	구조동역학개론	3-3-0	
	UIE410	Special Topics in Urban Infrastructure Engineering I	도시건설공학특론 Ⅰ	3-3-0	
	UIE411	Special Topics in Urban Infrastructure Engineering II	도시건설공학특론 Ⅱ	3-3-0	
	UIE412	Special Topics in Urban Infrastructure Engineering III	도시건설공학특론 Ⅲ	3-3-0	
	ESE411	Water and Wastewater Engineering	상하수도공학	3-3-0	
	ESE416	Hydraulics	수리학	3-3-0	
	ESE433	Satellite Remote Sensing	위성원격탐사	3-3-0	
	ESE435	GIS-Based Modeling	GIS 기반 모델링	3-3-0	
	DME431	Economics of Disaster	재난경제학	3-3-0	
	DME432	Vulnerability and Capacity Analysis	재해취약성 및 수용력분석	3-3-0	UIE210

▸ Recommended Course Tracks (UIE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Introduction to Civil Engineering	3-3-0		Structural Analysis	3-3-0					
	Introduction to Urban Planning	3-3-0		Probability Concepts in Engineering		3-3-0				
	Mechanics of Materials		3-3-0							
	Geographic Information System		3-3-0							
Total		6	6		3	3				18
Elective	Sustainable Design	3-1-4		Numerical Modeling and Analysis		3-3-0	Steel Structures	3-3-0		
	Construction Materials		3-3-0	Urban Transportation Planning		3-3-0	Design of Structural Systems		3-3-0	
	Urban and Regional Development		3-3-0	Matrix Structural Analysis		3-3-0	Foundation Engineering	3-3-0		
	Introduction to Environmental Engineering	3-3-0		Soil Mechanics	3-3-0		Infrastructure Engineering	3-3-0		
	Microeconomics		3-3-0	Concrete Structures	3-3-0		Urban Design	3-3-0		
	Fluid Mechanics		3-3-0	Properties of Concrete		3-2-2	Development Finance		3-3-0	
				Structural Engineering Lab	3-1-4		Introduction to Structural Dynamics		3-3-0	
				Hydrology		3-3-0	Special Topics in Urban Infrastructure Engineering I	3-3-0		
				Introduction to Remote Sensing		3-3-0	Special Topics in Urban Infrastructure Engineering II		3-3-0	
				Disaster Management		3-3-0	Special Topics in Urban Infrastructure Engineering III		3-3-0	
				Disaster Analysis	3-3-0		Water and Wastewater Engineering	3-3-0		
							Hydraulics	3-3-0		
							Satellite Remote Sensing		3-3-0	
							GIS-Based Modeling	3-3-0		
							Economics of Disaster		3-3-0	
							Vulnerability and Capacity Analysis		3-3-0	
Total		6	12		12	21		24	24	99
Sum Total		12	18		15	24		24	24	117

□ Disaster Management Engineering (DME)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	DME201	Introduction to Natural Hazards	자연재해개론	3-3-0	
	DME311	Probability Concepts in Engineering	공학확률	3-3-0	
	DME331	Disaster Management	재난관리	3-3-0	
1TR: R 2TR: E	ESE201	Introduction to Environmental Engineering	환경공학개론	3-3-0	
	UIE201	Introduction to Civil Engineering	건설공학개론	3-3-0	
	UIE203	Introduction to Urban Planning	도시계획개론	3-3-0	
Elective	DME202	Man-made Disasters	인적재해	3-3-0	
	ESE203	Global Environment	지구환경	3-3-0	
	ESE204	Water Pollution	수질오염	3-3-0	
	ESE205	Air Pollution	대기오염	3-3-0	
	ESE232	Atmosphere and Ocean Sciences	대기해양과학	3-3-0	
	ESE233	Environmental Geology	환경지질학	3-3-0	
	UIE204	Mechanics of Materials	재료역학	3-3-0	UIE201
	UIE205	Construction Materials	건설재료공학	3-3-0	
	UIE207	Urban and Regional Development	도시 및 지역개발	3-3-0	
	UIE210	Geographic Information System	지리정보시스템	3-3-0	
	MEN220	Fluid Mechanics	유체역학	3-3-0	
	DME321	Numerical Modeling and Analysis	수치모델링 및 분석	3-3-0	
	DME332	Disaster Analysis	재난분석	3-3-0	
	DME341	Water Resources Engineering	수자원공학	3-3-0	
	ESE311	Water Treatment Engineering	수처리공학	3-3-0	
	ESE312	Soil Pollution	토양오염	3-3-0	
	ESE332	Hydrology	수문학	3-3-0	
	ESE333	Introduction to Remote Sensing	원격탐사개론	3-3-0	
	ESE334	Atmospheric Dynamics	대기역학	3-3-0	
	ESE336	Environmental Impact Assessment	환경영향평가	3-3-0	
	UIE301	Urban Transportation Planning	교통계획	3-3-0	
	UIE303	Structural Analysis	구조역학	3-3-0	UIE204
	UIE304	Matrix Structural Analysis	매트릭스구조해석	3-3-0	UIE303

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	UIE305	Soil Mechanics	토질역학	3-3-0	
	UIE306	Concrete Structures	콘크리트구조공학	3-3-0	UIE204
	UIE307	Properties of Concrete	콘크리트재료공학	3-2-2	
	UIE308	Structural Engineering Lab	구조공학실험	3-1-4	UIE204
	DME411	Hazard Analysis for System Safety	재해분석과 시스템안전성	3-3-0	
	DME421	Weather Analysis and Prediction	날씨 분석 및 예측	3-3-0	
	DME431	Economics of Disaster	재난경제학	3-3-0	
	DME432	Vulnerability and Capacity Analysis	재해취약성 및 수용력분석	3-3-0	UIE210
	DME491	Special Topics in Disaster Management Engineering I	재난관리공학특론 I	3-3-0	
	DME492	Special Topics in Disaster Management Engineering II	재난관리공학특론 II	3-3-0	
	DME493	Special Topics in Disaster Management Engineering III	재난관리공학특론 III	3-3-0	
	ESE411	Water and Wastewater Engineering	상하수도공학	3-3-0	
	ESE412	Environmental Remediation	환경복원	3-3-0	
	ESE416	Hydraulics	수리학	3-3-0	
	ESE433	Satellite Remote Sensing	위성원격탐사	3-3-0	
	ESE435	GIS-Based Modeling	GIS 기반 모델링	3-3-0	
	UIE401	Steel Structures	강구조공학	3-3-0	UIE204
	UIE403	Foundation Engineering	기초공학	3-3-0	
	UIE404	Infrastructure Engineering	사회기반시설공학	3-3-0	
	UIE405	Urban Design	도시설계	3-3-0	
	UIE406	Development Finance	도시개발재무	3-3-0	
	UIE408	Introduction to Structural Dynamics	구조동역학개론	3-3-0	

▸ Recommanded Course Tracks (DME)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Introduction to Natural Hazards	3-3-0		Probability Concepts in Engineering		3-3-0				
	Introduction to Environmental Engineering	3-3-0		Disaster Management	3-3-0					
	Introduction to Civil Engineering	3-3-0								
	Introduction to Urban Planning	3-3-0								
Total		12	0		3	3				18
Elective	Man-made Disasters		3-3-0	Numerical Modeling and Analysis		3-3-0	Hazard Analysis for System Safety	3-3-0		
	Global Environment	3-3-0		Disaster Analysis	3-3-0		Weather Analysis and Prediction		3-3-0	
	Water Pollution		3-3-0	Water Resources Engineering	3-3-0		Economics of Disaster		3-3-0	
	Air Pollution		3-3-0	Water Treatment Engineering		3-3-0	Vulnerability and Capacity Analysis		3-3-0	
	Atmosphere and Ocean Sciences		3-3-0	Soil Pollution		3-3-0	Special Topics in Disaster Management Engineering I	3-3-0		
	Environmental Geology		3-3-0	Hydrology		3-3-0	Special Topics in Disaster Management Engineering II	3-3-0		
	Mechanics of Materials		3-3-0	Introduction to Remote Sensing		3-3-0	Special Topics in Disaster Management Engineering III		3-3-0	
	Construction Materials		3-3-0	Atmospheric Dynamics		3-3-0	Water and Wastewater Engineering	3-3-0		
	Urban and Regional Development		3-3-0	Environmental Impact Assessment	3-3-0		Environmental Remediation	3-3-0		
	Geographic Information System		3-3-0	Urban Transportation Planning		3-3-0	Hydraulics	3-3-0		
	Fluid Mechanics		3-3-0	Structural Analysis	3-3-0		Satellite Remote Sensing		3-3-0	
				Matrix Structural Analysis		3-3-0	GIS-Based Modeling	3-3-0		
				Soil Mechanics	3-3-0		Steel Structures	3-3-0		
				Concrete Structures	3-3-0		Foundation Engineering	3-3-0		
				Properties of Concrete		3-2-2	Infrastructure Engineering	3-3-0		
				Structural Engineering Lab	3-1-4		Urban Design	3-3-0		
							Development Finance		3-3-0	
							Introduction to Structural Dynamics		3-3-0	
Total		3	30		21	27		33	21	135
Sum Total		15	30		24	30		33	21	153

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Environment Science and Engineering	ESE431 Climate Dynamics		ESE431 Climate Dynamics (Add Prerequisite ESE232, ESE334)
			ESE437 Multimedia Environmental Modeling **(New)**
Urban Infrastructure Engineering			DME431 Economics of Disaster **(New)**
Disaster Management Engineering			UIE207 Urban and Regional Development **(New)**
			UIE405 Urban Design **(New)**
			UIE406 Development Finance **(New)**
			ESE232 Atmosphere and Ocean Sciences **(New)**
			ESE233 Environmental Geology **(New)**
			ESE311 Water Treatment Engineering **(New)**
			ESE411 Water and Wastewater Engineering **(New)**

5. Course Descriptions

1) Environmental Science and Engineering (ESE)

ESE201 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.

ESE202 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.

ESE203 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 earth and environmental sciences. Human influences such as urbanization, industrialization and the increased use of fossil energy will be studied as major causes of global warming, environmental pollution, stratospheric ozone depletion and the desertification process. Students are encouraged to participate in the class by group or individual presentation of their own research on selected problems.

ESE204 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.

ESE205 Air Pollution [대기오염]

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

ESE231 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.

ESE232 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.

ESE233 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.

ESE311 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.

ESE312 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.

ESE313 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.

ESE331 Analysis of Pollutants [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.

ESE332 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.

ESE333 Introduction to Remote Sensing [원격탐사개론]

This course provides a qualitative and quantitative introduction to the fundamentals of acquiring, analyzing and utilizing remote sensing data in the performance of environmental monitoring and natural resource inventories. This course introduces key applications of remote sensing as well as basic digital image processing techniques (e.g. image enhancement, image classification). The students will use the state-of-the-art software and hardware to examine satellite and airborne remote sensing data.

ESE334 Atmospheric Dynamics [대기역학]

Atmospheric dynamics is the study of lareg-scale atmospheric motions associated with weather and climate. Atmospheric dynamics is the study of large-scale atmospheric motions associated with weather and climate. A basic assumption for describing such motions is to regard the atmosphere as a continuous fluid medium and apply the fundamental conservation laws of mass, momentum, and thermodynamic energy, which are expressed in terms of partial differential equations over space and time. Solving those differential equations with some systematic simplifications based on observations, the students will obtain physical insights to the role of atmospheric motions in determining the observed weather and climate. The class will cover in depth the Chapters 1-6 of An Introduction to Dynamic Meteorology written by James R. Holton. The presented topics include fundamental and apparent forces, basic conservation laws, circulation and vorticity, atmospheric motion in the presence of friction, and the quasi-geostrophic analysis of large-scale atmospheric motion.

ESE335 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.

ESE336 Environmental Impact Assessment [환경영향평가]

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.

ESE337 Environmental Thermodynamics [환경열역학]

This course offers the basic understanding of thermodynamics relating to environmental and atmospheric fields and covers the fundamental laws of thermodynamics, properties of fluids, heat effects, and phase equilibria.

ESE411 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.

ESE412 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.

ESE413 Wastes Management [폐기물처리/재활용]

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

ESE414 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.

ESE415 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.

ESE416 Hydraulics [수리학]

This course provides the principles and fundamental theories related to the mechanical properties of liquids based on fluid mechanics. It focuses on various engineering applications of fluids and their properties.

ESE421~3 Special Topics in Environmental Engineering I ~ III [환경공학특론 I ~ III]

This course introduces new research topics in environmental engineering.

ESE431 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.

ESE432 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.

ESE433 Satellite Remote Sensing [위성원격탐사]

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.

ESE434 Climate Change Engineering [기후변화공학]

This course covers diverse topics on the causes, effects, and mitigation methods of global warming. For this purpose, we will focus on recent technologies for carbon dioxide capture and storage, clean use of fossil fuels, and new and renewable energies.

ESE435 GIS-Based Modeling [GIS 기반 모델링]

The purpose of the course is to present geographical, temporal, environmental modeling concepts using GIS-based modeling languages and techniques. Practical laboratory experience with state-of-the-art software and hardware will be used. At the conclusion of this course, students will be able to make informed decisions about the transformation of conceptual models to mathematical models using GIS components. This course includes various modeling concepts and techniques such as spatial interpolation, suitability/capability modeling, terrain form modeling, hydrologic modeling, diffusion modeling, calibration modeling, accessibility modeling, optimization modeling, and rainfall-runoff modeling.

ESE436 Statistics in Earth and Environmental Sciences [지구환경통계학]

Earth and Environmental Sciences often deal with huge data collected from observations and model simulations. A careful application of statistical methods to the data leads to comprehensive descriptions of geophysical phenomena or processes, validations of existing theories, and new

findings of nature. This course is aimed for junior and senior students who completed the basics of statistics. The course will review the basics of statistics first, and cover the various statistical methods frequently used in the modern research, such as the regression, time series analysis, and the principal component analysis.

ESE437 Multimedia environmental modelling [다매체환경모델링]

This course will deal with the principle of multimedia environmental fate models for persistent organic pollutants. After 2-3 weeks of lectures, students will start to make their own multimedia models using Visual Basic.

ESE441~3 Special Topics in Earth Science I~III [지구환경특론 I~III]

This course introduces new research topics in earth science.

2) Urban Infrastructure Engineering [UIE]

UIE201 Introduction to Civil Engineering [건설공학개론]

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

UIE202 Sustainable Design [환경설계론]

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

UIE203 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.

UIE204 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.

UIE205 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 the properties of construction materials 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.

UIE207 Urban and Regional Development [도시 및 지역개발]

This course introduces fundamental concepts and theories applied to local economic development including growth, trade, product-cycle, flexible specialization, and entrepreneurship theories.

UIE210 Geographic Information System [지리정보시스템]

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

UIE301 Urban Transportation Planning [교통계획]

This course discusses 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.

UIE303 Structural Analysis [구조역학]

This course is intended to provide students with the theory and application of modern structural analysis as it applies to trusses, beams, and frames. Particular emphasis is placed on developing the students' intuition to understand how structures react with applied loadings and the abilities to model and analyze civil and architectural structures

UIE304 Matrix Structural Analysis [매트릭스구조해석]

This course is designed to provides students with fundamental concepts in the methods of matrix structural analysis used in current practice. This covers the formation of global analysis equations, member force-deformation relations, virtual work principles, and introduction to nonlinear analysis.

UIE305 Soil Mechanics [토질역학]

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

UIE306 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.

UIE307 Properties of Concrete [콘크리트재료공학]

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

UIE308 Structural Engineering Lab [구조공학실험]

This course is intended for students to conduct 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.

UIE401 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.

UIE402 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 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.

UIE403 Foundation Engineering [기초공학]

This course is concerned with not only the design of foundations for super structures but also the design of non-foundation systems such as retaining walls, bulkheads, cofferdams, tunnels, and earth dams. The required techniques for the design will be also discussed, which includes site investigations and ground improvements.

UIE404 Infrastructure Engineering [사회기반시설공학]

This course provides an introduction to technical aspects of urban infrastructures such as tall, long-span, and large-space civil structures (schools, gymnasiums, etc.), transportation systems (bridges, roads, tunnels, subways, airports, etc.), water supply and drainage systems, waste treatment plants, electricity and gas distribution facilities, energy production plants, and so on. The students will

gain a better understanding of urban infrastructure systems.

UIE405 Urban Design [도시설계]

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

UIE406 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, and real estate and business development cases will be introduced in this course.

UIE408 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. The 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.

UIE410 Special Topics in Urban infrastructure Engineering I [도시건설공학특론 Ⅰ]

In this course, subject offerings of new and developing areas of knowledge in urban infrastructure engineering will be given with intention to augment the existing curriculum. See course information for topics and prerequisites.

UIE411 Special Topics in Urban Infrastructure Engineering II [도시건설공학특론 II]

In this course, subject offerings of new and developing areas of knowledge in urban infrastructure engineering will be given with intention to augment the existing curriculum. See course information for topics and prerequisites.

UIE412 Special Topics in Urban Infrastructure Engineering III [도시건설공학특론 III]

In this course, subject offerings of new and developing areas of knowledge in urban infrastructure engineering will be given with intention to augment the existing curriculum. See course information for topics and prerequisites.

3) Disaster Management Engineering [DME]

DME201 Introduction to Natural Hazards [자연재해개론]

This course provides students with the causes and effects of natural disasters such as typhoon, heavy rainfall, flooding and drought, earthquakes, volcanic eruptions, tsunami, landslides. In particular, the physical and dynamical aspects of severe and hazardous disasters are examined. Also, some

cases studies will be used to investigate human, economic, and environmental consequences of destructive natural hazards.

DME202 Man-made Disasters [인적재해]

The goal of the course is to provide a basic overview of the various types of human-induced and industrial hazards and their potential for causing disasters. The purpose is to familiarize students with the basic concepts of man-made disasters and societal vulnerability.

DME311 Probability Concepts in Engineering [공학확률]

The aim of this course is to identify and model non-deterministic engineering problems using probability theories. This course focuses on the introduction of stochastic concepts and simulation models, and their applications to real decision-making problems in various engineering disciplines including civil engineering.

DME321 Numerical Modeling and Analysis [수치모델링 및 분석]

This course introduces the basics concept of numerical modeling and provides students with numerical methods. In addition, students have experience of numerical modeling and analysis in MATLAB.

DME331 Disaster Management [재난관리]

The goal of the course is to provide understanding of the general principles of management and their specific applications in the field of disaster management. The objective is to identify and examine the essential and fundamental elements of disaster mitigation, preparedness, response and recovery within an inclusive management policy framework.

DME332 Disaster Analysis [재난분석]

This course introduces the basic elements, processes and techniques of research utilized for description and analysis with special reference to disaster management. This course reviews how research is done and how to understand scholarly work including reading, understanding and applying studies from the field of disaster research.

DME341 Water Resources Engineering [수자원공학]

This course introduces engineering design concepts for water resources and engineering implications, including design and analysis of systems directly concerned with use and control of water; quantitative introduction to hydrology, hydraulic engineering, and water resources planning.

DME411 Hazard Analysis for System Safety [재해분석과 시스템안전성]

The course introduces the concept of safety assessment of complex systems, such as: power plants, industrial facilities and offshore platforms. However, the same principles are also applied in computer science to software safety. The course will focus on hazards, mishap, risk, and all the different

hazard analysis types. Special attention will be given to: fault tree analysis, event tree analysis, common cause failures, and failure mode and effects analysis. (Suggested courses: MTH211 Statistics).

DME421 Weather Analysis and Prediction [날씨 분석 및 예측]

Most disaster damages in Korea are related to the high-impact weather events. This course provides how to analyze current weather using variable observation data and how to predict future weather using empirical method as well as numerical method.

DME431 Economics of Disaster [재난경제학]

This course covers the costs of natural and man-made disasters, the existing policy frameworks for mitigating these costs in the industrialized world, and the ways in which these policies might be adapted for the developing world.

DME432 Vulnerability and Capacity Analysis [재해취약성 및 수용력분석]

This course provides knowledge on methods of risk identification and hazard analysis and the development of disaster management capacity of a community or region. The objective is to develop skills to assess the risk associated with a variety of scenarios and resultant vulnerability.

DME491~3 Special Topics in Disaster Management Engineering I ~ III [재난관리공학특론 I~III]

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

School of Design and Human Engineering

1. School Introduction

The School of Design and Human Engineering 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 two specialized tracks - Industrial Design and Human and Systems Engineering. A wide range of curricula will help students become global experts making innovations with creativity in diverse areas across design and engineering.

2. Undergraduate Programs

□ Track Introduction

1) Industrial Design (ID)

The Industrial Design track is designed to foster creative designers who can lead the innovative design of product and product-service systems. It provides interdisciplinary courses on design knowledge, methods and techniques across the entire product development process, including problem definition, user and market analysis, needs finding, creative idea generation, form and function development, design engineering, prototyping and business start-up. Students majoring in the ID track will play an essential role as integrative design thinkers and practitioners in future society, leading positive and innovative change in our society by employing user-centered design and scientific methods.

2) Human and Systems Engineering (HSE)

In the Human & Systems Engineering track, students will learn basic and applied knowledge regarding the functions of the human physical, cognitive and affective systems and on topics such as general ergonomics, HCI (human computer interaction) and engineering design. They will also become familiar with the tools necessary for optimal product design and engineering. This track will equip students with systems thinking and problem solving capabilities as well as a holistic

understanding of the product development process including planning, designing, engineering, testing/evaluation, and managing.

More specifically, Human Factors Engineering is the branch of science that applies what is known about human behavior, mental (cognitive/affective) processes, and anatomy and physiology to the systemic design development, and evaluation of work methods, environments, technologies, and products/systems. Systems Engineering provides methods 1) to transform elemental technologies from mechanics and electronics into practical products, 2) to convert scientific principles and engineering technologies into manufacturing-related information, and 3) to construct manufacturing systems.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		Remark
		Interdisciplinary Major		
		1st Track	2nd Track	
Industrial Design	Required	30	_	
	Elective	18	18[1)]	
Human and Systems Engineering (HSE)	Required	18	-	
	Elective	30	18	

1) ID 2nd track students choose 6 IID coded courses (required or elective). Sophomore choose IID2XX coded courses, Juniors IID3XX coded courses and Seniors courses with IID4XX codes.
2) HSE 2nd track students choose any HSE courses as the electives.
※ ID 1st and 2nd track students should follow the prerequisite.

3. Curriculum

□ Industrial Design (ID)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
ID Required	IID201	Design Elements and Principles	디자인요소와 원리	3-2-2	
	IID221	Design History & Contexts	디자인 역사와 맥락	3-3-0	
	IID202	Product Design Fundamentals	제품디자인기초	3-2-2	IID201
	IID232	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	
	IID301	Product Design I	제품디자인 I	3-2-2	
	IID331	Design Knowledge and Skill	디자인 지식과 기술	3-2-2	
	IID332	UX Design Research Methods	UX 디자인 연구 방법	3-2-2	
	IID302	Product Design II	제품디자인 II	3-2-2	IID301
	IID431	Creative Design 1	창의디자인 1	3-2-2	
	IID432	Creative Design 2	창의디자인 2	3-2-2	IID431

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
ID Elective	IID206	Design Visualization	디자인 시각화	3-2-2	
	IID205	Design Internationalization	디자인 국제화	3-3-0	
	IID315	Design Methodology	디자인 방법론	3-3-0	
	IID404	Product Service System Design	제품서비스시스템디자인	3-2-2	
	IID405	Design Communication	디자인 커뮤니케이션	3-2-2	
	IID410	Special Topics in IID I	통합산업디자인특론 I	3-3-0	
	IID420	Special Topics in IID II	통합산업디자인특론 II	3-3-0	
	IID430	Special Topics in IID III	통합산업디자인특론 III	3-3-0	
	IID304	Interactive Technology	인터랙티브 기술	3-2-2	
	HSE201	Computational Tools for Engineers	공학전산기법	3-3-0	
	HSE202	Introduction to Human Factors Engineering	인간공학개론	3-3-0	
	HSE203	Introduction to Engineering Systems Design	공학 시스템 디자인 개론	3-3-0	
	HSE301	Experimental Design	실험계획법	3-3-0	
	HSE302	Engineering Drawing and Analysis	기계제도 및 해석	3-2-2	
	HSE204	Basic Circuit Theory & Lab	기초회로이론 및 실습	3-2-2	
	HSE205	Physical Ergonomics	인체인간공학	3-3-0	
	HSE206	Cognitive Ergonomics	인지 인간공학	3-3-0	
	HSE207	Engineering Mechanics	기초역학	3-3-0	
	HSE303	Color Science & Engineering	색채과학과 공학	3-3-0	
	HSE304	High Touch Design	하이터치 디자인	3-2-2	
	HSE305	Physical Computing	피지컬 컴퓨팅	3-2-2	
	HSE306	Usability Engineering	사용성공학	3-3-0	
	HSE307	Manufacturing System Design & Simulation	생산시스템설계 및 시뮬레이션	3-2-2	
	HSE308	System Control	시스템 제어	3-3-0	
	HSE309	Work Measurement Methods	작업측정 및 방법	3-3-0	
	HSE402	Engineering Design Methods	공학디자인기법	3-3-0	
	HSE404	Brain-Computer Interface Design	뇌-컴퓨터 인터페이스 디자인	3-3-0	
	HSE405	Safety Engineering	안전공학	3-3-0	
	HSE406	Affective Engineering	감성공학	3-3-0	
	HSE407	Research Practicum in Human Factors	인간공학 연구 실무	3-3-0	
	HSE410	Special Topics in HSE I	HSE 특론 I	3-3-0	
	HSE420	Special Topics in HSE II	HSE 특론 II	3-3-0	

▸ Recommended Course Tracks (ID)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	**IID201** Design Elements and Principles	3-2-2		**IID301** Product Design I	3-2-2		**IID431** Creative Design 1	3-2-2		
	IID221 Design History & Contexts	3-3-0		**IID331** Design Knowledge and Skill	3-2-2		**IID432**[3] Creative Design 2		3-2-2	
	IID202[1] Product Design Fundamentals		3-2-2	**IID332** UX Design Research Methods		3-2-2				
	IID232 3D CAD & Prototyping		3-2-2	**IID302**[2] Product Design II		3-2-2				
Total		6	6		6	6		3	3	30
Elective	**IID206** Design Visualization	3-2-2		**IID304** Interactive technology	3-2-2		**IID404** Product Service System Design	3-2-2		
	IID205 Design Internationalization		3-3-0	**IID315** Design Methodology		3-3-0	**IID405** Design Communication		3-2-2	
	HSE201 Computational Tools for Engineers	3-3-0		**HSE301** Experiment Design	3-3-0		**HSE402** Engineering Design Methods	3-3-0		
	HSE202 Introduction to Human Factors Engineering	3-3-0		**HSE302** Engineering Drawing and Analysis	3-2-2		**HSE404** Brain-Computer Interface Design	3-3-0		
	HSE203 Introduction to Engineering Systems Design	3-3-0		**HSE303** Color Science & Engineering	3-3-0		**HSE405** Safety Engineering		3-3-0	
	HSE204 Basic Circuit Theory & Lab		3-2-2	**HSE304** High Touch Design	3-2-2		**HSE406** Affective Engineering		3-3-0	
	HSE205 Physical Ergonomics		3-3-0	**HSE305** Physical Computing	3-2-2		**HSE407** Research Practicum in Human Factors		3-3-0	
	HSE206 Cognitive Ergonomics		3-3-0	**HSE306** Usability Engineering		3-3-0	**IID420** Special Topics in IID II	3-3-0		
	HSE207 Engineering Mechanics		3-3-0	**HSE307** Manufacturing System Design & Simulation		3-2-2	**IID430** Special Topics in IID III		3-3-0	
				HSE308 System Control		3-3-0	**HSE410** Special Topics in HSE I	3-3-0		
				HSE309 Work Measurement Methods		3-3-0	**HSE420** Special Topics in HSE II		3-3-0	
				IID410 Special Topics in IID I		3-3-0				
Total		12	15		18	18		15	18	96
Sum Total		18	21		24	24		18	21	126

※ ID 2nd track students choose 6 IID coded courses (required or elective). Sophomore choose IID2XX coded courses, Juniors IID3XX coded courses and Seniors courses with IID4XX codes.

1) Prerequisite : IID201
2) Prerequisite : IID301
3) Prerequisite : IID401

□ Human & Systems Engineering (HSE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Required	HSE201	Computational Tools for Engineers	공학전산기법	3-3-0	
	HSE202	Introduction to Human Factors Engineering	인간공학개론	3-3-0	
	HSE203	Introduction to Engineering Systems Design	공학 시스템 디자인 개론	3-3-0	
	HSE301	Experimental Design	실험계획법	3-3-0	
	HSE302	Engineering Drawing and Analysis	기계제도 및 해석	3-2-2	
	HSE401	Capstone Design	캡스톤 디자인	3-2-2	
Elective	IID221	Design History & Contexts	디자인 역사와 맥락	3-3-0	
	HSE204	Basic Circuit Theory & Lab	기초회로이론 및 실습	3-2-2	
	HSE205	Physical Ergonomics	인체인간공학	3-3-0	
	HSE206	Cognitive Ergonomics	인지 인간공학	3-3-0	
	HSE207	Engineering Mechanics	기초역학	3-3-0	
	HSE303	Color Science & Engineering	색채과학과 공학	3-3-0	
	HSE304	High Touch Design	하이터치 디자인	3-2-2	
	HSE305	Physical Computing	피지컬 컴퓨팅	3-2-2	
	HSE306	Usability Engineering	사용성공학	3-3-0	
	HSE307	Manufacturing System Design & Simulation	생산시스템설계 및 시뮬레이션	3-2-2	
	HSE308	System Control	시스템 제어	3-3-0	
	HSE309	Work Measurement Methods	작업측정 및 방법	3-3-0	
	MGT363	Operations Research	계량경영학	3-3-0	
	HSE402	Engineering Design Methods	공학디자인기법	3-3-0	
	HSE403	Project Lab	프로젝트 랩	1-1-0	
	HSE404	Brain-Computer Interface Design	뇌-컴퓨터 인터페이스 디자인	3-3-0	
	HSE405	Safety Engineering	안전공학	3-3-0	
	HSE406	Affective Engineering	감성공학	3-3-0	
	HSE407	Research Practicum in Human Factors	인간공학 연구 실무	3-3-0	
	HSE410	Special Topics in HSE I	HSE 특론 I	3-3-0	
	HSE420	Special Topics in HSE II	HSE 특론 II	3-3-0	

▸ Recommended Course Tracks (HSE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	**HSE201** Computational Tools for Engineers	3-3-0		**HSE301** Experiment Design	3-3-0		**HSE401** Capstone Design	3-2-2		
	HSE202 Introduction to Human Factors Engineering	3-3-0		**HSE302** Engineering Drawing and Analysis	3-2-2					
	HSE203 Introduction to Engineering Systems Design	3-3-0								
Total		9			6			3		18
Elective	**IID221** Design History & Contexts	3-3-0		**HSE303** Color Science & Engineering	3-3-0		**HSE402** Engineering Design Methods	3-3-0		
	HSE204 Basic Circuit Theory & Lab		3-2-2	**HSE304** High Touch Design	3-2-2		**HSE403** Project Lab	1-1-0		
	HSE205 Physical Ergonomics		3-3-0	**HSE305** Physical Computing	3-2-2		**HSE404** Brain-Computer Interface Design	3-3-0		
	HSE206 Cognitive Ergonomics		3-3-0	**HSE306** Usability Engineering		3-3-0	**HSE405** Safety Engineering		3-3-0	
	HSE207 Engineering Mechanics		3-3-0	**HSE307** Manufacturing System Design & Simulation		3-2-2	**HSE406** Affective Engineering		3-3-0	
				HSE308 System Control		3-3-0	**HSE407** Research Practicum in Human Factors		3-3-0	
				HSE309 Work Measurement Methods		3-3-0	**HSE410** Special Topics in HSE I	3-3-0		
				MGT363 Operations Research		3-3-0	**HSE420** Special Topics in HSE II		3-3-0	
Total		3	12		9	15		10	12	61
Sum Total		12	12		15	15		13	12	79

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Industrial Design	DHE201 Design Thinking	⇨	IID221 Design History & Contexts
	DHE302 DHE Research Methods	⇨	IID332 UX Design Research Methods
	DHE401 Creative Design 1	⇨	IID431 Creative Design 1
	DHE402 Creative Design 2	⇨	IID432 Creative Design 2
	IID204 Design Knowledge and Skill	⇨	IID331 Design Knowledge and Skill
	IID303 3D CAD & Prototyping	⇨	IID232 3D CAD & Prototyping
	IID401 Product Service System Design **(Track Required Course)**	⇨	IID404 Product Service System Design **(Track Elective Course)**
	IID206 Design Sketching & Visualization	⇨	IID206 Design Visualization
	IID402 Design Communication	⇨	IID405 Design Communication
	AHE201 Introduction to Human Factors Engineering	⇨	HSE202 Introduction to Human Factors Engineering
	AHE202 Cognitive Ergonomics	⇨	HSE206 Cognitive Ergonomics
	AHE203 Physical Ergonomics	⇨	HSE205 Physical Ergonomics
	AHE301 Experimental Design	⇨	HSE301 Experimental Design
	AHE311 Usability Engineering	⇨	HSE306 Usability Engineering
	AHE402 Affective Engineering	⇨	HSE406 Affective Engineering
	AHE411 Safety Engineering	⇨	HSE405 Safety Engineering
	AHE412 Brain-Computer Interaction	⇨	HSE404 Brain-Computer Interface Design
	ESD201 Engineering Mechanics I	⇨	HSE207 Engineering Mechanics
	ESD202 Basic Circuit Theory & Lab	⇨	HSE204 Basic Circuit Theory & Lab
	ESD204 Computational Tools for Engineers	⇨	HSE201 Computational Tools for Engineers
	ESD302 Manufacturing System Design & Simulation	⇨	HSE307 Manufacturing System Design & Simulation
	ESD303 System Control	⇨	HSE308 System Control
	ESD401 Engineering Design Methods	⇨	HSE402 Engineering Design Methods
	DHE312 High Touch Design	⇨	HSE304 High Touch Design
	DHE313 Color Science & Design	⇨	HSE303 Color Science & Engineering
			IID205 Design Internationalization **(New)**
			IID315 Design Methodology **(New)**
			HSE305 Physical Computing **(New)**
			HSE309 Work Measurement Methods **(New)**
			HSE407 Research Practicum in Human Factors **(New)**
			HSE203 Introduction to Engineering Systems Design **(New)**
			HSE302 Engineering Drawing and Analysis **(New)**
			HSE410 Special Topics in HSE I **(New)**
			HSE420 Special Topics in HSE II **(New)**
	AHE302 Perception (Close)		

Acad. Yr.	2014		2015
Human & Systems Engineering	DHE201 Design Thinking	⇨	IID221 Design History & Contexts
	AHE201 Introduction to Human Factors Engineering	⇨	HSE202 Introduction to Human Factors Engineering
	AHE202 Cognitive Ergonomics **(Track Required Course)**	⇨	HSE206 Cognitive Ergonomics **(Track Elective Course)**
	AHE203 Physical Ergonomics **(Track Required Course)**	⇨	HSE205 Physical Ergonomics **(Track Elective Course)**
	AHE301 Experimental Design	⇨	HSE301 Experimental Design
	AHE311 Usability Engineering **(Track Required Course)**	⇨	HSE306 Usability Engineering **(Track Elective Course)**
	AHE411 Safety Engineering **(Track Required Course)**	⇨	HSE405 Safety Engineering **(Track Elective Course)**
	ESD201 Engineering Mechanics I **(Track Required Course)**	⇨	HSE207 Engineering Mechanics **(Track Elective Course)**
	ESD202 Basic Circuit Theory & Lab **(Track Required Course)**	⇨	HSE204 Basic Circuit Theory & Lab **(Track Elective Course)**
	ESD204 Computational Tools for Engineers	⇨	HSE201 Computational Tools for Engineers
	ESD301 Engineering Drawing and Analysis	⇨	HSE302 Engineering Drawing and Analysis
	ESD302 Manufacturing System Design & Simulation **(Track Required Course)**	⇨	HSE307 Manufacturing System Design & Simulation **(Track Elective Course)**
	ESD303 System Control **(Track Required Course)**	⇨	HSE308 System Control **(Track Elective Course)**
	ESD401 Engineering Design Methods **(Track Required Course)**	⇨	HSE402 Engineering Design Methods **(Track Elective Course)**
	AHE312 Work Measurement Methods	⇨	HSE309 Work Measurement Methods
	AHE314 Advanced Topics in ACE (Affect, Cognition and Ergonomics)	⇨	HSE407 Research Practicum in Human Factors
	AHE402 Affective Engineering	⇨	HSE406 Affective Engineering
	AHE412 Brain-Computer Interaction	⇨	HSE404 Brain-Computer Interface Design
	AHE410 Special Topics in AHE I	⇨	HSE410 Special Topics in HSE I
	AHE420 Special Topics in AHE II	⇨	HSE420 Special Topics in HSE II
	DHE312 High Touch Design	⇨	HSE304 High Touch Design
	DHE313 Color Science & Design	⇨	HSE303 Color Science & Engineering
	DHE402 Creative Design 2 **(Close)**	⇨	HSE401 Capstone Design **(Substitution)**
	IID303 3D CAD & Prototyping **(Close)**	⇨	IID232 3D CAD & Prototyping **(Substitution)**
	IID304 Interactive Technology **(Close)**	⇨	HSE305 Physical Computing **(Substitution)**
			HSE203 Introduction to Engineering Systems Design **(New)**
			HSE403 Project Lab **(New)**
			HSE401 Capstone Design **(New)**
			HSE305 Physical Computing **(New)**
			MGT363 Operation Research **(New)**
	AHE302 Perception **(Close)**		
	DHE302 DHE Research Methods **(Close)**		
	DHE401 Creative Design 1 **(Close)**		
	AHE430 Special Topics in AHE III **(Close)**		

Acad. Yr.	2014		2015
Human & Systems Engineering	ESD206 Engineering Mechanics II **(Close)**		
	ESD403 Reliability Engineering **(Close)**		
	ESD410 Special Topics in ESD I **(Close)**		
	ESD420 Special Topics in ESD II **(Close)**		
	ESD430 Special Topics in ESD III **(Close)**		
	MEN350 Manufacturing Processes and Lab **(Close)**		

5. Course Descriptions

1) Industrial Design (ID)

IID201 Design Elements and Principles [디자인 요소와 원리]

This course is a basic design course which aims to cultivate creative presentation techniques. Basic elements and principles of 2D and 3D design are taught through lectures and studio practice. This will then provide students with a more developed understanding of the relationship between visual and functional elements of design. The course will also cover the principle of esthetic harmony.

IID221 Design History & Contexts [디자인 역사와 맥락]

This course studies the history of industrial design and its contexts within our contemporary society. The contents of the course will include, but not be limited to the history and context of design as it relates to the social, cultural, economic, political, technical and the aesthetic. Design history and contexts has as its object of study all designed objects including those of Architecture, fashion, crafts, interiors, textiles, graphic design, industrial design and product design. Visual literacy, research and writing skills, and critical analyses are some of the skills covered in this course. Students will be provided with a systematic understanding of how industrial design operates in various geographical and historical contexts. The course will help students develop the intellectual rigor necessary to become the next generation of art and design leaders. Through the use of multidisciplinary approaches, students learn how to imaginatively frame questions and consider problems from multiple perspectives.

IID202 Product Design Fundamentals [제품디자인 기초]

This is an introductory course in product design. Students will develop a greater understanding of and appreciation for 3D form and design aesthetic both through lectures and discussion of key

concepts and their application in a series of design tasks and short projects. Through a final project to design a low-tech 3D product, students learn skills ranging from solving observed design problems to constructing prototypes and mockups to communicate design intent.

IID232 3D CAD & Prototyping [3D CAD와 프로토타이핑]

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

IID301 Product Design I [제품 디자인 I]

This course is a practical instruction in product design focusing on product innovation, production processes and techniques, characteristics of materials, and some of the key concepts and principles that underpin product design practice. The course aims to develop students' capacity to design products according to the system of mass production through practising the creation of product concepts and the improvement of current designs.

IID331 Design Knowledge and Skill [디자인 지식과 기술]

A comprehensive prototyping approach is critical to making informed design decisions and is a strategic part of an industrial designer’s toolkit. This course explains how models and prototypes of various levels of fidelity are used to understand design problems, explore solutions, investigate human interactions and communicate design intent to others. Students will learn effective prototyping skills, methods and strategies using various workshop machines and digital technologies to realize and communicate their design intentions.

DHE332 UX Design Research Methods UX [디자인 연구 방법]

This course focuses on selecting and applying methods, techniques and tools for simulating user-product interaction and assessing usability and user experience. Special attention is given to methods and techniques of observational research. In this project students start by analysing an existing product in a user study. The conclusions from this study are used to redesign the product and optimise usability and user experience. Then an interactive prototype of the design proposal has to be built and finally the design proposal is put to the test in a second user study.

IID302 Product Design II [제품 디자인 II]

This course is designed with a focus on market research related to product design such as product life cycle, classification of markets, and the consumer's motivation to purchase. This course cultivates students' ability to satisfy consumer needs through survey methods, gathering statistics, cultural anthropological approaching and design based scenarios.

IID431 Creative Design 1 [창의 디자인 1]

This course involves conducting the first stage of a substantial product development process. During the course students are required to identify an area of study, conduct interdisciplinary research and conceive and propose a novel idea or design concept for this space. Final outcomes will include a report and presentation describing the problem area, research conducted and final design concepts.

IID432 Creative Design 2 [창의 디자인 2]

This course uses, as a starting point, work undertaken during Creative Design I (IID401). During the course students continue to develop and refine their ideas through the application of knowledge and skills acquired during their undergraduate degree. The scope of final outcomes may include, but not be limited to, the fabrication of functional prototypes; patent applications; designs and reports. Finally, students will present their work as prototypes, visual representations, posters and any other relevant medium at a terminal degree exhibition open to industry and the public.

IID206 Design Visualization [디자인 시각화]

This course focuses on the core design ability of sketching and visualization to foster both pragmatic skills as well as an understanding of the role and use of sketching as a tool for design thinking and communication. The course will provide students with improved sketching abilities and a more holistic approach to and understanding of sketching as a means to support design practice.

IID205 Design Internationalization [디자인 국제화]

This course is designed to prepare the student to work in an international context as the profession of industrial designer has become international. Especially industrial designers working in local companies are faced with international aspects of product development and management such as entering international markets, outsourcing production to other countries, international product policies and globalization. In order to prepare students for industrial design in the international context, they will be introduced to the international aspects of their profession

IID315 Design Methodology [디자인 방법론]

The goal of this course is to help students to gain a deeper understanding of designing as a problem solving activity in a specific context. The course offers Design Theory and Methodology as a framework that integrates theoretical concepts from different fields, which all contribute to the process and thus to the product. Lectures, discussions and assignments help the students to develop the ability to think critically about the design process and thus to improve their own design processes.

IID404 Product Service System Design [제품서비스 시스템디자인]

The objective of this course is to investigate the integrated concept of design products and their systems. 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 systems. The course will emphasize team work and collaborative learning

to solve theoretical and practical design issues.

IID405 Design Communication [디자인 커뮤니케이션]

This course addresses the fundamental principles of design theory and communication. Emphasis is given to portfolio design and self promotion through the use of various media. The course also aims to develop a greater understanding of the relationship between communication and design practice within industry. From the oral presentation of design ideas to the use of visualization methods and prototypes of various levels of detail and fidelity, students will develop their ability to effectively communicate their design intentions to a variety of stake holders.

IID410,420,430 Special Topics in IID I, II, III [통합산업디자인특론 I, II, III]

In these courses contemporary topics in various areas related to Industrial Design will be covered. Topic selection will be made based upon special interests.

IID304 Interactive Technology [인터랙티브 기술]

This course introduces students to the area of physical computing - the use of sensors and actuators to sense and respond to natural human actions and activities. This course is about creating systems and products that bridge the gap between the physical and digital worlds by providing the knowledge, skills, examples and experience to realize novel and compelling forms of physical-digital connection. It takes the form of a studio course supplemented by a series of tutorials covering basic technical material. Students will develop skills in conceiving, designing, prototyping and critiquing systems that realize physical-digital interaction design.

HSE201 Computational Tools for Engineers [공학전산기법]

This course studies essential and practical computational tools and methods for engineers and designers. Students will improve their understanding of computer programming and IT applications in engineering design. Practical laboratories and projects with MATLAB and LabView will complement the course.

HSE202 Introduction to Human Factors Engineering [인간공학개론]

This course surveys human factors engineering emphasizing the systems approach to workplace and machine design. It includes a 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.

HSE203 Introduction to Engineering Systems Design [공학 시스템 디자인 개론]

This course introduces entry-level students to the basic concepts and methods of engineering systems design. Real-world engineering problems will be provided to give the students the basic understanding of how the engieering design process works.

HSE301 Experimental Design [실험계획법]

The course describes procedures for designing, conducting and analyzing experiments efficiently and effectively. It includes the fundamentals of research, experimental design alternatives, fitting and testing statistical models, and data interpretation and presentation. Both design and statistical issues will be discussed and computer software packages to implement the methods presented will be illustrated extensively.

HSE302 Engineering Drawing and Analysis [기계제도 및 해석]

This course not only provides the fundamental components of mechanical drawing, but also studies mechanical kinematics, system analysis and parameter optimization via simulation tools. In this course, students are expected to learn various computer simulation tools and their fundamentals for the design and development of mechanical products. 'HSE207 Engineering Mechanics' is strongly recommended as prerequisite for this course.

HSE204 Basic Circuit Theory & Lab [기초회로이론 및 실습]

The aims of this course are to develop understanding of the principles and the fundamental concepts of circuit analysis, and to extend the students'ability to apply system analysis to other branches of engineering. This course integrates a number of concepts introduced in other courses in the disciplines of physics and mathematics. Students will see how abstract theoretical ideas work in practice. The course will focus on both hands-on experience and design practice.

HSE205 Physical Ergonomics [인체인간공학]

This course provides students with a working knowledge of key areas of physical ergonomics. These include: the physiology of the human musculoskeletal system; work capacity; occupational biomechanics; and digital human movement modeling. This knowledge will be applied to problems in product and environment design.

HSE206 Cognitive Ergonomics [인지 인간공학]

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

HSE207 Engineering Mechanics [기초역학]

This course studies the essential and fundamental concepts of engineering mechanics, including solid mechanics, dynamics, fluid dynamics, and thermodynamics. In this course, students are expected to understand basic knowledge of system physics in order to analyze and model mechanical systems.

HSE303 Color Science & Engineering [색채과학과 공학]

This course deals with the human vision, fundamentals of color science, and its applications. Human visual system, psychophysics, CIE colorimetry, color appearance, and engineering issues related to color imaging systems such as displays or camera will be taught. Student will conduct a project

related to the human visual perception and application system

HSE304 High Touch Design [하이터치 디자인]

High Touch Design is a process that tries to develop a user friendly, compatible and aesthetic product based upon 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. The term project will be assigned to create a non-existing product.

HSE305 Physical Computing [피지컬 컴퓨팅]

This course introduces students to the area of physical computing - the use of sensors and actuators to sense and respond to natural human actions and activities. This course is about creating systems and products that bridge the gap between the physical and digital worlds by providing the knowledge, skills, examples and experience to realize novel and compelling forms of physical-digital connection. It takes the form of a studio course supplemented by a series of tutorials covering basic technical material. Students will develop skills in conceiving, designing, prototyping and critiquing systems that realize physical-digital interaction design

HSE306 Usability Engineering [사용성공학]

In the context of the design of interactive computer systems (e.g. Human-Computer Interaction), this course deals with definition of usability, what metrics can be used to measure and quantify it and what techniques and methods can be used to improve and achieve it. Course material will be delivered by lecture and student assessment is via exams and a single full-semester class project. Individual classes will also be devoted to supporting and critiquing project work.

HSE307 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 equipment are functioning to maximum efficiency and productivity.

HSE308 System Control [시스템 제어]

This course aims to introduce students to the fundamental principles of system modeling and its control. Students will study how to model the dynamics of mechanicals, electrical and hybrid systems. The topics include control system modeling, time response and frequency response analysis, classic control theory, and state space representation. Projects with MATLAB and LabView will be conducted during the course. Engineering Mechanics I and Basic Circuit Theory & Lab are recommended prerequisites for this course.

HSE309 Work Measurement Methods [작업측정 및 방법]

This course aims to introduce methods for assessing and improving human performance and manufacturing productivity. Topics studied include basic industrial engineering tools, work measurement procedures, data acquisition, analysis and applications, performance evaluation and appraisal, and learning curve etc.

HSE402 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 phases of design alternatives, whilst various optimization techniques such as 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.

HSE404 Brain-Computer Interface Design [뇌-컴퓨터 인터페이스 디자인]

This course introduces the fundamentals of Brain-Computer Interaction (BCI). Students will learn how to sense, process and use signals captured from the brain to develop functional interfaces between the human brain and external devices.

HSE405 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.

HSE406 Affective Engineering [감성공학]

Translation of human affections into design features is the objective of Affective Engineering. This course focuses upon the 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.

HSE407 Research Practicum in Human Factors [인간공학 연구 실무]

This course deals with special topics in ACE (Affect, Cognition, and/or Ergonomics). The instructor will introduce basics, advances, and recent activities in ACE-related research areas. Students will present and criticize journal papers from these areas. For the team-based project, each team will define their research topic, design experiments, run pilot/main experiments, and write a professional research report.

HSE410,420 Special Topics in HSE I, II [HSE 특론 I, II]

In these courses contemporary topics in various areas related to Human and Systems Engineering will be covered. Topic selection will be made based upon special interests.

2) Human & Systems Engineering (HSE)

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HSE401 Capstone Design [캡스톤 디자인]

Capstone design applies the engineering sciences to the design of a system, component or process. Students work in teams to design and develop functional prototypes (hardware, software), computer simulations, or professional engineering reports with real applications. At the end of the semester, students showcase their efforts at the school exhibition.

IID221 Design History & Contexts [디자인 역사와 맥락]

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This course aims to introduce methods for assessing and improving human performance and manufacturing productivity. Topics studied include basic industrial engineering tools, work measurement procedures, data acquisition, analysis and applications, performance evaluation and appraisal, and learning curve etc.

MGT363 Operations Research [계량경영학]

The goal of this course is to teach students to formulate, analyze, and solve mathematical models that represent real-world problems. The course will also discuss how to use EXCEL (and LINDO) for solving optimization problems. In particular, this course will cover linear programming, network flow problems (and integer programs, nonlinear programs) dynamic programming, simulation, and stochastic models.

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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 phases of design alternatives, whilst various optimization techniques such as 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.

HSE403 Project Lab [프로젝트 랩]

Students and strategic partners from industry will work in project teams and undertake innovative technology development or product design projects involving product specification, conceptual design, detailed design and prototype-making/testing. The teams must aim to disseminate completed project outcomes to industry. The progress of each project will be reviewed based on formal presentations

HSE404 Brain-Computer Interface Design [뇌-컴퓨터 인터페이스 디자인]

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HSE410,420 Special Topics in HSE I, II [HSE 특론 I, II]

In these courses contemporary topics in various areas related to Human and Systems Engineering will be covered. Topic selection will be made based upon special interests.

School of Materials Science and Engineering

1. School Introduction

The School of Materials Science and Engineering 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, processing and properties. The School of Materials Science and Engineering covers conventional materials to most advanced materials including nano materials and beyond.

2. Undergraduate Programs

□ Track Introduction

1) Advanced Materials Science (AMS)

Students in Advanced Materials Science(AMS) track will learn how the structure is controlled during the manufacturing process by various chemical, thermal, mechanical, electrical and other treatments. AMS 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 science, technologies and industrial fields based on the knowledge of materials science and engineering.

2) Nano Materials Engineering (NME)

Students in Nano Materials Engineering (NME) track will learn the basic knowledges of nano materials science and engineering. NME track is directed towards understanding of various nano materials, nano structures and its applications mostly in the nano regime. Nano materials design and synthesis, nano processing and nano devices fabrications are in the scope of this specialized track. We envision that the students will pioneer realization of nano materials in modern nano science and technologies based on the knowledge of nano materials.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		
		Interdisciplinary Major		
		1st Track	2nd Track	
Advanced Materials Science	Required	21	9	
	Elective	27	9	
Nano Materials Engineering	Required	21	9	
	Elective	27	9	

3. Curriculum

□ Advanced Materials Science (AMS)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	AMS202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	AMS203	Thermodynamics of Materials	재료열역학	3-3-0	
	AMS230	Introduction to Crystallography	결정학개론	3-3-0	AME202 or NME202
	AMS314	Defects in Crystals	결정결함론	3-3-0	
	AMS390	Introduction to Computational Materials Science	전산재료과학개론	3-3-0	
1TR:R 2TR:E	AMS300	Materials Lab	재료실험	3-1-4	
	AMS312	Phase Transformations in Materials	재료상변태	3-3-0	
	NME313	Mechanical Behavior of Materials	재료의기계적거동	3-3-0	AME202 or NME202
	AMS350	Solid State Physics of Materials I	재료고체물리 I	3-3-0	
Elective	AMS311	Introduction to Metallic Materials	금속재료개론	3-3-0	
	AMS330	Introduction to Ceramics	세라믹 물성학	3-3-0	
	AMS351	Thin Film Technology	박막공학	3-3-0	
	AMS352	Solid State Physics of Materials II	재료고체물리 II	3-3-0	
	AMS353	Surface Science of Materials	재료표면과학	3-3-0	AMS202 or NME202
	AMS401	Transmission Electron Microscopy	전자현미경학	3-3-0	
	AMS431	Magnetic Properties of Materials	재료의 자기적 성질	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	AMS432	Piezoelectric Materials	압전재료	3-3-0	
	AMS410	Principles of Corrosion Engineering and Prevention	재료 부식과 방식	3-3-0	
	AMS411	Extreme Environment Materials	극한환경소재	3-3-0	
	AMS460	Bio-inspired Materials Science	바이오소재과학	3-3-0	
	AMS497	Special Topics in Advanced Materials Science I	신소재과학특론 I	3-3-0	
	AMS498	Special Topics in Advanced Materials Science II	신소재과학특론 II	3-3-0	
	NME250	Modern Physics of Materials	재료현대물리	3-3-0	
	NME251	Introduction to Nanomaterials	나노재료개론	3-3-0	
	NME252	Physical Chemistry of Materials : Reaction Engineering	재료물리화학 : 반응공학	3-3-0	
	NME301	Nano Materials Lab	나노재료실험	3-1-4	
	NME315	Physical Metallurgy	물리금속학	3-3-0	NME313
	NME354	Introduction to Semiconductor	반도체개론	3-3-0	
	NME355	Introduction to nano-energy Materials	나노에너지재료	3-3-0	
	NME370	Introduction to Polymer Materials	고분자재료개론	3-3-0	
	NME371	Introduction to Flexible Electronics	유연전자소자 개론	3-3-0	
	NME430	Nano-Electroceramics	나노전자세라믹스	3-3-0	
	NME452	Nano Semiconducting Materials	나노반도체소자	3-3-0	
	NME454	Nano-Materials Reliability	나노소재신뢰성	3-3-0	
	NME455	Display Engineering	디스플레이공학	3-3-0	
	NME456	Intoduction to Nanophotonics	나노포토닉스 개론	3-3-0	
	NME470	Polymer Physics	고분자 물리	3-3-0	
	NME471	Polymer Composites	고분자 복합재료	3-3-0	
	MEN230	Solid MechanicsI	고체역학 I	3-3-0	
	MEN301	Numerical Analysis	수치해석	3-3-0	
	MEN431	Introduction to Plastic Deformation	소성학개론	3-3-0	
	EE231	ElectromagneticsI	전자기학 I	3-3-0	
	PHY301	Quantum Mechanics I	양자물리학 I	3-3-0	PHY101, PHY102
	ENE312	Electrochemistry	전기화학	3-3-0	
	CHM211	Organic Chemistry I	유기화학 I	3-3-0	
	CHM391	Instrumental Analysis	기기분석	3-3-0	
	CHM371	Introduction to Nanochemistry	나노화학개론	3-3-0	
	CHM351	Inorganic Chemistry I	무기화학 I	3-3-0	

▸ Recommended Course Tracks (AMS)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	AMS202 Introduction to Materials Science and Engineering	3-3-0	(3-3-0)	AMS314 Defects in Crystals		3-3-0				
	AMS203 Thermodynamics of Materials	3-3-0		AMS390 Introduction to Computational Materials Science	3-3-0					
	AMS230 Introduction to Crystallography		3-3-0							
1TR : R 2TR : E				AMS300 Materials Lab	3-1-4					
				AMS312 Phase Transformations in Materials	3-3-0					
				AMS350 Solid State Physics of Materials I	3-3-0					
				NME313 Mechanical Behavior of Materials	3-3-0					
Total		6	3		15	3				27
Elective	NME250 Modern Physics of Materials		3-3-0	AMS311 Introduction to Metallic Materials		3-3-0	AMS401 Transmission Electron Microscopy	(3-3-0)	(3-3-0)	
	NME251 Introduction to Nanomaterials		3-3-0	AMS330 Introduction to Ceramics	(3-3-0)	(3-3-0)	AMS431 Magnetic Properties of Materials		3-3-0	
	NME252 Physical Chemistry of Materials : Reaction Engineering		3-3-0	AMS351 Thin Film Technology	3-3-0		AMS460 Bio-inspired Materials Science	3-3-0		
	MEN230 Solid MechanicsI	3-3-0		AMS353 Surface Science of Materials		3-3-0	NME430 Nano-Electroceramics	3-3-0		
	EE231 ElectromagneticsI	3-3-0		NME301 Nano Materials Lab		3-1-4	AMS432 Piezoelectric Materials		3-3-0	
	CHM211 Organic Chemistry I	3-3-0		NME315 Physical Metallurgy	(3-3-0)	(3-3-0)	NME452 Nano Semiconducting Materials	3-3-0		
				NME354 Introduction to Semiconductor		3-3-0	NME454 Nano-Materials Reliability	3-3-0		
				NME355 Introduction to nano-energy Materials	3-3-0		NME455 Display Engineering	3-3-0		
				NME370 Introduction to Polymer Materials	3-3-0		NME470 Polymer Physics		3-3-0	
				NME371 Introduction to Flexible Electronics		3-3-0	NME471 Polymer Composites		3-3-0	
				MEN301 Numerical Analysis	3-3-0		MEN431 Introduction to Plastic Deformation		3-3-0	
				PHY301 Quantum Mechanics I	3-3-0		* AMS410 Principles of Corrosion Engineering and Prevention	(3-3-0)	(3-3-0)	
				ENE312 Electrochemistry		3-3-0	* AMS411 Extreme Environment Materials	(3-3-0)	(3-3-0)	
				CHM391 Instrumental Analysis	3-3-0		* NME456 Intoduction to Nanophotonics	(3-3-0)	(3-3-0)	
				CHM371 Introduction to Nanochemistry		3-3-0				
				CHM351 Inorganic Chemistry I	3-3-0					
				* AMS352 Solid State Physics of Materials II	(3-3-0)	(3-3-0)				
Total		9	9		30	24		27	15	114
Sum Total		15	12		45	27		27	15	141

* to be determined.

□ Nano Materials Engineering [NME]

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	NME203	Thermodynamics of Materials	재료열역학	3-3-0	
	NME251	Introduction to Nanomaterials	나노재료개론	3-3-0	
	NME313	Mechanical Behavior of Materials	재료의기계적거동	3-3-0	AMS202 or NME202
	NME370	Introduction to Polymer Materials	고분자재료개론	3-3-0	
	NME430	Nano-Electroceramics	나노전자세라믹스	3-3-0	
1TR:R 2TR:E	NME202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	NME250	Modern Physics of Materials	재료현대물리	3-3-0	
	AMS300	Materials Lab	재료실험	3-1-4	
	AMS312	Phase Transformations in Materials	재료상변태	3-3-0	
Elective	NME252	Physical Chemistry of Materials : Reaction Engineering	재료물리화학 : 반응공학	3-3-0	
	NME301	Nano Materials Lab	나노재료실험	3-1-4	
	NME315	Physical Metallurgy	물리금속학	3-3-0	NME313
	NME354	Introduction to Semiconductor	반도체개론	3-3-0	
	NME355	Introduction to nano-energy Materials	나노에너지재료	3-3-0	
	NME371	Introduction to Flexible Electronics	유연전자소자 개론	3-3-0	
	NME452	Nano-Semiconducting Devices	나노반도체소자	3-3-0	
	NME454	Nano-Materials Reliability	나노소재신뢰성	3-3-0	
	NME455	Display Engineering	디스플레이공학	3-3-0	
	NME456	Introduction to Nanophotonics	나노포토닉스 개론	3-3-0	
	NME470	Polymer Physics	고분자 물리	3-3-0	
	NME471	Polymer Composites	고분자 복합재료	3-3-0	
	NME497	Special Topics in Nano Materials Engineering I	나노재료공학특론 I	3-3-0	
	NME498	Special Topics in Nano Materials Engineering II	나노재료공학특론 II	3-3-0	
	AMS230	Introduction to Crystallography	결정학개론	3-3-0	AMS202 or NME202
	AMS311	Introduction to Metallic Materials	금속재료개론	3-3-0	
	AMS314	Defects in Crystals	결정결함론	3-3-0	
	AMS330	Introduction to Ceramics	세라믹 물성학	3-3-0	
	AMS350	Solid State Physics of Materials I	재료고체물리 I	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	AMS351	Thin Film Technology	박막공학	3-3-0	
	AMS352	Solid State Physics of Materials II	재료고체물리 II	3-3-0	
	AMS353	Surface Science of Materials	재료표면과학	3-3-0	
	AMS390	Introduction to Computational Materials Science	전산재료과학개론	3-3-0	
	AMS401	Transmission Electron Microscopy	전자현미경학	3-3-0	
	AMS431	Magnetic Properties of Materials	재료의 자기적 성질	3-3-0	
	AMS432	Piezoelectric Materials	압전재료	3-3-0	
	AMS410	Principles of Corrosion Engineering and Prevention	재료 부식과 방식	3-3-0	
	AMS411	Extreme Environment Materials	극한환경소재	3-3-0	
	AMS460	Bio-inspired Materials Science	바이오소재과학	3-3-0	
	MEN230	Solid MechanicsI	고체역학 I	3-3-0	
	MEN431	Introduction to Plastic Deformation	소성학개론	3-3-0	
	MEN301	Numerical Analysis	수치해석	3-3-0	
	EE231	ElectromagneticsI	전자기학 I	3-3-0	
	PHY301	Quantum Mechanics I	양자물리학 I	3-3-0	PHY101, PHY102
	ENE312	Electrochemistry	전기화학	3-3-0	
	CHM211	Organic Chemistry I	유기화학 I	3-3-0	
	CHM391	Instrumental Analysis	기기분석	3-3-0	
	CHM371	Introduction to Nanochemistry	나노화학개론	3-3-0	
	CHM351	Inorganic Chemistry I	무기화학 I	3-3-0	

▸ Recommended Course Tracks (NME)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	NME203 Thermodynamics of Materials	3-3-0		NME313 Mechanical Behavior of Materials	3-3-0		NME430 Nano-Electroceramics	3-3-0		
	NME251 Introduction to Nanomaterials		3-3-0	NME370 Introduction to Polymer Materials	3-3-0					
1TR : R 2TR : E	NME202 Introduction to Materials Science and Engineering	3-3-0	3-3-0	AMS300 Materials Lab	3-1-4					
	NME250 Modern Physics of Materials		3-3-0	AMS312 Phase Transformations in Materials	3-3-0					
Total		6	9		12			3		30
Elective	NME252 Physical Chemistry of Materials : Reaction Engineering		3-3-0	NME301 Nano Materials Lab		3-1-4	AMS432 Piezoelectric Materials		3-3-0	
	AMS230 Introduction to Crystallography		3-3-0	* AMS330 Introduction to Ceramics	(3-3-0)	(3-3-0)	NME452 Nano-Semiconducting Devices	3-3-0		
	MEN230 Solid MechanicsI	3-3-0		* NME315 Physical Metallurgy	(3-3-0)	(3-3-0)	NME454 Nano-Materials Reliability	3-3-0		
	EE231 ElectromagneticsI	3-3-0		NME354 Introduction to Semiconductor		3-3-0	NME455 Display Engineering	3-3-0		
	CHM211 Organic Chemistry I	3-3-0		NME355 Introduction to nano-energy Materials	3-3-0		NME470 Polymer Physics		3-3-0	
				NME371 Introduction to Flexible Electronics		3-3-0	* AMS401 Transmission Electron Microscopy	(3-3-0)	(3-3-0)	
				AMS311 Introduction to Metallic Materials		3-3-0	AMS431 Magnetic Properties of Materials		3-3-0	
				AMS314 Defects in Crystals		3-3-0	AMS460 Bio-inspired Materials Science	3-3-0		
				AMS350 Solid State Physics of Materials I	3-3-0		NME471 Polymer Composites		3-3-0	
				AMS351 Thin Film Technology	3-3-0		MEN431 Introduction to Plastic Deformation		3-3-0	
				AMS353 Surface Science of Materials		3-3-0	* NME456 Introduction to Nanophotonics	(3-3-0)	(3-3-0)	
				AMS390 Introduction to Computational Materials Science	3-3-0		* AMS410 Principles of Corrosion Engineering and Prevention	(3-3-0)	(3-3-0)	
				MEN301 Numerical Analysis	3-3-0		* AMS411 Extreme Environment Materials	(3-3-0)	(3-3-0)	
				PHY301 Quantum Mechanics I	3-3-0					
				ENE312 Electrochemistry		3-3-0				
				CHM391 Instrumental Analysis	3-3-0					
				CHM371 Introduction to Nanochemistry		3-3-0				
				CHM351 Inorganic Chemistry I	3-3-0					
				* AMS352 Solid State Physics of Materials II	(3-3-0)	(3-3-0)				
Total		9	6		33	24		24	15	111
Sum Total		15	15		45	24		27	15	141

* to be determined.

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Advanced Materials Science			AMS330 Introduction to Ceramics **(New)**
			AMS432 Piezoelectric Materials **(New)**
Nano Materials Engineering			NME471 Polymer Composites **(New)**

5. Identical Courses (동일유사과목 지정)

Courses
AMS202 = NME202 (Introduction to Materials Science and Engineering, 재료공학개론)
AMS203 = NME203 (Thermodynamics of Materials, 재료열역학)

6. Course Descriptions

1) Advanced Materials Science [AMS]

AMS202 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.

AMS203 Thermodynamics of Materials [재료열역학]

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.

AMS230 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.

AMS300 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.

AMS311 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.

AMS312 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.

AMS314 Defects in Crystals [결정결함론]

As well known in the materials science field, the properties of materials are strongly influenced by the population of intrinsic and extrinsic defects in crystals. This course contains three main sections: point defects (zero-dimensional defects), dislocations (one-dimensional defects), and planar defects (two-dimensional defects). The properties, characteristics, kinetics, energetics and thermodynamics of those defects in crystals will be discussed.

AMS330 Introduction to Ceramics [세라믹 물성학]

This course is designed to provide students with the core understanding necessary to pursue the subject of ceramics as it now exists and to be prepared for any surprises likely to emerge. Key concepts will be developed in a sequence which builds on firm foundations, using the materials learned so that their significance is continuously reinforced. The nature of defects which intrudes upon the perfect geometry of ideal crystal structures, migration of matter and charge, chemical and phase equilibria are among the subjects discussed.

AMS350 Solid State Physics of Materials I [재료고체물리 I]

This course will provide fundamental knowledges of physics of solids on the basis of quantum and statistical mechanics. Topics include crystal structures, reciprocal lattice, x-ray diffraction, lattice dynamics, solid state thermodynamics, free and nearly free electron models, kinetic theory and transport, energy band theory, metal/semiconductor/insulator, and semiconductor physics and devices.

AMS351 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.

ASM352 Solid State Physics of Materials II [재료고체물리 II]

This course covers beyond the solid state physics I with a focus on the cooperative phenomena of electrons. Topics include plasmon/polariton/polaron, optical processes in solids, dielectrics and ferroelectrics, magnetism and magnetic order, superconductivity, and physics in low dimensional system.

AMS353 Surface Science of Materials [재료표면과학]

In low dimensional materials, the surfaces plays an important role in governing the material's whole property. The physical and chemical properties of the surface is different from that of bulk materials, and these novel properties of the surface can be used to develop new functional materials. This course covers the structure of the surface, the physical, chemical, and electronic properties of the surface, the physics and chemistry behind surface phenomena.

AMS390 Introduction to Computational Materials Science [전산재료과학개론]

This course will focus on introducing computational methods, numerical techniques, theories and algorithms in describing the equilibrium, kinetics, diffusion and evolution of materials. During the course, students will be exposed to first-hands-on experience in various numerical treatments and computational methods for various topics such as linear algebra, fast fourier transformation, differential equation, Monte Carlo Potts model, phase field model, finite difference/elements, and etc. The main objective of this course is let students understand the advantages, disadvantages and pitfalls of various methods, and therefore grab the idea that the computational materials science can play a fundamental role in designing structures of materials, processes and devices for better performance.

AMS401 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.

AMS410 Principles of Corrosion Engineering and Prevention [재료 부식과 방식]

The focus of this course is on the fundamentals of corrosion engineering and corrosion prevention of metallic and alloy structures as well as on non-metallic composites and hybrid materials. Recent challenges in corrosion of advanced materials used in the automotive, aerospace, and marine industries as well as for underground structures for oil, gas, geothermal and tidal wave technologies will included. This course also covers most traditional and non-traditional tests for corrosion studies, including characterization techniques and analysis of corrosion phenomenon and corrosion monitoring principles.

AMS411 Extreme Environment Materials [극한환경소재]

This course covers the design, synthesis and applications of materials that can reliably withstand the extreme thermal, pressure and highly corrosive environments for long periods of time without failure. Understanding how these extreme environments affect the physical and chemical processes that occur in the bulk material and at its surface would open the door to employing these conditions to make entirely new classes of materials with greatly enhanced performance for future technologies.

AMS431 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.

AMS432 Piezoelectric Materials [압전 재료]

Piezoelectricity that is one of the most interesting physical phenomena in solid-state physics will be introduced and discussed in this course. Given that the most widely used piezoelectric materials are ferroelectric materials, our discussion will cover a range of material classes, i.e., from dielectrics to ferroelectrics from fundamentals to applications. This lecture aims primarily at providing an extensive overview on the state-of-the-art in piezoelectrics and related materials from fundamentals to applications, followed by in-depth discussion on the remaining challenges and future directions for the researchers of next generation.

AMS460 Bio-inspired Materials Science [바이오소재과학]

The objectives of the course are to offer an overview of bio-inspired materials, bio-inspired intelligent structures, and bio-inspired morphing structures through advanced understanding of material properties, design and structural behavior at different levels (material, element, structural and system levels). We will discuss emerging applications for bio-inspired structures and the impact of bio-inspired and bio-derived ideas on nano- and related technologies.

AMS497~8 Special Topics in Advanced Materials Science Ⅰ ~ Ⅱ [신소재과학 특론 Ⅰ ~ Ⅱ]

This course covers cutting-edge technologies with applications in advanced materials science and engineering, especially on advanced structural materials, characterization, multifunctional metallic composites, polymer materials, spintronic materials, bio-inspired materials, electronic materials, graphene, low-dimensional crystals, optoelectronic materials, and nano devices. This content is changeable depending on instructor.

2) Nano Materials Engineering [NME]

NME202 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.

NME203 Thermodynamics of Materials [재료열역학]

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.

NME250 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.

NME251 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.

NME252 Physical Chemsistry of Materials : Reaction Engineering [재료물리화학 : 반응공학]

This course is designed to extend the concepts and knowledge learned from subject NME203 Thermodynamics of materials 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.

NME301 Nanomaterials Lab [나노재료실험]

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

NME313 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.

NME315 Physical Metallurgy [물리금속학]

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.

NME354 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.

NME355 Introduction to Nano-Energy Materials [나노에너지재료]

This course deals with basic nano-energy materials such as metal, semiconductor, oxide, and carbon based materials to realize electronic, photovoltaic, electrochemical, piezoeletric, and thermoelectric devices. In addition, students will learn fundamental principles of the charge carrier transport of nano-scale materials in devices and their characterization tools.

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.

NME371 Introduction to Flexible Electronics [유연 전자소자 개론]

Flexible electronics is a technology for fabricating opto-electronic devices with mechanically flexible and stretchable forms using rigid and soft materials, including plastic substrates. This course provides an introduction to recent trends in flexible and wearable electronic devices, and the physics and chemistry of soft, elastic materials for the flexible electronics.

NME430 Nano-Electroceramics [나노 전자세라믹스]

A ceramic is an inorganic, non-metallic solid. Modern state-of-the-art electronics and displays are based on ceramic semiconducting materials such as silicon (Si) and gallium arsenide (GaAs). This course will present the principles and concepts of electronic device operation and fabrication (e.g.

how transistors work and how they are made) using ceramic nanomaterials, mainly focusing on Si and GaAs. It begins with the electrical and structural properties of ceramic nanomaterials and the operation of the ceramic-based p-n junctions and transistors.

NME452 Nano-Semiconducting Devices [나노반도체소자]

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.

NME454 Nano-Materials Reliability [나노소재 신뢰성]

This course covers mechanical behavior of zero through three dimensional nanstrucutre materials. Since nano-materials generally has high surface-to-volume ratio and are generally attached to other materials such as substrates, it is important and interesting to understand their mechanical behavior. This course provides ideas to resolve reliability issues in nano devices such as delamination, crack propagation, and degradation failure during design and manufacturing.

NME455 Display Engineering [디스플레이공학]

This course will provide the basic concept of display devices such as organic light-emitting diodes (OLEDs), liquid crystal display (LCD), and so on. The basic principle of devices such as how to operate, how to calculate and increase the device efficiency and which kinds of materials used will be studied.

NME456 Introduction to Nanophotonics [나노포토닉스개론]

Nanophotonics is the study of the behavior of light on the nanometer scale. In this course, the basic concept of nanophotonics and its applications will be covered. Students learn the novel properties of light at the nanometer scale as well as highly power efficient and new functional devices for engineering applications including optics, or the interaction of light with particles or substances, at deeply subwavelength length scales, and measurement technologies such as near-field scanning optical microscopy (NSOM), photoassisted scanning tunnelling microscopy, and surface plasmon optics.

NME470 Polymer Physics [고분자물리]

This course presents the various physical properties (e.g. mechanical, optical, and transport) of polymers with respect to the underlying physical chemistry of polymers in melt, solution, and solid state. Topics include conformation and molecular dimensions of polymer chains; an examination of the structure and thermodynamics of glassy, crystalline, and rubbery elastic states of polymers; liquid crystallinity, microphase separation, multi-component polymer system.

NME471 Polymer Composites [고분자 복합재료]

The demand for composite materials is ever increasing with regard to both mechanical and multi-functional properties (such as electrical and thermal conductivity). The understanding of basic structure and properties of materials that are currently being used for composite materials is essential to develop novel materials. In addition, nano-composites are of great interest due to their promising potential replacing with conventional composite materials. The main background of this course is introducing the fundamentals of science and technologies associated with composites. The lecture is to help undergraduate student understand the requirement of materials for composites and relationship between reinforcing material and matrix.

NME497~8 Special Topics in Nano Materials Engineering I~II [나노재료공학 특론 I~II]

This course covers cutting-edge technologies with applications in nano materials engineering, especially on nanostructured materials, multi-functional composites, hybrid polymer materials, spintronics materials, organic/inorganic optical materials, electronic materials, low-dimensional materials, optoelectronic materials, and nano-devices. This content is changeable depending on instructor.

School of Energy and Chemical Engineering

1. School Introduction

The School of Energy and Chemical Engineering was designed for an emerging field combining chemical engineering principles with research about energy conversion and storage. 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 Energy and Chemical Engineering encompasses a wide range of interests including green chemical processes, chemical engineering, advanced materials, and energy conversion and storage. Students can achieve in-depth knowledge and hands-on experience on catalysts, nanomaterials and devices, polymers, fine chemicals, applied molecular chemistry, and other chemical and energy engineering-related subjects.

2. Undergraduate Programs

□ Track Introduction

1) Energy Engineering (ENE)

The Energy Engineering track will cover the principles and application of the energy conversion (fuel cells, solar cells) and energy storage devices (rechargeable batteries, hydrogen storage). It is interdisciplinary program in which students can learn about the broad applications of electrochemistry, design of new energy-related materials, and understanding of energy conversion and storage devices. This track aims to produce creative scientific minds that are familiar with the principles of materials chemistry, electrochemistry, material engineering, and energy conversion and storage system.

2) Chemical Engineering (ACE)

The 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.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)	
		Interdisciplinary Major	
		1st Track	2nd Track
Energy Engineering	Required	28	12
	Elective	20	6
Chemical Engineering	Required	21	15
	Elective	27	3

▸ Required Experimental Courses

School	Track	Required Courses	Remarks
School of Energy and Chemical Engineering	Energy Engineering	ENE223 Lab for Energy Materials ENE314 Energy conversion and storage lab ENE323 Solar cells lab	Choose two
	Chemical Engineering	ACE221 Organic Chemistry Laboratory ACE302 Advanced Chemical Engineering Laboratory ACE361 Organic/Physical Chemistry Laboratory	Choose one

※ Complete based on 1TR
※ Students whose 1st track is Energy Conversion and Storage and who were admitted in 2009 are not required to complete.

3. Curriculum

□ Energy Engineering (ENE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Required Group	ENE211	Organic Chemistry I	유기화학 I	3-3-0	
	ENE212	Physical Chemistry I	물리화학 I	3-3-0	
	ENE213	Analytical Chemistry	분석화학	3-3-0	
	ENE221	Organic Chemistry II	유기화학 II	3-3-0	
	ENE222	Physical Chemistry II : Kinetics	물리화학 II : 동역학	3-3-0	
	ENE223	Lab for Energy Materials	에너지 재료 실험	2-0-4	
	ENE226	Polymer Concepts	고분자과학개론	3-3-0	
	ENE311	Inorganic Chemistry I	무기화학 I	3-3-0	
	ENE312	Electrochemistry	전기화학	3-3-0	
	ENE313	Solid State Chemistry I	고체화학 I	3-3-0	
	ENE314	Energy Conversion and Storage Lab	에너지 변환 및 저장실험	2-0-4	
	ENE322	Instrumental Analysis	기기분석	3-3-0	
	ENE323	Solar Cells Lab	태양전지실험	2-0-4	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Elective Group	ENE216	Fundamentals of Materials Science	재료과학개론	3-3-0	
	ENE316	Electronic Devices	전자소자	3-3-0	
	ENE317	Fundamentals of Energy Materials	에너지재료개론	3-3-0	
	ENE319	Physical Chemistry III : Quantum Mechanics	물리화학 III : 양자역학	3-3-0	
	ENE321	Polymer Material Science	고분자재료과학	3-3-0	
	ENE326	Inorganic Chemistry II	무기화학 II	3-3-0	
	ENE327	Solid State Chemistry II	고체화학 II	3-3-0	
	ENE328	Fundamentals of Energy Conversion Systems	에너지 변환 시스템 개론	3-3-0	
	ENE400	Special Topics in ECS I	에너지공학특론 I	3-3-0	
	ENE401	Special Topics in ECS II	에너지공학특론 II	3-3-0	
	ENE402	Special Topics in ECS III	에너지공학특론 III	3-3-0	
	ENE403	Special Topics in ECS IV	에너지공학특론 IV	3-3-0	
	ENE404	Special Topics in ECS V	에너지공학특론 V	3-3-0	
	ENE416	Introduction to Nanoscience and Nanotechnology	나노과학 및 기술	3-3-0	
	ENE480	Scientific Expression with IT	공학IT개론	3-2-2	

▸ Recommended Course Tracks (ENE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	[ENE211] Organic Chemistry I	3-3-0		[ENE311] Inorganic Chemistry I	3-3-0					
	[ENE212] Physical Chemistry I	3-3-0		[ENE312] Electrochemistry	3-3-0	3-3-0				
	[ENE213] Analytical Chemistry	3-3-0		[ENE313] Solid State Chemistry I	3-3-0					
	[ENE221] Organic Chemistry II		3-3-0	[ENE314] Energy Conversion and Storage Lab	2-0-4	2-0-4				
	[ENE222] Physical Chemistry II: Kinetics		3-3-0	[ENE322] Instrumental Analysis	3-3-0					
	[ENE223] Lab for Energy Materials		2-0-4	[ENE323] Solar Cells Lab		2-0-4				
	[ENE226] Polymer Concepts		3-3-0							
Total		9	11		14	7				41
Elective	[ENE216] Fundamentals of Materials Science		3-3-0	[ENE316] Electronic Devices	3-3-0		[ENE416] Introduction to Nanoscience and Nanotechnology		3-3-0	
				[ENE317] Fundamentals of Energy Materials	3-3-0		[ENE480] Scientific Expression with IT		3-3-0	
				[ENE319] Physical Chemistry III : Quantum Mechanics	3-3-0					
				[ENE321] Polymer Material Science		3-3-0				
				[ENE326] Inorganic Chemistry II		3-3-0				
				[ENE327] Solid State Chemistry II		3-3-0				
				[ENE328] Fundamentals of Energy Conversion Systems		3-3-0				
Total		0	3		9	12		0	6	30
Sum Total		9	14		23	19		0	6	71

□ Chemical Engineering (ACE)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Required	ACE201	Organic Chemistry I	유기화학 I	3-3-0	
	ACE203	Physical Chemistry I	물리화학 I	3-3-0	
	ACE311	Chemical Reaction Engineering	반응공학	3-3-0	
	ACE331	Transport Phenomena I	전달현상 I	3-3-0	*①MTH201 ②ACE203
	ACE351	Introduction to Polymer Science and Engineering	고분자과학개론	3-3-0	ACE201
1TR(R) 2TR(E)	ACE212	Introduction to Chemical Process	화학공정개론	3-3-0	
	ACE231	Chemical Engineering Thermodynamics	화공열역학	3-3-0	
Elective	ACE202	Organic Chemistry II	유기화학 II	3-3-0	
	ACE221	Organic Chemistry Laboratory	유기화학실험	2-0-4	
	ACE241	Fundamentals in Engineering Biology	화학생명공학	3-3-0	
	ACE301	Computational Methods for Chemical Engineering	화학공학전산	3-3-0	
	ACE302	Advanced Chemical Engineering Laboratory	첨단화학공학실험	2-0-4	
	ACE321	Solid State Chemistry	고체화학	3-3-0	
	ACE332	Transport Phenomena II	전달현상 II	3-3-0	
	ACE352	Polymer Materials	고분자재료	3-3-0	
	ACE361	Organic/Physical Chemistry Laboratory	유기물리화학실험	2-0-4	
	ACE391	Instrumental Analysis	기기분석	3-3-0	
	ACE416	Nanomaterials Chemistry	나노재료화학	3-3-0	
	ACE431	Introduction to Catalysis	촉매개론	3-3-0	
	ACE432	Chemical Engineering Mathematics	화공수학	3-3-0	
	ACE441	Introduction to Molecular Biotechnology	분자생명공학개론	3-3-0	
	ACE401	Special Topics in Chemical Engineering I	화학공학특론 I	3-3-0	
	ACE402	Special Topics in Chemical Engineering II	화학공학특론 II	3-3-0	
	ACE403	Special Topics in Chemical Engineering III	화학공학특론 III	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
	ENE222	Physical Chemistry II : Kinetics	물리화학 II : 동역학	3-3-0	Students who already took ACE311 are not necessary to take this course
	ENE312	Electrochemistry	전기화학	3-3-0	
	ENE319	Physical Chemistry III : Quantum Mechanics	물리화학 III : 양자역학	3-3-0	
	ENE326	Inorganic Chemistry II	무기화학 II	3-3-0	
	BIO211	Biochemistry I	생화학 1	3-3-0	
	CHM232	Physical Chemistry II	물리화학 2	3-3-0	
	CHM291	Analytical Chemistry	분석화학	3-3-0	
	CHM333	Physical Chemistry III	물리화학 3	3-3-0	
	CHM351	Inorganic Chemistry I	무기화학 1	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-0	
	MEN211	Applied Thermodynamics	응용열역학	3-3-0	MEN210
	AMS202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	AMS351	Thin Film Technology	박막공학	3-3-0	
	NME454	Nano-Materials Reliability	나노소재신뢰성	3-3-0	
	NME452	Nano Semiconducting Materials	나노반도체소자	3-3-0	

* "Transportation Phenomena I" requires successful completion of both ①MTH201 and ②ACE203 as prerequisites.
※ Students who took "Physical Chemistry II, III" courses offered by ENE Track before 2015, their course credit will be awarded for ACE Elective course credit.

▸ Recommended Course Tracks (ACE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	[ACE201] Organic Chemistry I	3-3-0		[ACE311] Chemical Reaction Engineering	3-3-0	3-3-0				
	[ACE203] Physical Chemistry I	3-3-0		[ACE331] Transport Phenomena I	3-3-0					
	[ACE212] Introduction to Chemical Process	3-3-0		[ACE351] Introduction to Polymer Science and Engineering	3-3-0					
	[ACE231] Chemical Engineering Thermodynamics		3-3-0							
Total		9	3		9	3		0	0	24
Elective	[ACE202] Organic Chemistry II		3-3-0	[ACE301] Computational Methods for Chemical Engineering		3-3-0	[ACE416] Nanomaterials Chemistry		3-3-0	
	[ACE221] Organic Chemistry Laboratory		2-0-4	[ACE302] Advanced Chemical Engineering Laboratory	3-3-0		[ACE431] Introduction to Catalysis		3-3-0	
	[ACE241] Fundamentals in Engineering Biology	3-3-0		[ACE321] Solid State Chemistry		3-3-0	[ACE432] Chemical Engineering Mathematics	3-3-0		
				[ACE332] Transport Phenomena II		3-3-0	[ACE441] Introduction to Molecular Biotechnology	3-3-0		
				[ACE352] Polymer Materials		3-3-0				
				[ACE361] Organic/Physical Chemistry Laboratory	3-3-0					
				[ACE391] Instrumental Analysis		3-3-0				
Total		3	5		6	15		6	6	41
Sum Total		12	8		15	18		6	6	65

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Energy Engineering	ENE226 Polymer Concepts **(Track Elective Course)**	⇨	ENE226 Polymer Concepts **(Track Required Course)**
	ENE321 Polymer Material Science **(Track Required Course)**	⇨	ENE321 Polymer Material Science **(Track Elective Course)**
	ENE318 Introduction to Solar Cells **(Course close)**		
Chemical Engineering	ENE212 Physical Chemistry I	⇨	ACE203 Physical Chemistry I
	ACE341 Introduction to Molecular Biotechnology	⇨	ACE441 Introduction to Molecular Biotechnology
			ACE221 Organic Chemistry Laboratory **(New)**
			ACE416 Nanomaterials Chemistry **(New)**
			ACE432 Chemical Engineering Mathematics **(New)**
			ENE222 Physical Chemistry II : Kinetics **(New)**
			ENE319 Physical Chemistry III : Quantum Mechanics **(New)**
	CHM201 Organic Chemistry Laboratory I **(Course close)**	⇨	ACE221 Organic Chemistry Laboratory **(Substitution)**
	ACE242 Engineering Biology Laboratory **(Course close)**		
	ENE318 Introduction to Solar Cells **(Course close)**		
	CHM371 Introduction to Nanochemistry **(Course close)**	⇨	ACE416 Nanomaterials Chemistry **(Substitution)**
	BME323 Biomedical Engineering **(Course close)**	⇨	

5. Identical Courses with other tracks

List of Identical Courses					
ACE		ENE		CHM	
ACE201	Organic Chemistry I 유기화학 I	ENE211	Organic Chemistry I 유기화학 I	CHM211	Organic Chemistry I 유기화학 I
ACE203	Physical Chemistry I 물리화학 I	ENE212	Physical Chemistry I 물리화학 I	CHM231	Physical Chemistry 물리화학
-		ENE213	Analytical Chemistry 분석화학	CHM291	Analytical Chemistry I 분석화학 I
ACE202	Organic Chemistry II 유기화학 II	ENE221	Organic Chemistry II 유기화학 II	CHM212	Organic Chemistry II 유기화학 II
ACE351	Introduction to Polymer Science and Engineering 고분자과학개론	ENE226	Polymer Concepts 고분자과학개론	CHM372	Introduction to Polymer Chemistry 고분자화학개론
-		ENE311	Inorganic Chemistry I 무기화학 I	CHM351	Inorganic Chemistry I 무기화학 I
ACE321	Solid State Chemistry 고체화학	ENE313	Solid State Chemistry I 고체화학 I	CHM454	Solid State Chemistry I 고체화학 I
-		ENE317	Fundamentals of Energy Materials 에너지재료개론	CHM313	Fundamentals of Energy Materials 에너지재료개론
ACE352	Polymer Materials 고분자재료	ENE321	Polymer Material Science 고분자재료과학		-
ACE391	Instrumental Analysis 기기분석	ENE322	Instrumental Analysis 기기분석	CHM391	Instrumental Analysis 기기분석
-		ENE326	Inorganic Chemistry II 무기화학 II	CHM352	Inorganic Chemistry II 무기화학 II
ACE416	Nanomaterials Chemistry 나노재료화학	ENE416	Introduction to Nanoscience and Nanotechnology 나노과학 및 기술	CHM371	Introduction to Nanochemistry 나노화학개론

※ It is strongly recommended that students to take courses offered by 1TR.

6. Course Descriptions

1) Energy Engineering (ENE)

ENE211 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.

ENE212 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.

ENE213 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.

ENE216 Fundamentals of Materials Science [재료과학개론]

This course will cover essential knowledge on a broad range of topics of materials science such as crystal structures and physical properties of materials. Through this course, students will take a chance to have an insight into various materials which are of critical importance for energy applications.

ENE221 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.

ENE222 Physical Chemistry II : Kinetics [물리화학 II : 동역학]

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.

ENE223 Lab for Energy Materials [에너지 재료 실험]

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.

ENE226 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.

ENE311 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.

ENE312 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.

ENE313 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.

ENE314 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.

ENE316 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.

ENE317 Fundamentals of Energy Materials [에너지재료개론]

This course offers basic understandings and applications of the energy materials related to energy conversion and storage using organic and inorganic materials. It covers the roles of bonding defining the fundamental types of energy materials and structural defects, kinetics, and expands to in-depth

understanding of electronic, magnetic materials and metals and ceramics, glasses and polymers. Finally, this course focuses on the material selection and design for the solar cells, fuel cell, and batteries. It also investigates not only the basic concepts and materials for light harvesting system, light-emitting diodes, solar cells, and thermoelectrics. Through this course, students will have a chance to enhance their understanding to energy materials.

ENE319 Physical Chemistry III : Quantum Mechanics [물리화학 III : 양자역학]

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.

ENE321 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.

ENE322 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).

ENE323 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.

ENE326 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.

ENE327 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.

ENE328 Fundamentals of Energy Conversion Systems [에너지 변환 시스템 개론]

This course is designed to introduce the system and design of energy conversion and storage devices for renewable energy sources. Students will first learn about energy sources available on earth including kinetic, solar, and chemical. Next, the course will provide students with a review of the thermodynamic concepts behind energy constant and energy transfer via an energy conversion device. Finally, this course will tie together concepts of renewable energy sources and thermodynamics teaching students about design elements for energy conversion and storage devices, in which renewable energy sources are converted and stored.

ENE400~404 Special Topics in ECS I~V [에너지공학특론 I~V]

This course is designed to introduce current topics in energy conversion and storage.

ENE416 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.

ENE480 Scientific Expression with IT [공학IT개론]

The scientific research often requires IT technologies to obtain effective data, understand the meaning of numbers, or explain what they actually show. There are many programming tools to express scientific data. For instances, software "Origin" enables us to manipulate various graphs to obtain specific meaning, and software "Chemdraw" give us effective molecular geometry. In addition, "Endnote" makes it facile to handle the references. This course will give you chances to approach more IT-adopted scientific expression through various programs, which will include Origin, Chemdraw, Endnote, and 3DMAX, etc.

2) Chemical Engineering (ACE)

ACE201 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.

ACE202 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.

ACE203 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.

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.

ACE221 Organic Chemistry Laboratory [유기화학실험]

This is a lab session of 2nd year organic chemistry course, which covers basic organic transformations, purifications and characterisations of organic compounds. The lab sessions provide basic knowledge and skills for simple reactions in organic chemistry. Safety will be a high priority.

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.

The 2nd track students are strongly recommended to take this course even if they have taken courses relevant to thermodynamics.

ACE241 Fundamentals in Engineering Biology [화학생명공학]

This course will emphasize the fundamental concepts of biology including an introduction to the disciplines of biochemistry, cell organization, metabolism, genetics, genomics, molecular biology, recombinant DNA technology and evolution that provide the foundation for modern biotechnology and bioengineering.

ACE301 Computational Methods for Chemical Engineering [화학공학전산]

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.

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.

ACE311 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.

ACE321 Solid State Chemistry [고체화학]

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.

ACE331 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.

Differential Equations and Physical Chemistry I are pre-required courses, and further it is strongly

recommended that students should take Chemical Engineering Thermodynamics or a corresponding course in advance.

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 [고분자과학개론]

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.

ACE361 Organic/Physical Chemistry Laboratory [유기물리화학실험]

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.

ACE391 Instrumental Analysis [기기분석]

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

ACE401~403 Special Topics in Chemical Engineering I~III [화학공학특론 I~III]

This course is designed to introduce current topics in advanced chemical engineering. Through this course, students will understand how basic knowledge in chemical engineering is used in the research and development of chemical products and processes and discuss the future trends in chemical engineering.

ACE416 Nanomaterials Chemistry [나노재료화학]

This course is intended primarily as an introduction course to nanomaterials chemistry for undergraduate-level chemical engineers. The objective of this course is to understand basic concepts of nanoscience and nanotechnology and introduce general synthetic principles, characterization methods, and potential applications of nanostructured materials. These issues will be discussed with currently important nanomaterials, including silica, semiconducting, magnetic plasmonic, and carbon nanostructures.

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.

ACE432 Chemical Engineering Mathematics [화공수학]

This course is designed for advanced students in chemical engineering. The objective of this course is to apply the knowledge of reactor design and transport phenomena to mathematically formulating and describing physicochemical processes of chemical engineers' interest. Topics covered include the review of basic chemical engineering principles, ordinary differential equations, partial differential equations, and complex variables.

ACE441 Introduction to Molecular Biotechnology [분자생명공학개론]

Molecular biotechnology results from the convergence of many areas of research, such as molecular biology, microbiology, biochemistry, immunology, genetics, and cell biology. This course introduces a basic introduction to several key techniques used in biological engineering and illustrative examples and laboratory investigations that explore modern approaches within the context of engineering and technology.

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]

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, power electronics and power interface circuit design, semiconductor devices, plasma and microwave engineering, optoelectronic devices. 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]

While most of people are familiar with computers, not many people have a good understanding of what computer science and engineering (CSE) is really about. Implementation of computer programs that improve the quality of human life is an important aspect of computer science and engineering, however learning how to write computer programs is not the core discipline of computer science but just a necessary skill to implement and prove creative and innovative computational logics and ideas in many broad sub-areas of computer science such as algorithms, theoretical computer science, programming languages, operating systems, databases, networks, computer security, computer graphics, artificial intelligence, and many more. In CSE track, students learn foundational principles of the core sub-areas of computer science. Having this curriculum, we cultivate the finest computer scientists and engineers that have the ability of conducting highly creative and innovative research and creating high-quality computing solutions.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		Remark
		Interdisciplinary Major		
		1st Track	2nd Track	
Electrical Engineering	Required	36	18	
	Elective	12	0	
Computer Science & Engineering	Required	36	9	
	Elective	12	9	

3. Curriculum

□ Electrical Engineering [EE]

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	CSE201	Digital Logic	디지털로직	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-0	
	EE231	Electromagnetics I	전자기학 I	3-3-0	
	EE301	Microelectronics I	전자회로 I	3-3-0	EE201
	EE311	Signals and Systems	신호및시스템	3-3-0	
	EE320	Digital System Lab	디지털시스템실험	3-1-4	EE201, CSE201
1TR:R (Choose six) 2TR:E	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스개론	3-3-0	
	EE302	MicroelectronicsII	전자회로Ⅱ	3-3-0	EE301
	EE312	Introduction to Communications	통신개론	3-3-0	EE211
	EE313	Introduction to Control	자동제어공학개론	3-3-0	EE311
	EE321	Electronics Experiment Laboratory	전자회로실험	3-1-4	CSE201, EE201 EE301
	EE331	Introduction to electronic devices	전자소자개론	3-3-0	
	EE411	Digital Signal Processing	디지털신호처리	3-3-0	EE311
Elective	EE314	Introduction to Data Networks	데이터 네트워크 개론	3-3-0	EE211
	EE401	Analog Integrated Circuits	아날로그집적회로설계	3-3-0	EE301, EE302
	EE402	Introduction to VLSI Design	초고밀도 집적회로 설계	3-3-0	EE301
	EE403	Introduction to RF Engineering	RF 공학 개론	3-3-0	EE201, EE301
	EE404	Fundamentals of Power Electronics	전력전자공학개론	3-3-0	EE301, EE313
	EE412	Communication Systems	통신시스템	3-3-0	EE312
	EE431	Semiconductor VLSI Devices Engineering	반도체집적소자공학	3-3-0	
	EE432	Optoelectronics	광전자공학	3-3-0	
	CSE221	Data Structures	데이터구조	3-3-0	
	CSE241	Object Oriented Programming	객체 지향 프로그래밍	3-3-0	
	CSE463	Machine Learning	기계 학습	3-3-0	
	PHY204	Electromagnetism II	전자기학 II	3-3-0	
	PHY416	Semiconductor Physics	반도체물리학	3-3-0	
	PHY427	Plasma and Beam Physics	플라즈마 및 빔물리	3-3-0	
	EE480	Special Topics in EE I	전자및전기공학특론 I	3-3-0	
	EE481	Special Topics in EE II	전자및전기공학특론 II	3-3-0	
	EE482	Special Topics in EE III	전자및전기공학특론 III	3-3-0	
	EE483	Special Topics in EE IV	전자및전기공학특론 IV	3-3-0	
	EE484	Special Topics in EEV	전자및전기공학특론 V	3-3-0	

▸ Recommended Course Tracks (EE)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
	[1]Digital Logic	3-3-0		Microelectronics I	3-3-0					
Required	Basic Circuit Theory		3-3-0	Signals and Systems	3-3-0					
	Electromagnetics I	3-3-0		Digital System Lab	3-1-4					
Total		6	3		9					18
	Probability and Introduction to Random Processes		3-3-0	MicroelectronicsII		3-3-0	Digital Signal Processing	3-3-0		
1TR:R (choose six)				Introduction to Communications	3-3-0					
				Introduction to Control		3-3-0				
2TR:E				Electronics Experiment Laboratory		3-3-0				
				Introduction to electronic devices	3-3-0					
Total			3		6	9		3		21
	Data Structures		3-3-0	Introduction to Data Networks		3-3-0	Analog Integrated Circuits	3-3-0		
	[2]Object Oriented Programming	3-3-0					Introduction to VLSI Design	3-3-0		
	Electromagnetism II		3-3-0				Introduction to RF Engineering		3-3-0	
							Fundamentals of Power Electronics	3-3-0		
Elective							Communication Systems	3-3-0		
							Semiconductor VLSI Devices Engineering		3-3-0	
							Optoelectronics	3-3-0		
							Machine Learning		3-3-0	
							Semiconductor Physics	3-3-0		
							Plasma and Beam Physics	3-3-0		
Total		3	6			3		21	9	42
Sum Total		9	12		15	12		24	9	81

* 2014 & 2015 admitted students should take 'Digital System Lab(EE320)'.
  - Students who entered UNIST before 2014 are not required.
* Only for EE new track[3] students who already took 'Digital System Lab(CSE201)' should follow 2014 curriculum.
* EE old track[4] students should follow 2013(=2012) curriculum.

1) Digital Logic(CSE201) 2015 curriculum = Digital System Lab(CSE201) in 2014 curriculum
2) Object Oriented Programming(CSE241) in 2014 & 2015 curriculum = Advanced Programming(CSE202) in 2013 curriculum.
3) 1/2 Track Credit Requirement : 48/18
4) 1/2 Track Credit Requirement : 33/27

□ Computer Science & Engineering [CSE]

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	CSE221	Data Structures	데이터구조	3-3-0	CSE241
	CSE241	Object Oriented Programming	객체 지향 프로그래밍	3-3-0	
	CSE331	Introduction to Algorithms	알고리즘	3-3-0	CSE232
1TR:R 2TR:E	CSE201	Digital Logic	디지털로직	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-0	
	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스개론	3-3-0	
	CSE232	Discrete Mathematics	이산수학	3-3-0	
	CSE301	Computer Organization	컴퓨터조직론	3-3-0	CSE201, CSE241
	CSE311	Operating Systems	운영체제	3-3-0	CSE241, CSE221
	CSE332	Theory of Computation	계산 이론	3-3-0	
	CSE341	Principles of Programming Languages	프로그래밍언어	3-3-0	CSE241
	CSE351	Computer Networks	컴퓨터네트워크	3-3-0	CSE241, EE211
Elective	CSE411	Introduction to Compilers	컴파일러 개론	3-3-0	CSE341
	CSE412	Parallel Computing	병렬 컴퓨팅	3-3-0	
	CSE421	Database Systems	데이터베이스 시스템	3-3-0	CSE241, CSE221
	CSE462	Artificial Intelligence	인공지능	3-3-0	CSE331
	CSE463	Machine Learning	기계 학습	3-3-0	
	CSE465	Mobile Computing	모바일 컴퓨팅	3-3-0	CSE241, CSE351
	CSE471	Computer Graphics	컴퓨터 그래픽스	3-3-0	CSE241, CSE221
	CSE480	Special Topic in CSE I	컴퓨터 공학 특론 I	3-3-0	
	CSE481	Special Topic in CSE II	컴퓨터 공학 특론 II	3-3-0	
	CSE482	Special Topic in CSE III	컴퓨터 공학 특론 III	3-3-0	
	CSE483	Special Topic in CSE IV	컴퓨터 공학 특론 IV	3-3-0	
	CSE484	Special Topic in CSE V	컴퓨터 공학 특론 V	3-3-0	

▸ Recommended Course Tracks [CSE]

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Data Structures		3-3-0	Introduction to Algorithms	3-3-0					
	[1]Object Oriented Programming	3-3-0								
Total		3	3		3					9
1TR:R 2TR:E	[2]Digital Logic	3-3-0		Computer Organization	3-3-0					
	Basic Circuit Theory		3-3-0	Operating Systems		3-3-0				
	Probability and Introduction to Random Processes		3-3-0	Theory of Computation		3-3-0				
	Discrete Mathematics	3-3-0		Principles of Programming Languages	3-3-0					
				Computer Networks		3-3-0				
Total		6	6		6	9				27
Elective							Introduction to Compilers	3-3-0		
							Parallel Computing		3-3-0	
							Database Systems	3-3-0		
							Artificial Intelligence	3-3-0		
							Machine Learning		3-3-0	
							Mobile Computing	3-3-0		
							Computer Graphics	3-3-0		
Total								15	6	21
Sum Total		9	9		9	9		15	6	57

* [3]CSE old track students following 2009~2013 can take new courses in 2014 & 2015 curriculum as electives.

1) Object Oriented Programming(CSE241) in 2014&2015 curriculum = Advanced Programming(CSE202) in 2013 curriculum
2) Digital Logic(CSE201) in 2015 curriculum = Digital System Lab(CSE201) in 2014 curriculum
3) 1/2 Track Credit Requirement : 33/27

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Electrical Engineering	CSE201 Digital System Lab	⇨	CSE201 Digital Logic
			EE320 Digital System Lab **(New)**
	EE321 Electronics Experiment Laboratory **(Track Required Course)**	⇨	EE321 Electronics Experiment Laboratory **(1TR Required Course, 2TR Elective Course)**
	EE413 Introduction to Data Networks	⇨	EE314 Introduction to Data Networks
	EE312 Introduction to Communications **(Prerequisite EE211, EE311)**	⇨	EE312 Introduction to Communications **(Prerequisite EE211)**
Computer Science & Engineering	CSE201 Digital System Lab	⇨	CSE201 Digital Logic
			CSE465 Mobile Computing **(New)**
	CSE411 Introduction to Compilers	⇨	CSE411 Introduction to Compilers **(Add Prerequisite CSE341)**
	CSE461 Software System Design (Close)		
	CSE464 Software Engineering (Close)		

5. Course Descriptions

1) Electrical Engineering (EE)

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 VLSI, magnetically coupled networks, power analysis, laplace transform, capacitor, inductor, and polyphase circuits are main topics of the course. The PSpice 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.

EE231 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.

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 MicroelectronicsI 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 analog and digital communication systems. The topics include Fourier transform, communication signals, amplitude modulation (AM), phase and frequency modulation (PM and FM), noise in communications, techniques in analog to digital transformation (sampling and quantization), and an introduction to source and channel coding.

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.

EE314 Introduction to Data Networks [데이터 네트워크 개론]

This course provides an introduction to data networks. The topics covered in the course include the OSI 7-layer architecture and mathematical modeling of its underlying peer-to-peer protocols, with an emphasis on lower layers such as data link, MAC, and network layers.

EE320 Digital System Lab [디지털 시스템 실험]

This experiment course related to basic circuit theory and digital systems is focused on both hands-on experience and design practice with the following experiments: 1. Utilization of experimental equipments such as oscilloscope, power supply, and function generator, 2. Basic electric circuit theory with R, L, and C circuit networks, 3. Various digital circuit and systems, 4. Design specific digital system for given functionality as a term project.

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 characteristics, 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.

EE331 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.

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.

EE403 Introduction to RF Engineering [RF공학개론]

This course is intended to introduce the general background that is required for RF, microwave, mm-wave, and THz designs. After a brief review of EM and transmission line theory, microwave network and impedance matching concepts are introduced. With the understanding of microwave network, the design of microwave components including power divider, couplers, resonators, active RF circuits, and RF systems will be covered.

EE404 Fundamentals of Power Electronics [전력전자공학개론]

The objective of this course is to introduce essential elements for controling and interfacing electric power. Main topics include power rectifiers for AC-DC conversion, PFC circuits, various DC-DC converters, resonant converters, bidirectional converters, and inverters for DC-AC conversion. This course is focusing on static power conversions; however, an introduction to electromechanical energy conversion and the control and drives of electric machines will be served.

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.

EE431 Semiconductor VLSI Devices Engineering [반도체집적소자공학]

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.

EE432 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.

EE480~4 Special Topics in EE I~V [전자및전기공학특론 I~V]

This course introduces new research topics in the field of Electrical Engineering

2) Computer Science & Engineering (CSE)

CSE201 Digital Logic [디지털 로직]

To understand the basic principles of digital logic circuit, this course introduces the fundamental concepts, components and operations of digital systems. The topics to be covered include the theories of binary numbers, Boolean algebra, combination/sequential logics, registers, and counters and their implementation via hardware description languages.

CSE221 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.

CSE241 Object Oriented Programming [객체 지향 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.

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 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 synchronization tools are covered in 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.

CSE332 Theory of Computation [계산이론]

This course is an introductory course on the theory of computation. The topics covered in this course includes: mathematical modelling of computing mechanisms (automatons), formal languages, computability, and basic complexity theory.

CSE341 Principles of 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.

CSE351 Computer Networks [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.

CSE411 Compiler Design [컴파일러 개론]

This course introduces the design and implementation of compiler and runtime systems for programming languages. The topics covered include parsing techniques, lexcial and syntactic analysis, context analysis, and runtime systems.

CSE412 Parallel Computing [병렬 컴퓨팅]

As we enter the multicore era, parallel and distributed computing techniques now permeate most computing activities. This course is designed to let students follow rapid changes in computing hardware platforms and devices, and understand the concepts of parallel computing architecture, parallel programming models, parallel computing applications, and performance analysis.

CSE421 Database Systems [데이터베이스 시스템]

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.

CSE462 Artificial Intelligence [인공지능]

Can machines think? Many pioneers in computer science have investigated this question. Artificial Intelligence (AI) is a branch of computer science dedicated to the creation of machines with intelligence. This course aims to introduce students to the field of AI and make them familiar with fundamental techniques for building intelligent systems.

CSE463 Machine Learning [기계 학습]

Machine learning is the science and engineering of building system that can learn from data. In recent years, machine learning has given us self-driving cars, effective web search, and accurate recommendation systems. This course will provide the theoretical underpinnings of machine learning, but also best practices in the machine learning industries. The courses include a broad introduction to machine learning, learning theory, and data mining.

CSE465 Mobile Computing [모바일 컴퓨팅]

This course studies how mobile computing is different from conventional computing in the aspect of its concept, architecture and applications. Major enabling techniques of mobile computing such as

sensing, mobile communication, machine learning, and system optimization for energy efficiency are explained with opportunities of implementing such technologies in Android platforms.

CSE471 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.

CSE480~4 Special Topics in CSE I~V [컴퓨터공학특론 I~V]

This course introduces new research topics in the field of Computer Science & Engineering

School of Life Sciences

1. School Introduction

School of Life Sciences aims to improve human health by interdisciplinary research and education in biomedical sciences and engineering through the convergence of fundamental biology, nanotechnology and various engineering principles. In order to meet the increased needs in healthcare and advanced medical theragnostics, school of life sciences pursues to train creative global leaders through interdisciplinary research and education programs.

2. Undergraduate Programs

□ Track Introduction

1) Biomedical Engineering (BME)

Biomedical engineering (BME) aims to improve human health by applying advanced engineering principles and methods to medical and biological problems, such as disease diagnostics, health monitoring, treatment, and therapy. In order to meet the increased needs in healthcare, BME track at UNIST pursues to train creative global leaders through top-class interdisciplinary research and education programs. Our competitive research programs include biochips, biomedical devices, biomimetics, biomaterials, molecular imaging, tissue engineering, drug delivery, bio-robots, genomics and genome engineering.

2) Biological Sciences (BIO)

Ground-breaking research achievements in biological sciences such as the human genome project, stem cell research, innovative therapies in cancers, and age-related diseases highlight the potential of biological sciences to be one of the most promising areas in science. The Biological Sciences 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. Researches in the Biological Sciences track at UNIST are focused on age-related diseases, neuroscience, stem cells and regenerative medicine.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		Remark
		Interdisciplinary Major		
		1st Track	2nd Track	
Biomedical Engineering	Required	30	12	
	Elective	18	6	
Biological Sciences	Required	23	15	
	Elective	25	3	

3. Curriculum

□ Biomedical Engineering (BME)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	BME211	Introduction to Biomedical Engineering	생명공학개론	3-3-0	
	BME301	Computational Methods for Biosciences and Bioengineering	생명과학생명공학전산	3-3-0	
	BME311	Transport Phenomena in Biological Systems	생체유체역학	3-3-0	MTH201
	BME435	Biomaterials and Tissue Engineering	바이오재료 및 조직공학	3-3-0	
1TR : R 2TR : E	BIO301	Cell Biology	세포생물학	3-3-0	
	BIO332	Anatomy and Physiology	해부및생리학	3-3-0	
	BME411	Physical Biology of the Cell	세포생물물리학	3-3-0	
	BME413	Biomedical Instrumentation Laboratory	의료기기실험	3-1-4	
	BME470	BME Senior Design I	–	3-1-4	
	BME480	BME Senior Design II	–	3-1-4	
Elective	BME212	Bio-instrumental Analysis	바이오기기분석	3-3-0	
	BME319	Optics and Imaging	광학이미징	3-3-0	
	BME321	Introduction to Light Microscopy for Biology	생물현미경개론	3-3-0	
	BME324	Genomics	게놈학	3-3-0	
	BME325	Introduction to Quantitative Biology	정량적생물학개론	3-3-0	
	BME421	Nano-Bioengineering	나노바이오공학	3-3-0	
	BME431	Biomedical Imaging	의생명이미징	3-3-0	
	BME433	Lasers and Biomedical Applications	레이저와 바이오 응용	3-3-0	
	BME401	Special Topics in Biomedical Engineering I	생명공학특론I	3-3-0	
	BME402	Special Topics in Biomedical Engineering II	생명공학특론 II	3-3-0	
	BME403	Special Topics in Biomedical Engineering III	생명공학특론III	3-3-0	
	BIO201	Molecular Biology	분자생물학	3-3-0	
	BIO202	Molecular Biology Laboratory	분자생물학실험	2-0-4	
	BIO211	Biochemistry I	생화학 1	3-3-0	
	BIO221	Biochemistry II	생화학 2	3-3-0	
	BIO431	Bioinformatics	생정보학	3-3-0	

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	CHM211 or ACE201	Organic Chemistry I	유기화학 1	3-3-0	
	ACE241	Fundamentals in Engineering Biology	화학생명공학	3-3-0	
	ACE311	Chemical Reaction Engineering	반응공학	3-3-0	
	ACE352a	Polymer Materials	고분자재료	3-3-0	
	CHM372a	Introduction to Polymer Chemistry	고분자화학개론	3-3-0	
	NME370a	Introduction to Polymer Materials	고분자재료개론	3-3-0	
	ACE441	Introduction to Molecular Biotechnology	분자생명공학개론	3-3-0	
	CHM231	Physical Chemistry I	물리화학 1	3-3-0	
	CHM291	Analytical Chemistry I	분석화학 1	3-3-0	
	CHM371	Introduction to Nanochemistry	나노화학개론	3-3-0	
	CSE463	Machine Learning	기계학습	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-0	
	EE231 or PHY203	Electromagnetics I	전자기학	3-3-0	
	EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세스 개론	3-3-0	
	EE311	Signals and Systems	신호 및 시스템	3-3-0	
	EE301	Microelectronics I	전자회로1	3-3-0	EE201
	EE331	Introduction to electronic devices	전자소자개론	3-3-0	
	EE411	Digital Signal Processing	디지털신호처리	3-3-0	EE311
	EE412	Communication Systems	통신시스템	3-3-0	EE312
	EE432	Optoelectronics	광전자공학	3-3-0	
	HSE204	Basic Circuit Theory & Lab	기초회로이론 및 실습	3-2-2	
	MEN451	Introduction to MEMS	MEMS개론	3-3-0	
	NME202 or AMS202	Introduction to Materials Science and Engineering	재료공학개론	3-3-0	
	NME472	Introduction to Sensors	센서개론	3-3-0	
	PHY213	Modern Physics	현대물리학	3-3-0	
	PHY303	Thermal and Statistical Physics	열 및 통계물리학	3-3-0	PHY101, PHY102
	PHY301b	Quantum Physics I	양자물리 I	3-3-0	PHY101, PHY102
	CHM232b	Physical Chemistry II	물리화학 2	3-3-0	

* a: Select one of three courses marked with superscript "a".
* b: Select one of two courses marked with superscript "b".
* BME211, BME301, BME311 and BME435 are required courses for students whose 2nd track is Biomedical Engineering with 2014~2015 curriculum.

▸ Recommended Course Tracks (BME)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	**Introduction to Biomedical Engineering	3-3-0		**Transport Phenomena in Biological Systems	3-3-0		*Physical Biology of the cell	3-3-0		
				*Biomedical Instrumentation Laboratory	3-1-4		*BME Senior Design I	3-1-4		
				**Computational Methods for Biosciences and Bioengineering		3-3-0	*BME Senior Design II		3-1-4	
				**Biomaterials and Tissue Engineering *		3-3-0				
				*Cell Biology	3-3-0					
				*Anatomy and Physiology		3-3-0				
Total		3	0		9	9		6	3	30
Elective	Bio-instrumental Analysis		3-3-0	Optics and Imaging	3-3-0		Nano-Bioengineering	3-3-0		
	Biochemistry I	3-3-0		Introduction to Light Microscopy for Biology		3-3-0	Biomedical Imaging		3-3-0	
	Fundamentals in Engineering Biology	3-3-0		Genomics		3-3-0	Laser and Biomedical Applications	3-3-0		
	Organic Chemistry I	3-3-0		Introduction to Quantitative Biology	3-3-0		Bioinformatics	3-3-0		
	Physical Chemistry I	3-3-0		Chemical Reaction Engineering	3-3-0	3-3-0	Digital Signal Processing	3-3-0		
	Electromagnetics I	3-3-0		Introduction to Polymer Materials	3-3-0		Introduction to MEMS	3-3-0		
	Modern Physics	3-3-0		Signals and Systems	3-3-0		Communication Systems	3-3-0		
	Molecular Biology		3-3-0	Microelectronics I	3-3-0		Optoelectronics	3-3-0		
	Molecular Biology Lab		3-3-0	Introduction to Electronic Devices	3-3-0		Introduction to Molecular Biotechnology	3-3-0		
	Introduction to Materials Science and Engineering		3-3-0	Polymer Materials		3-3-0	Introduction to Sensors		3-3-0	
	Basic Circuit Theory		3-3-0	Introduction to Nanochemistry		3-3-0	Nanomaterials Chemistry		3-3-0	
	Probability and Introduction to Random Processes		3-3-0	Introduction to Polymer Chemistry		3-3-0	Machine Learning		3-3-0	
				Thermal and Statistical Physics		3-3-0	Basic Circuit Theory & Lab		3-3-0	
Total		18	18		21	21		24	15	117
Sum Total		21	18		30	30		30	18	147

1) * : Required only for 1track, ** : Required for 1track and 2track
2) It is mandatory that students whose 2nd track is Biomedical Engineering take all courses chosen only from BME code courses including BIO431.
3) NBC students must check for viable replacement courses according to the course replacement list before registration.
4) BME321, BME324, BME325, BME433, ACE241, BIO431 courses are BME & BIO electives from 2014 curriculum.
5) BME470, BME480 are required for students whose 1st track is Biomedical Engineering from 2014 curriculum.

▸ Suggested Path of the 1st track elective courses

If students whose 1st track is Biomedical Engineering are interested in one of focused areas such as Biomedical Devices, Imaging, Biomaterials, and Genomics & Quantitative Biology, Biomedical Engineering(BME) highly recommends the following elective courses according to your academic interests. The classes listed in the table are strongly recommended, but are not required for graduation.

Year	Area of Interest (Elective Course Only)			
	Biomedical Devices	Imaging	Biomaterials	Genomics & Quantitative Biology
2	CHM211 CHM231 BIO201 BIO211 BIO202	EE201 EE231 or PHY203 PHY301 or CHM232 PHY213	BIO211 CHM211 CHM231 NME251 NME202 or AMS202	PHY203 PHY213 EE211 BIO201 BIO202 BIO211 BIO221
3	BME319 BME321 CHM371 ACE241 ACE311 NME202	BME319 BME321 BME325 EE311	BIO201 CHM371 CHM372 or NME370 or ACE352	BME324 BME325 BIO316 BIO333 EE311 PHY303
4	BME421 BME431 BME433 CHM473 MEN451 MEN472 HSE204 or EE201	BME431 BME433 EE411	BME421 BME431 CHM473 MEN451 AMS460 ACE441	BIO431 BIO433 CSE463

□ Biological Sciences (BIO)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	BIO211	Biochemistry I	생화학 1	3-3-0	
	BIO201	Molecular Biology	분자생물학	3-3-0	
	BIO301	Cell Biology	세포생물학	3-3-0	1track only, BIO211, BIO201
	BIO302	Developmental Biology	발생학	3-3-0	1track only, BIO201
	BIO332	Anatomy and Physiology	해부 및 생리학	3-3-0	
1TR : R 2TR : E	BIO221	Biochemistry II	생화학 2	3-3-0	
	BIO261	Biochemistry Laboratory	생화학실험	2-0-4	
	BIO333	Genetics	유전학	3-3-0	1track only, BIO201
Elective	BIO202	Molecular Biology Laboratory	분자생물학실험	2-0-4	
	BIO303	Neurobiology	신경생물학	3-3-0	
	BIO314	Instrumental Bioanalysis	생물기기분석	3-3-0	
	BIO316	Protein Science	단백질학	3-3-0	
	BIO331	Microbiology	미생물학	3-3-0	
	BIO361	Cell Biology & Genetics Laboratory	세포생물학 및 유전학실험	2-0-4	
	BIO404	Current Topics in Biological Sciences	현대생명과학동향	3-3-0	
	BIO412	Microbial Physiology	미생물생리학	3-3-0	BIO331
	BIO431	Bioinformatics	생정보학	3-3-0	
	BIO432	Immunology	면역학	3-3-0	
	BIO433	Biochemistry of Signal Tranduction and Regulation	세포신호전달	3-3-0	
	BIO401	Special Topics in Biological Sciences I	생명과학특론I	3-3-0	
	BIO402	Special Topics in Biological Sciences II	생명과학특론II	3-3-0	
	BIO403	Special Topics in Biological Sciences III	생명과학특론III	3-3-0	
	ACE241	Fundamentals in Engineering Biology	화학생명공학	3-3-0	
	BME321	Introduction to Light Microscopy for Biology	생물현미경개론	3-3-0	
	BME324	Genomics	게놈학	3-3-0	
	BME411	Physical Biology of the Cell	세포생물물리학	3-3-0	
	BME413	Biomedical Instrumentation Laboratory	의료기기실험	3-1-4	
	BME431	Biomedical Imaging	의생명이미징	3-3-0	
	CHM211	Organic Chemistry I	유기화학 1	3-3-0	
	CHM212	Organic Chemistry II	유기화학2	3-3-0	
	CHM231	Physical Chemistry I	물리화학1	3-3-0	

▸ Recommended Course Tracks (BIO)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	**Biochemistry I	3-3-0		**Cell Biology	3-3-0					
	*Biochemistry II		3-3-0	**Anatomy and Physiology		3-3-0				
	*Biochemistry Laboratory	2-0-4	2-0-4	**Developmental Biology	3-3-0					
	**Molecular Biology		3-3-0	*Genetics		3-3-0				
Total		5	8		6	6				25
Elective	Organic Chemistry I	3-3-0		Cell Biology & Genetics Laboratory	2-0-4		Immunology	3-3-0		
	Physical Chemistry I	3-3-0		Instrumental Bioanalysis	3-3-0		Bioinformatics	3-3-0		
	Molecular Biology Lab.		2-0-4	Protein Science		3-3-0	Microbial Physiology	3-3-0		
	Organic Chemistry II		3-3-0	Microbiology	3-3-0		Biochemistry of Signal Tranduction and Regulation	3-3-0		
				Neurobiology		3-3-0	Current topics in Biological Sciences	3-3-0	3-3-0	
				Biomedical Instrumentation Lab.	3-1-4		Physical Biology of the cell	3-3-0		
				Introduction to Light Microscopy for Biology		3-3-0	Biomedical Imaging		3-3-0	
				Genomics		3-3-0				
Total		6	5		11	12		18	6	58
Sum Total		11	13		17	18		18	6	83

1) * : Required only for 1track, ** : Required for 1track and 2track
2) It is mandatory that students whose 2nd track is Biological Sciences take all major courses chosen only from BIO code courses.
3) NBC students must check for viable replacement courses according to the course replacement list before registration.

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Biomedical Engineering	BME323 Biochemical Engineering **(Course close)**	⇨	ACE241 Fundamentals in Engineering Biology **(Substitution)**
	BME212 Bio-instrumental Analysis **(1TR Required Course, 2TR Elective Course)**	⇨	BME212 Bio-instrumental Analysis **(Track Elective Course)**
			BME321 Intro. to Light Microscopy for Biology **(New)**
			BME324 Genomics **(New)**
			BME325 Intro. to Quantitative Biology **(New)**
			BME433 Lasers and Biomedical Applications **(New)**
			BME470 BME Senior design I **(New)**
			BME480 BME Senior design II **(New)**
Biological Sciences			BME321 Intro. to Light Microscopy for Biology **(New)**
			BME324 Genomics **(New)**

5. Identical Courses with other tracks

Courses
BIO211 Biochemistry I = CHM321 Biochemistry I
BIO221 Biochemistry II = CHM322 Biochemistry II
BME435 Biomaterials and Tissue Engineering = AMS460 Bio-inspired Materials Science

6. Course Descriptions

1) Biomedical Engineering [BME]

BME211 Introduction to Biomedical Engineering [생명공학개론]

This course is an introduction to Biomedical Engineering (BME) and will demonstrate to students how to apply engineering knowledge and skills to real-word problems in medicine and biology. Course will covers the basis of biology and physiology, medical instruments, biomaterials, medical imaging, and computational biology. It is intended to facilitate the student's understanding in areas of BME and gain the core concept of BME, interdisciplinary research. Course is designed by composed lectures

which provide the opportunity to learn various BME activities in academia as well as industry.

BME212 BIO-instrumental Analysis [바이오기기분석]

The objective of this course is to provides a fundamental understanding of various analysis tools and instruments in biomecial applications. This course will cover the basic principles of qualitative and quantitative analyses, including chromatography, spectroscopy, and biomedical imaging.

BME311 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.

BME301 Computational Methods for Biosciences and Bioengineering Biomedical Engineering [생명과학생명공학전산]

This course provides key concepts and principles of numerical methods for biosciences and bioengineering. Lectures will be supplemented by hands-on demonstration and exercises by using scientific computing software tools, such as Matlab, Mathematica and/or their open source alternatives. Candidate topics to be covered include partial differential equations, time series analysis, stochastic modelling of biological processes, and graph-theoretic analysis of large-scale networks.

BME319 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.

BME321 Introduction to Light Microscopy for Biology [생물현미경개론]

Light microscopy is an essential tool in modern biology. This course aims to provide introduction to the principles and applications of light microscope system covering both theory and practices. It offers guidance in the selection of microscopes, optics, cameras, and image processing as well as fluorescence tags. It covers common light microscopy such as phase contrast, DIC, fluorescence and confocal microscopy. It expands and updates to state of
art systems including multi-photon excitation and super-resolution microscopes.

BME324 Genomics [게놈학]

Genomics is the new name for genetics that encompasses not only traditional genetics research and technology topics but also includes information technology, systems biology, high throughput biodata generation, processing, and analyses. In covers areas such as sequencing, DNA synthesis, and

genome writing and editing. Genomics course requires the students to have been exposed to general biology, data processing, statistics, mathematics, and computer science. The genomic research can be largely divided into experimental and informatic parts. The course will not cover hands-on experiments due to space limitation. Students who took this subject will be able to understand life in terms of information processing with much knowledge on how to use technologies to solve problems such as curing cancer and aging.

BME325 Introduction to Quantitative Biology [정량적생물학개론]

This course is designed to provide the quantitative and analytical tools for understanding and rational design of biological systems. The early part of the course covers the central dogma on a number basis and reviews recent progress in genetic/genomic engineering for various purposes. The latter part is devoted to the cellular information processing with two thematic topics of gene expression regulation and neural information processing. Rudimentary math and mandatory freshman science courses will suffice for prerequisite. Minimal experience in mathematical software is recommended but not required.

BME411 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.

BME413 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.

BME421 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.

BME431 Biomedical Imaging [의생명이미징]

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.

BME433 Lasers and Biomedical Applications [레이저와 바이오 응용]

The use of lasers in biomedical field has been tremendously increased for last two decades, ranging from optical diagnostics to laser therapy. This course will provide the fundamental understandings of lasers and laser-matter interactions, as well as various applications including optical imaging, diagnostics, and laser surgery. The course also covers the most recent advancements in laser technology for examples, fiber lasers and microlasers and their applications in biomedical field. This course is designed for senior undergraduate students, but not limited.

BME435 Biomaterials and Tissue Engineering [바이오재료 및 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.

BME401~3 Special Topics in Biomedical Engineeirng I~III [생명공학특론 I~III]

This course discusses recent research trends on Biomedical Engineering. 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.

BME470 BME Senior Design I, BME480 BME Senior Design II

All BME students are required to take a two-semester capstone course in the senior year: "Biomedical Engineering Senior Design I and II". This course was designed in order to BME seniors make the transition into industry through self-chosen team projects. Thus, course material emphasizes practical training such as entrepreneurship, market research, regulatory considerations, and client-based engineering project. Entire projects through two semesters are mentored by BME research faculty member. Students end their final semester with a demonstration of their prototype device and are judged by a panel of faculty and invited guests from industry. Through this course, BME senior students will learn how to identify product needs and assess potential obstacles, then use tools of project management and creativity development to solve real-world problems.

2) Biological Sciences (BIO)

BIO201 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.

BIO202 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.

BIO211 Biochemistry I [생화학I]

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.

BIO221 Biochemistry II [생화학II]

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.

BIO261 Biochemistry Laboratory [생화학실험]

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.

BIO301 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.

BIO302 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.

BIO303 Neurobiology [신경생물학]

Neurobiology is a central component of modern biomedical sciences. The objective of this class is to help you gain a solid understanding of this discipline. You will be expect to understand the

structures and functions of the key players, to understand the interaction between the components, to understand central principles that govern the network of nervous system, and to be able to apply this knowledge to solve noble problems.

BIO314 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.

BIO316 Protein Science [단백질학]

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.

BIO331 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.

BIO332 Anatomy and Physiology [해부및생리학]

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

BIO333 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.

BIO361 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.

BIO404 Current Topics in Biological Sciences [현대생명과학동향]

Biological science is one of the most exciting and rapidly developing areas of science. This course aims to inform students of recent topics in various fields of biological sciences such as molecular

biology, cell biology, immunology, neuroscience, structural biology and developmental biology. The instructor will introduce current research topics and students are encouraged to share their opinions on the topics, discuss about challenging ideas and seek for possible answers to unanswered questions.

BIO412 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.

BIO431 Bioinformatics [생정보학]

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.

BIO432 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.

BIO433 Biochemistry of Signal Transduction and Regulation [세포신호전달]

Cellular signaling in higher organism is a major topic in modern medical and pharmacological research. Also, signal transduction is a subject that ranks among the most rapidly developing fields in biomedical sciences. Diseases such as cancer, diabetes and cardiovascular disorders are caused in part by disturbances in cellular signaling processing, and the majority of therapeutic drugs target corresponding cellular pathways. Accordingly, this lecture will concentrate on signaling and regulation in animal systems and in man. It is the aim of this lecture to understand the biochemical and physiological properties of signaling molecules and their regulation. Furthermore, the tools used for signal transduction and the organizational principle of signaling pathways will be discussed in this lecture.

BIO401~3 Special Topics in Biological Sciences I~III [생명과학특론 I~III]

This course will provide in-depth coverage of current hot topics in biological sciences.

School of Natural Science

1. School Introduction

The school of natural science was founded in 2010 to promote the basic science education and to facilitate the creative interdisciplinary research between science and engineering. Since then, it has been offering MS and Ph.D degrees. Natural Science strives to improve the quality of human life through finding and understanding basic rules in nature. Historically, the convergence of basic science and engineering has been a key process for the advance of human civilization. We believe that the systematic interdisciplinary research between natural science and engineering will be able to speed up the convergence of these two disciplines and UNIST proudly provides an unprecedented and unique education system in Korea for this purpose.

From 2014, the school of natural science provides three majors, mathematical sciences, physics, and chemistry for undergraduate and graduate students. For the purpose of performing world top class research, UNIST has been recruiting several top researchers. As a result, the School of Natural Science will host at least two International Business Belt Campus Research Centers. This school is ready to soar to the apex of science and technology.

2. Undergraduate Programs

□ Track Introduction

1) Physics (PHY)

Physics forms a fundamental knowledge system and a framework of 'thinking' for almost every other contemporary science and technology. We incubate the next generation human resources to inherit and lead the diverse researches in modern physics by providing a set of related curriculums. In the physics track of UNIST, we offer not only basic physics courses such as classical mechanics, electromagnetism, quantum physics, statistical physics, mathematical physics and basic laboratory experiments, but also advanced courses for the future research such as solid state physics, optics, computational physics, plasma and beam physics, biological physics, particle physics, cosmology, advanced experiments, etc.

2) Chemistry (CHEM)

Chemistry is a central science that seeks the understanding of nature and interactions between atoms

and molecules. In addition to this essential scientific question, modern development such as nanoscience offers new chances to explore the world of 'beyondatoms and molecules. The department offers lectures and experimental courses in all fields of chemistry: physical, organic, analytical, biological, and materials/polymers chemistry. The department stresses a research experience as an essential educationaltool. Research opportunities with our world-class researchersare provided to all undergraduate students in the state-of-the art facilities and environment.

3) Mathematical Siences (MTH)

Department of Mathematical Science explores the connections between mathematics and its applications at both the research and educational levels. In addition to conventional study on mathematical structures, the mathematical research at UNIST is devoted to encompass some of the most diverse and interdisciplinary research in the physical, engineering, and biological sciences. The department provides a dynamic and engaging research environment that is especially strong in scientific computing, mathematical biology and modern mathematical methods.

The undergraduate and graduate curriculum is planned with the following varied objectives: (1) to offer students an introduction to the fundamental study of quantity, structure, space, and change; (2) to prepare students for graduate study in pure or applied mathematics; (3) to serve the needs of students in fields that rely substantially on mathematics, such as the physics, biology, engineering, business and economics.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		
		Interdisciplinary Major		
		1st Track	2nd Track	
Physics	Required	30	12	
	Elective	18	6	
Chemistry	Required	28	12	
	Elective	20	6	
Mathematical Sciences	Required	30	12	
	Elective	18	6	

3. Curriculum

□ Physics (PHY)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Required	PHY201	Classical Mechanics	고전역학	3-3-0	PHY101, PHY103
	PHY203	Electromagnetism I	전자기학 I	3-3-0	PHY101, PHY103
	PHY301	Quantum Physics I	양자물리학 I	3-3-0	PHY101, PHY103
	PHY303	Thermal and Statistical Physics	열 및 통계물리학	3-3-0	PHY101, PHY103

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
1TR:R 2TR:E	PHY204	Electromagnetism II	전자기학 II	3-3-0	PHY203
	PHY207	Physics Lab I	물리학실험 I	3-1-4	PHY101, PHY103
	PHY211	Mathematical Physics I	수리물리학 I	3-3-0	
	PHY213	Modern Physics	현대물리학	3-3-0	PHY101, PHY103
	PHY302	Quantum Physics II	양자물리학 II	3-3-0	PHY301
	PHY307	Physics Lab II	물리학실험 II	3-1-4	PHY101, PHY103
Elective	PHY221	Introduction to Computational Physics	전산물리학 입문	3-2-2	
	PHY312	Mathematical Physics II	수리물리학 II	3-3-0	PHY211
	PHY315	Solid State Physics I	고체물리학 I	3-3-0	PHY301
	PHY321	Optics	광학	3-3-0	PHY204
	PHY333	Astrophysics I: Stars and Blackholes	천체물리학 I: 항성과 블랙홀	3-3-0	
	PHY334	Astrophysics II: Galaxies and the Universe	천체물리학 II: 은하와 우주	3-3-0	
	PHY407	Precision Measurements in Physics	정밀전자계측론	3-1-4	
	PHY415	Solid State Physics II	고체물리학 II	3-3-0	
	PHY416	Semiconductor Physics	반도체물리학	3-3-0	PHY315
	PHY417	Quantum Material Physics	양자물질물리학	3-3-0	PHY315
	PHY418	Polymer and Soft Matter Physics	고분자 및 연성물질물리학	3-3-0	PHY303
	PHY419	Phase Transition and Critical Phenomena	상전이와 임계현상	3-3-0	PHY303
	PHY423	Computational Physics	전산물리학	3-3-0	PHY221
	PHY425	Atomic and Molecular Physics	원자 및 분자물리학	3-3-0	
	PHY427	Introduction to Plasma Physics	플라즈마 물리학 입문	3-3-0	
	PHY428	Introduction to Beam Physics	빔 물리학 입문	3-3-0	
	PHY429	Nuclear and Elementary Particle Physics	핵 및 입자물리학	3-3-0	
	PHY431	General Relativity and Cosmology	일반상대론 및 우주론	3-3-0	
	PHY435	Biological Physics	생물물리학	3-3-0	
	PHY437	Nonlinear Dynamics	비선형동역학	3-3-0	
	PHY439	Introduction to Modern Theoretical Physics	현대이론물리학 입문	3-3-0	PHY312

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
	PHY441	Fluid Physics	유체물리학	3-3-0	
	PHY471	Special Topics in Physics I	물리학 특강 I	3-3-0	
	PHY472	Special Topics in Physics II	물리학 특강 II	3-3-0	
	PHY473	Special Topics in Physics III	물리학 특강 III	3-3-0	
	CHM335	Molecular Structure and Dynamics	분자구조 및 동력학	3-3-0	
	MTH251	Mathematical Analysis I	해석학 I	3-3-0	
	MTH313	Complex Analysis I	복소해석학 I	3-3-0	
	MTH420	Fourier Analysis	푸리에 해석학	3-3-0	
	MTH451	Advanced Linear Algebra	고급선형대수학	3-3-0	
	MEN220	Fluid Mechanics	유체역학	3-3-0	
	NSE427	Fundamentals of Nuclear Fusion	핵융합개론	3-3-0	
	AMS431	Magnetic Properties of Materials	재료의 자기적 성질	3-3-0	
	AMS230	Introduction to Crystallography	결정학개론	3-3-0	
	BME411	Physical Biology of the Cell	세포생물물리학	3-3-0	
	EE201	Basic Circuit Theory	회로이론	3-3-0	
	EE403	Introduction to RF Engineering	RF 공학 개론	3-3-0	
	EE432	Optoelectronics	광전자공학	3-3-0	
	CSE332	Theory of Computation	계산 이론	3-3-0	

▸ Recommended Course Tracks (PHY)

Grade	Sophomore			Junior			Senior			Sum Total
Division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Classical Mechanics	3-3-0		Quantum Physics I	3-3-0					
	Electromagnetism I	3-3-0		Thermal and Statistical Physics		3-3-0				
Total		6			3	3				12
1TR:R 2TR:E	Modern Physics	3-3-0		Physics Lab II	3-1-4					
	Electromagnetism II		3-3-0	Quantum Physics II		3-0-0				
	Physics Lab I		3-1-4							
	Mathematical Physics I		3-3-0							
Total		3	9		3	3				18
Elective	Introduction to Computational Physics	3-3-0		Mathematical Physics II	3-3-0		Precision Measurements in Physics	3-1-4		
				Astrophysics I: Stars and Blackholes	3-3-0		Semiconductor Physics	3-3-0		
				Solid State Physics I		3-3-0	Phase Transition and Critical Phenomena	3-3-0		
				Optics		3-3-0	Solid State Physics II	3-3-0		
				Astrophysics II: Galaxies and the universe		3-3-0	Quantum Material Physics	3-3-0		
							Biological Physics	3-3-0		
							Introduction to Modern Theoretical Physics	3-3-0		
							Introduction to Plasma Physics	3-3-0		
							Special Topics in Physics I	3-3-0		
							Polymer and Soft Matter Physics		3-3-0	
							Computational Physics		3-3-0	
							Atomic and Molecular Physics		3-3-0	
							Fluid Physics		3-3-0	
							Introduction to Beam Physics		3-3-0	
							Nuclear and Elementary Particle Physics		3-3-0	
							General Relativity and Cosmology		3-3-0	
							Nonlinear Dynamics		3-3-0	
							Special Topics in Physics II		3-3-0	
							Special Topics in Physics III		3-3-0	
Total		3	0		6	9		27	30	75
Sum Total		12	9		12	15		27	30	105

▸ Replacement Courses

When students change the track to PHY from DPH, each courses are substituted as below.

Course for 2013 Curriculum		Correspondence/Substitution to 2015 Curriculum	
Course Code	Course Title	Course Code	Course Title
PHY501	Classical Mechanics	PHY201	Classical Mechanics
DPH201	Electromagnetics I	PHY203	Electromagnetism I
DPH303	Quantum Mechanics I	PHY301	Quantum Physics I
DPH305	Thermal and Statistical Physics	PHY303	Thermal and Statistical Physics
DPH202	Electromagnetics II	PHY204	Electromagnetism II
CSE201	Digital System Lab	PHY207	Physics Lab I
		PHY307	Physics Lab II
MSE250	Modern Physics of Materials	PHY213	Modern Physics
DPH304	Quantum Mechanics II	PHY302	Quantum Mechanics II
PHY500	Advanced Mathematical Physics	PHY312	Mathematical Physics II
DPH401	Solid State Physics	PHY315	Solid State Physics I
PHY541	Computational Physics	PHY423	Computational Physics

* The track required and elective of the DPH track not specified in the table above are acknowledged as elective courses of the Physics track.
* 'Digital System Lab(CSE201)' can replace only one of 'Physics Lab I(PHY207)' or 'Physics Lab II(PHY307)'

□ Chemistry (CHEM)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Required	CHM201	Organic Chemistry Lab	유기화학실험	2-0-4	
	CHM211	Organic Chemistry I	유기화학 I	3-3-0	
	CHM212	Organic Chemistry II	유기화학 II	3-3-0	
	CHM231	Physical Chemistry I	물리화학 I	3-3-0	
	CHM232	Physical Chemistry II	물리화학 II	3-3-0	
	CHM291	Analytical Chemistry I	분석화학 I	3-3-0	
	CHM302	Physical/Analytical Chemistry Lab	물리분석화학실험	2-0-4	
	CHM321	Biochemistry I	생화학 I	3-3-0	
	CHM351	Inorganic Chemistry I	무기화학 I	3-3-0	
	CHM391	Instrumental Analysis	기기분석	3-3-0	
Elective	CHM301	Inorganic Chemistry Lab	무기화학실험	2-0-4	
	CHM311	Synthetic Organic Chemistry	합성유기화학	3-3-0	
	CHM313	Fundamental of Energy Materials	에너지재료개론	3-3-0	.
	CHM322	Biochemistry II	생화학 II	3-3-0	
	CHM323	Medicinal Chemistry	의약화학	3-3-0	CHM211, CHM212
	CHM324	Spectroscopy in Organic Chemistry	유기분광학	3-3-0	
	CHM333	Physical Chemistry III	물리화학 III	3-3-0	
	CHM335	Molecular Structure and Dynamics	분자구조 및 동력학	3-3-0	
	CHM352	Inorganic Chemistry II	무기화학 II	3-3-0	
	CHM371	Introduction to Nanochemistry	나노화학개론	3-3-0	
	CHM372	Introduction to Polymer Chemistry	고분자화학개론	3-3-0	
	CHM421	Introduction to Chemical Biology	화학생물학개론	3-3-0	
	CHM422	Supramolecular Chemistry	초분자화학	3-3-0	
	CHM431	Frontier Spectroscopy	첨단 분광학	3-3-0	
	CHM451	Inorganic Materials Analysis	무기재료분석	3-3-0	
	CHM452	Organometallic Chemistry	유기금속화학	3-3-0	
	CHM453	Bioinorganic Chemistry	생무기화학	3-3-0	
	CHM454	Solid State Chemistry	고체화학	3-3-0	
	CHM471	Block Copolymers	블록 코폴리머	3-3-0	
	CHM473	Nanomaterials Chemistry	나노재료화학	3-3-0	
	CHM401	Special Topics in Chemistry I	화학특론 I	3-3-0	
	CHM402	Special Topics in Chemistry II	화학특론 II	3-3-0	
	CHM403	Special Topics in Chemistry II	화학특론 III	3-3-0	

▸ Recommended Course Tracks (CHEM)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Organic chemistry I	3-3-0		Biochemistry I	3-3-0					
	Physical Chemistry I	3-3-0		Inorganic Chemistry I	3-3-0					
	Analytical Chemistry I	3-3-0		Instrumental Analysis	3-3-0					
	Organic Chemistry II		3-3-0	Physical/Analytical Chemistry Lab		2-0-4				
	Physical Chemistry II		3-3-0							
	Organic Chemistry Lab		2-0-4							
Total		9	8		9	2				28
Elective				Synthetic Organic Chemistry	3-3-0		Introduction to Chemical Biology	3-3-0		
				Fundamental of Energy Materials	3-3-0		Organometallic Chemistry	3-3-0		
				Physical Chemistry III	3-3-0		Solid State Chemistry	3-3-0		
				Molecular Structure and Dynamics	3-3-0		Block Copolymers	3-3-0		
				Inorganic Chemistry Lab	2-0-4		Supramolecular Chemistry		3-3-0	
				Biochemistry II		3-3-0	Frontier Spectroscopy		3-3-0	
				Medicinal Chemistry		3-3-0	Inorganic Materials Analysis		3-3-0	
				Inorganic Chemistry II		3-3-0	Bioinorganic Chemistry		3-3-0	
				Introduction to Nanochemistry		3-3-0	Nanomaterials Chemistry		3-3-0	
				Introduction to Polymer Chemistry		3-3-0				
Total					14	15		12	15	56
Sum Total		9	8		23	17		12	15	84

□ Mathematical Sciences (MTH)

Course is	Course No.	Course Title	Course Title(Kor.)	Cred.-Lect.-Exp.	Remark (Prerequisite)
Required	MTH251	Mathematical Analysis I	해석학 I	3-3-0	
	MTH302	Modern Algebra I	현대대수학 I	3-3-0	
	MTH313	Complex Analysis I	복소해석학 I	3-3-0	
	MTH351	General Topology	위상수학	3-3-0	
1TR:R 2TR:E	MTH202	Ordinary Differential Equations	상미분방정식론	3-3-0	MTH201
	MTH252	Mathematical Analysis II	해석학 II	3-3-0	MTH251
	MTH321	Numerical Analysis	수치해석학	3-3-0	
	MTH342	Probability	확률론	3-3-0	
	MTH413	Differential Geometry I	미분기하학 I	3-3-0	
	MTH421	Introduction to Partial Differential Equations	편미분방정식개론	3-3-0	MTH201
Elective	MTH230	Set Theory	집합론	3-3-0	
	MTH260	Elementary Number Theory	정수론	3-3-0	
	MTH271	Methods of Applied Mathematics	응용수학방법론	3-3-0	
	MTH281	Discrete Mathematics	이산수학	3-3-0	
	MTH303	Modern Algebra II	현대대수학 II	3-3-0	MTH302
	MTH314	Complex Analysis II	복소해석학 II	3-3-0	
	MTH330	Introduction to Geometry	기하학 개론	3-3-0	
	MTH333	Scientific Computing	과학계산	3-3-0	
	MTH343	Financial Mathematics	금융수학	3-3-0	
	MTH344	Mathematical Statistics	수리통계학	3-3-0	
	MTH361	Mathematical Modeling and Applications	수리모형방법론	3-3-0	
	MTH412	Dynamical Systems	동적 시스템	3-3-0	
	MTH414	Differential Geometry II	미분기하학 II	3-3-0	MTH413
	MTH420	Fourier Analysis	푸리에 해석학	3-3-0	
	MTH432	Algebraic Topology	대수위상	3-3-0	
	MTH451	Advanced Linear Algebra	고급선형대수학	3-3-0	MTH203
	MTH461	Stochastic Processes	확률과정론	3-3-0	
	MTH480	Topics in Mathematics I	수학 특강 I	3-3-0	
	MTH481	Topics in Mathematics II	수학 특강 II	3-3-0	
	*PHY201	Classical Mechanics	고전역학	3-3-0	
	*PHY211	Mathematical Physics I	수리물리학 I	3-3-0	
	*PHY312	Mathematical Physics II	수리물리학 II	3-3-0	
	*PHY437	Nonlinear Dynamics	비선형동역학	3-3-0	
	*MEN220	Fluid Mechanics	유체역학	3-3-0	
	*MEN301	Numerical Analysis	수치해석	3-3-0	
	*MEN302	Introduction to Finite Element Method	유한요소법개론	3-3-0	
	*EE211	Probability and Introduction to Random Processes	확률과 랜덤프로세서	3-3-0	
	*EE311	Signals and Systems	신호 및 시스템	3-3-0	
	*CSE232	Discrete Mathematics	이산수학	3-3-0	
	*CSE331	Introduction to Algorithms	알고리즘개론	3-3-0	
	*CSE463	Machine Learning	기계학습	3-3-0	
	*DME321	Numerical Modeling and Analysis	수치모델링 및 분석	3-3-0	
	*FIA401	Financial Engineering	금융공학	3-3-0	

* For only 1st track students, up to 6 credits can be taken from outside mathematical sciences.

▸ Recommended Course Tracks (MTH)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Mathematical Analysis I	3-3-0		Modern Algebra I	3-3-0					
				Complex Analysis I	3-3-0					
				General Topology	3-3-0					
Total		3	0		9	0				12
1TR:R 2TR:E	Ordinary Differential Equations		3-3-0	Numerical Analysis		3-3-0	Differential Geometry I	3-3-0		
	Mathematical Analysis II		3-3-0	Probability		3-3-0	Introduction to Partial Differential Equations	3-3-0		
Total		0	6		0	6		6	0	18
Elective	Set Theory	3-3-0		Mathematical Statistics	3-3-0		Fourier Analysis	3-3-0		
	Discrete Mathematics	3-3-0		Mathematical Modeling and Applications	3-3-0		Dynamical Systems	3-3-0		
	Elementary Number Theory		3-3-0	Modern Algebra II		3-3-0	Topics in Mathematics I	3-3-0		
	Methods of Applied Mathematics		3-3-0	Complex Analysis II		3-3-0	Differential Geometry II		3-3-0	
				Introduction to Geometry		3-3-0	Algebraic Topology		3-3-0	
				Scientific Computing		3-3-0	Advanced Linear Algebra		3-3-0	
				Financial Mathematics		3-3-0	Stochastic Processes		3-3-0	
							Topics in Mathematics II		3-3-0	
Total		6	6		6	15		9	15	57
Sum Total		9	12		15	21		15	15	87

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Physics	PHY315 Solid State Physics	⇨	PHY315 Solid State Physics 1
			PHY415 Solid State Physics 2 **(New)**
	PHY417 Cryogenics and Superconductivity	⇨	PHY417 Quantum Material Physics
	PHY333 Introduction to Astrophysics	⇨	PHY333 Introduction to Astrophysics 1 : Stars and Blackholes
			PHY334 Introduction to Astrophysics 2 : Galaxies and the Universe **(New)**
			PHY441 Fluid Physics **(New)**
			PHY428 Introduction to Beam Physics **(New)**
Chemistry			CHM324 Spectroscopy in Organic Chemistry
	CHM202 Physical/Analytical Chemistry Lab	⇨	CHM302 Physical/Analytical Chemistry Lab
	CHM201 Organic Chemistry Lab 1	⇨	CHM201 Organic Chemistry Lab
	CHM423 Medicinal Chemistry	⇨	CHM323 Medicinal Chemistry
	CHM301 Inorganic Chemistry Lab	⇨	CHM301 Inorganic Chemistry Lab **(Add Prerequisite CHM201)**
Mathematical Sciences	MTH261 Modern Algebara I	⇨	MTH302 Modern Algebara I
	MTH262 Modern Algebra II	⇨	MTH303 Modern Algebra II
	MTH311 Complex Analysis	⇨	MTH313 Complex Analysis
			MTH314 Complex Analysis II **(New)**
	MTH301 Probability	⇨	MTH342 Probability
	MTH331 Differential geometry I	⇨	MTH413 Differential geometry I
	MTH332 Differential Geometry II	⇨	MTH414 Differential Geometry II
	MTH411 Ordinary differential equations	⇨	MTH202 Ordinary differential equations
	MTH312 Fourier Analysis	⇨	MTH420 Fourier Analysis
	MTH341 Mathematical Statistics	⇨	MTH344 Mathematical Statistics
	MTH352 Algebraic Topology	⇨	MTH432 Algebraic Topology
	MTH431 Scientific Computing	⇨	MTH333 Scientific Computing
	MTH441 Financial Mathematics	⇨	MTH343 Financial Mathematics

5. Identical Courses with other tracks

CHM	ENE	ACE	BIO
CHM211 Organic Chemistry I	ENE211 Organic Chemistry I	ACE201 Organic Chemistry I	
CHM212 Organic Chemistry II	ENE221 Organic Chemistry II	ACE202 Organic Chemistry II	
CHM231 Physical Chemistry I	ENE212 Physical Chemistry I	ACE203 Physical Chemistry I	
CHM291 Analytical Chemistry I	ENE213 Analytical Chemistry		
CHM351 Inorganic Chemistry I	ENE311 Inorganic Chemistry I		
CHM313 Fundamentals of Energy Materials	ENE317 Fundamentals of Energy Materials		
CHM352 Inorganic Chemistry II	ENE326 Inorganic Chemistry II		
CHM371 Introduction to Nanochemistry	ENE416 Introduction to Nanoscience and Nanotechnology	ACE416 Nanomaterials Chemistry	
CHM372 Introduction to Polymer Chemistry	ENE226 Polymer Concepts	ACE351 Introduction to polymer Science and Engineering	
CHM391 Instrumental Analysis	ENE322 Instrumental Analysis	ACE391 Instrumental Analysis	
CHM454 Solid State Chemistry	ENE313 Solid State Chemistry I	ACE321 Solid State Chemistry I	
CHM321 Biochemistry I			BIO211 Biochemistry I
CHM322 Biochemistry II			BIO221 Biochemistry II

※ It is strongly recommended that students to take courses offered by 1TR.

6. Course Descriptions

1) Physics (PHY)

PHY201 Classical Mechanics [고전역학]

This course covers various aspects of the Newtonian mechanics, including kinematics, angular motion, gravity, collision, and oscillations. Elementary description of fluid and rigid bodies can be discussed. The course in part aims at training students with mathematical techniques for physics study. Variational principles and formulations of Lagrangians and Hamiltonians are introduced, and its connection to quantum mechanics and relativity is discussed.

PHY203 Electromagnetism I [전자기학 I]

This course is the first half of one-year electromagnetism 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.

PHY204 Electromagnetism II [전자기학 II]

This course is the second half of the one-year electromagnetism 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.

PHY207 Physics Lab I [물리학실험 I]

This course provides hands-on experience on the experimental physics. The purpose of the course is to deepen basic physical concepts by means of measurement and observation of physical phenomena.

PHY211 Mathematical Physics I [수리물리학 I]

The subject of mathematical physics covers elementary introduction to mathematical tools that are required for the study of advanced physics subjects. As prerequisites, students are assumed to have mastered the elementary physics courses. The background in basic analysis and linear algebra is recommended but also is self-consistently treated during the course. Differential operators are discussed in terms of geometry; the analysis of complex variable is introduced with particular focus onto special functions that frequently appear in physics study. Variational principles and linear algebra including group representation are to be introduced briefly as a basis for the study of quantum mechanics.

PHY213 Modern Physics [현대물리학]

This course provides an overview of the two pillars of modern physics: special/general theory of relativity and quantum theory of light and matter. It is intended to bridge between General Physics (PHY101) and higher undergraduate physics courses, featuring logical connection between classical mechanics and electromagnetism to their modern counterparts. The key concepts to be covered include Lorentz transformation, equivalence principle, wave-particle duality, Planck's law of electromagnetic radiation, Schrödinger equation, uncertainty principle, electronic band structure, LASER, and so forth. Special emphasis will be placed on the close interplay between fundamental physics and technological applications.

PHY221 Introduction to Computational Physics [전산물리학 입문]

This course aims for training the students in various elementary computational techniques necessary

for numerical modelling of actual physics problems in the upper level courses. The subjects to be covered are basic linux commands, C, C++, fortran, mathematica, matlab, and methods of numerical analysis using those tools to solve elementary mathematics and physics problems. In addition to the regular class hours, participating the lab two hours every week is mandatory.

PHY301 Quantum Physics I [양자물리학 I]

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

PHY302 Quantum Physics II [양자물리 II]

This course is the second half of one-year quantum mechanics 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.

PHY303 Thermal and Statistical Physics [열 및 통계물리학]

This course is intended to provide science/engineering majors with the basic concepts of equilibrium thermodynamics as an analytical tool. The course will cover the fundamental laws of thermodynamics in relation to the free energy and phase transition with particular emphasis on the modern statistical interpretation of classical thermodynamic concepts. Applications in condensed matter and biophysical systems will provide a starting point for advanced studies in statistical physics and interdisciplinary research.

PHY307 Physics Lab II [물리학실험 II]

This course provides hands-on experience on the experimental physics. Students will learn advanced experiments which led to development of modern physics. The experimental set-ups are from a variety of physics fields such as optics, astrophysics, condensed matter physics and beam physics, etc, which basically cover modern physics. The course will deepen students' understanding of physical concepts and its applications.

PHY312 Mathematical Physics II [수리물리학 II]

This course is a continuation of the Mathematical Physics (PHY211) and aims at training students with advanced level of mathematical method, including tensor analysis, integral transforms, calculus of variations, integral equations, and group theory. This course focuses on mathematical description of physical problem rather than emphasizing mathematical rigour, thus example problems in classical mechanics and quantum mechanics are to be discussed. As prerequisites, students are assumed to have mastered the general physics and classical mechanics, and studied basic introduction to quantum mechanics. The background of mathematics at the level of "Mathematical Physics" is also strongly required.

PHY315 Solid State Physics I [고체물리학 I]

This course is the first half of one-year introductory course to solid state physics course. This course covers crystal structure, lattice vibration, free electron theory in metals, the quantum electron theory and the concept of band theory, and electron transport in metal/semiconductor/insulator.

PHY321 Optics [광학]

This course provides undergraduate level topics in modern optics advanced from the basic knowledge of electromagnetic wave. This course begins with classical geometrical optics including ray-tracing, aberration, lens, mirros, and so on and then covers wave optics reviewing basic electrodynamics and including topics such as polarization, interference, wave guiding, Fresnel and Fraunhofer diffraction, and so on. Some topics in instrumentation and experiments are covered as well.

PHY333 Introduction to Astrophysics I: Stars and Blackholes [천체물리학 I: 항성과 블랙홀]

In astrophysics, observed astronomical phenomena are described with physics of various fields. This course introduces in topical fashion astrophysics of astronomical phenomena such as formation, evolution and structure of stars, and properties of compact objects such as white dwarfs, neutron stars and black holes.

PHY334 Introduction to Astrophysics II: Galaxies and the Universe [천체물리학II: 은하와 우주]

In astrophysics, observed astronomical phenomena are described with physics of various fields. This course introduces in topical fashion astrophysics of astronomical phenomena such as nature and origin of galaxies, the large scale structure of the universe, and cosmology.

PHY407 Precision Measurements in Physics [정밀전자계측론]

This course is designed to provide an introduction to the electronics and measurement techniques used for various experiments in scientific and engineering fields. The topics covered include basics on electronics network theory, passive circuits, semiconductor diodes and transistors, operational amplifiers, and computer data acquisitions. Several essential elements for ultra-low noise electrical measurements including signal averaging, synchronous and lock-in detection, single electron transistors, SQUID sensors, etc. are also discussed.

PHY415 Solid State Physics II [고체물리학 II]

This course is the second of one-year introductory course to solid state physics course. This course covers ordered and disordered states, such as ferroelectricity, magnetism, point defect, interface physics and dislocation, in the solid.

PHY416 Semiconductor Physics [반도체물리학]

As one of the specialized topics of condensed matter physics, this course is designed to discuss the fundamental physics of semiconductor materials and devices at post-introductory level. It covers semiconducting crystals, energy bands and density of states, doping and carrier concentration, semiclassical approaches for carrier transport, Fermi Golden Rule and optical processes, and

interfaces in semiconductor devices. Quantum transport at low-dimensional systems will also be introduced as a more advanced subject.

PHY417 Quantum Materials Physics [양자물질물리학]

This course is intended to discuss the basics of unique collective quantum phenomena occurring in condensed matter systems such as superfluidity, superconductivity, quantum spin state, and quantum Hall effect, etc.

PHY418 Polymer and Soft Matter Physics [고분자 및 연성물질 물리학]

Soft matter, often called complex fluids, is a group of materials which have structures much larger than atomic or molecular scale, and they are easily deformed by thermal stresses or fluctuations. Colloids, polymers, surfactants, emulsions, foams, gels, granular materials, and a number of biological materials are examples of soft matter. In this course, students will learn the general macroscopic physical properties of soft matters and their microscopic origins. The universal static and dynamic properties of polymers and their statistical mechanical analysis will be one of the major topics.

PHY419 Phase Transition and Critical Phenomena [상전이와 임계현상]

This course is designed as an advanced sequel to Thermal and Statistical Physics (PHY303) with focus on the emergent properties of many-body systems. Mean-field theory of continuous and first-order phase transitions, Landau-Ginzburg phenomenology, spontaneous symmetry breaking, correlation functions, and the roles of fluctuations will be briefly covered in connection to the key concepts of scaling and universality classes. Selected topics for the (optional) term project will include not only the condensed matter systems but also diverse interdisciplinary subjects found in biology, economics, social sciences, and the studies of complex systems.

PHY423 Computational Physics [전산물리학]

Computational physics is the study and implementation of numerical algorithms to solve problems in physics for which a quantitative theory is available. This course will start from the introduction of basic computational tools, and such tools will be used to develop computational analysis of a few sample problems including solutions of partial differential equations, Monte-Carlo simulations, molecular dynamics simulations, Fourier transforms, etc.

PHY425 Atomic and Molecular Physics [원자 분자 물리학]

This course starts with the most direct and concrete application of quantum mechanics to a realistic system. It covers electronic structure, electronic transitions, and excited states of hydrogenic and multi-electron atoms. Bond mechanisms between atoms, such as ionic bonds and covalent bonds are introduced and placed on the foot of quantum mechanics and theories of electronic structures. Vibrational and rotational structure is treated, and some introductions to polyatomic molecules and solid structure are also discussed.

PHY427 Introduction to Plasma Physics [플라즈마 물리 입문]

This course introduces basic plasma and charged particle phenomena that cover fusion plasmas, microwave sources, accelerators, and astrophysical plasmas. It provides basic understanding of charged particle motion under various electromagnetic environments. Basic fluid dynamics, waves in plasmas, and diffusion and sheaths are described. Plasma diagnostics and fusion plasmas are also introduced.

PHY428 Introduction to Beam Physics [빔 물리학 입문]

This course introduces the theory and application of charged particle beams that cover microwave sources, particle accelerators, and laser-plasma interactions. It provides basic understanding of charged particle motions under various electromagnetic environments such as magnets, RF cavities, and plasmas. Transverse beam optics, acceleration and longitudinal motion, collective description of beam distributions, and interaction between the beam and the EM fields are reviewed within the context of classical physics. Advanced concepts for beam generation and acceleration, and high frequency EM wave generation are also introduced.

PHY429 Nuclear & Elementary Particle Physics [핵 및 입자물리학]

This course covers introductory topics of nuclear and particle physics at the undergraduate level. The topics of nuclear physics include scattering theory, structure of nuclei, nuclear models, nuclear reactions, and so on. Particle physics deals with more fundamental particles that constitute nuclei and the primary topic of particle physics is so called standard model that includes fundamental particles such as quarks and leptons and fundamental interactions among those particles such as electro-weak and strong interactions (QED: quantum electrodynamics and QCD: quantum chromodynamics, respectively). The particle physics part of this course covers the basics of the standard model.

PHY431 General Relativity and Cosmology [일반상대론 및 우주론]

This course begins with a brief review of special relativity as a basis for general relativity and covers basic mathematical tools for general relativity such as tensor algebra and introductory differential geometry. Then, basic formalism of general relativity is developed. Modern cosmology is based upon general relativity and so recent observations and theoretical developments of modern cosmology are introduced based upon general relativity. Some astrophysical topics such as gravitational waves and blackholes are also covered.

PHY435 Biological Physics [생물물리학]

This course outlines the physical aspects of life phenomena ranging from the population genetics down to the molecular biology. Students will be introduced to the theoretical and experimental tools based on the fundamental notions of electrostatics and statistical mechanics. Key chapters include random walks, diffusion, structure and dynamics of macromolecules, cellular information processing, and other selected topics. Throughout the chapters, students will learn how those methodologies have been successfully applied to solve variety of biological problems and thus critically assess the power and limitations of modern tools for biophysics research. Acquaintance with basic biological concepts

will be helpful but not required.

PHY437 Nonlinear Dynamics [비선형동역학]

This is an introductory course for the nonlinear dynamics and chaos. This course stresses analytical methods, concrete examples and geometric intuition. The theory is developed systematically, starting with first-order differential equations and their bifurcations, followed by phase plane analysis, limit cycles and their bifurcations, and culminating with the Lorenz equations, chaos, iterated maps, period doubling, renormalization, fractals, and strange attractors. The course will also cover some applications of nonlinear dynamics, such as mechanical vibrations, lasers, biological rhythms, superconducting circuits, insect outbreaks, chemical oscillators, genetic control systems, chaotic waterwheels, and even a technique for using chaos to send secret messages.

PHY439 Introduction to Modern Theoretical Physics [현대이론물리학 입문]

This course provides an overview of modern theoretical methods developed during the 20th century. It starts from special relativity with modern tensor notation and quantum mechanics including Dirac equation and path integral formalism. After introducing classical field theory, non-relativistic and relativistic quantum fields and their canonical quantization methods are discussed. Gauge theory and Feynman diagram are covered in their elementary level.

PHY441 Fluid Physics [유체물리학]

Static and dynamic properties of fluids will be introduced with the various physical phenomena in fluid flow. Attending the course will improve the ability of the students in understanding and applying the physical properties of flow by introducing many examples which we can see in everyday life.

PHY471~3 Special Topics in PHY Ⅰ ~ Ⅲ [물리학특강 Ⅰ ~ Ⅲ]

This course introduces new research topics in the field of Physics.

2) Chemistry (CHEM)

CHM201 Organic Chemistry Lab [유기화학실험]

This is a lab session of 2nd year organic chemistry courses, which covers basic organic transformations, purifications, and characterisations of organic compounds. The lab sessions provide basic knowledge and skills for simple reactions in organic chemistry. Safety will be a high priority.

CHM211 Organic Chemistry Ⅰ [유기화학 Ⅰ]

This class is an introduction to the classification, structure, and reaction mechanism of organic compounds. The class is set up so that, upon completion, students will understand the different characteristics of organic compounds, including their classification, structure, nomenclature, reaction mechanisms, and synthesis.

CHM212 Organic Chemistry II [유기화학 II]

This is a continuation of lectures in a two-semester organic chemistry course that is being offered to introduce students to the comprehensive principles of organic chemistry and to communicate the excitement of scientific discovery. The basic objective of Organic Chemistry 2 is to continue to lay a solid organic chemistry foundation for further studies in chemistry and related fields.

CHM231 Physical Chemistry I [물리화학 I]

This essential course is for undergraduate students who are interested in chemistry and chemistry-related fields. The course is designed to build basic physical concepts for fundamental understanding of equilibria in chemistry. Equilibria include physical change, such as fusion and vaporisation, and chemical change including electrochemistry. The details cover classical thermodynamics, particularly in terms of enthalpy and entropy. The students are expected to obtain a unified view of equilibrium and the direction of spontaneous change under the chemical potentials of bulk substances.

CHM232 Physical Chemistry II [물리화학 II]

A series of lectures on quantum chemistry is provided in this course. In the introductory part, lectures introduce 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, wave function, and uncertainty principle are covered in the beginning of the course. Principles and applications of various spectroscopic techniques incorporating electronic, vibrational, rotational, and Raman spectroscopy are described in the following lectures.

CHM291 Analytical Chemistry I [분석화학 I]

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. This introductory course also covers the principles of spectrophotometry and mass spectrometry.

CHM301 Inorganic Chemistry Lab [무기화학실험]

This is a lab session of 3rd year inorganic chemistry courses, which covers basic synthetic techniques, and characterisations of inorganic compounds. The lab sessions provide basic knowledge and skills for simple reactions in inorganic chemistry.

CHM302 Physical/Analytical Chemistry Lab [물리분석화학실험]

This experimental course is designed to provide students a chance to experience up-to-date experimental physical chemistry instruments and experimentation as well as state-of-the art analytical instruments to characterise organic, inorganic, and biological molecules and materials.

CHM311 Synthetic Organic Chemistry [합성유기화학]

This course covers topics on the structure and reactivity of organic molecules with an emphasis on reaction mechanisms. Students will be introduced frontier molecular orbital theory and pericyclic reactions including Diels-Alder reaction, sigmatropic rearrangement, and elecrocyclization. Also, reactivity of various functional groups and stereochemistry of reactions will be discussed. This course recommends prerequisites of Organic Chemistry 1 and 2.

CHM313 Fundamentals of Energy Materials [에너지재료개론]

This course offers basic understandings and applications of the energy materials related to energy conversion and storage using organic and inorganic materials. It covers the roles of bonding defining the fundamental types of energy materials and structural defects, kinetics, and expands to in-depth understanding of electronic, magnetic materials, and metals and ceramics, glasses and polymers. Finally, this course focuses on the material selection and design for the solar cells, fuel cell, and batteries.

CHM321 Biochemistry 1 [생화학 I]

Our body is composed of various biological polymers such as protein, nucleic acid, lipid and glycan. These bio-polymers are composed of many monomer molecules such as amino acids, bases, fatty acids, and various sugar molecules. In this course of Biochemistry 1, students will learn basic biosynthetic mechanism of biopolymers by biological machinery. Biological polymers' structure and cellular functions will be discussed in this course, too. Because key mechanisms in this lecture will be discussed with organic chemistry terms, students are expected to have 2nd-year level knowledge of organic chemistry 1 and 2.

CHM322 Biochemistry II [생화학 II]

The second part of lecture covers signalling and metabolism of biological systems. Biosynthesis of carbohydrate, proteins, and DNAs will also be discussed. Recent advances in the convergence of biomolecules and nanotechnology will also be introduced.

CHM323 Medicinal Chemistry [의약화학]

This course covers structures and functions of drug targets including proteins, DNA, and RNA, and their interactions with small organic molecules. These interactions between macromolecules and small molecules serve as the basis for inhibition/activation of their biological functions. Students will also learn the concepts in phamacokinetics, pharmacodynamics, and drug metabolism. The basic processes involved in drug discovery from hit identification to clinical candidates will be covered with case studies on examples of life saving drugs. This course recommends prerequisites of organic chemistry and biochemistry.

CHM324 Spectroscopy in Organic Chemistry [유기분광학]

This course will provide the students with a fundamental understanding of the theory and practice of common spectroscopic techniques (NMR, IR, UV-vis, and MS) used in the identification of organic

compounds. Special emphasis will be given in the application and interpretation of these analytical spectra. Students are expected to have taken 'Organic Chemistry I' and 'Organic Chemistry II'.

CHM333 Physical Chemistry III [물리화학 III]

Statistical thermodynamics and kinetic theory are the two main topic s 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 of the course, basic kinetic theory including reaction rate, collision, diffusion, and activated complex theory (Eyring equation) are covered.

CHM335 Molecular Structure and Dynamics [분자구조 및 동력학]

Chemistry is defined as "a science that deals with the composition, structure, and properties of substances and with the transformations that they undergo" (Merriam Webster Dictionary). This course will introduce molecular structure and the important spectroscopic and spectrometric tools for structure analysis of small and large molecules. The kinetics of chemical and physical transformations, as relevant to chemistry and biology, will be covered in the second part of the course. Modern experiments will be discussed to show capabilities and limits of current spectroscopic technologies.

CHM351 Inorganic Chemistry I [무기화학 I]

The course is designed for undergraduate students who plan to major in chemistry and materials science and engineering. The objective of this course is to understand basic principles of modern inorganic chemistry. Topics covered in this course include atomic and molecular structures, molecular shape and symmetry, structure of solids, acid-base, oxidation-reduction, and molecular bonding.

CHM352 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 be discussed.

CHM371 Introduction to Nanochemistry [나노화학개론]

This course is intended primarily as an introduction course to nano chemistry for undergraduate students. The objective is to understand basic concepts of nanoscience and nanotechnology from a chemical perspective and introduce general synthesis principles, characterization techniques, and potential technological applications of nanostructured materials. Such issues will be discussed in terms of presently important nano materials, including silica, magnetic, semiconducting, and carbon nanostructures.

CHM372 Introduction to Polymer Chemistry [고분자화학개론]

This course is designed for undergraduate students who are interested in synthetic and physical

chemistry of molecules of high molecular weight. This introductory course covers basic concepts of polymer such as molecular weights and their distribution, synthetic chemistry of various polymerisations, behaviour of polymers in solution and bulk, and physical properties of synthetic macromolecules. Recent developments in synthetic chemistry, a convergence of synthetic and biopolymers, and the fascinating world of applications of polymers will also be introduced. Students are expected to have second-year level knowledge of organic and physical chemistry.

CHM391 Instrumental Analysis [기기분석]

This course introduces the principles of analytical instruments which are essential for the characterisation of various compounds and materials. The course provides students with the opportunity to learn how to operate them in laboratories. This course deals with many instruments for spectroscopic analysis (NMR, IR, UV-Vis, Raman), x-ray analysis (XRD, XRF), surface analysis (AFM, XPS, SIMS), thermal analysis (DSC, TGA), mass spectrometry, and electron microscopy.

CHM421 Introduction to Chemical Biology [화학생물학개론]

Chemical biology can be defined as a biological study with chemical approaches. In recent two decades, chemical biology has been expanded to make lots of fascinating discoveries in biological field and some approaches of chemical biology have been essential tools in some biological research field. In this course, we will learn and discuss about concepts, mechanisms and applications of newly developed chemical tools in chemical biology field from current chemical biology research topics such as biological surrogates for glyco-and lipid biology, total protein synthesis, unnatural amino acid polymerisation, biomimetic synthetic enzymes, acitivity-based proteomics, affinity-based inhibitor, protein tagging tools, fluorescent chemical probes. Students are expected to have third year level knowledge of organic chemistry, biochemistry, and cellular biology.

CHM422 Supramolecular Chemistry [초분자화학]

Supramolecular chemistry involves the use of non covalent bonding interactions to self-assemble molecules into thermodynamically stable and well-defined structures. The course explores the field of supramolecular chemistry from molecules to nano materials. This course will provide students with an introduction to recent interesting research. The topics tp be covered include the types of non-covalent bonding, molecular recognition, the role of molecular recognition in biological systems, synthesis of new materials through supramolecular chemistry, applications for new nano materials. Students will be introduced to essential background concepts such as types of non covalent bonding and strategies for the design of supramolecular assemblies.

CHM431 Frontier Spectroscopy [첨단분광학]

This course is designed for undergraduate students who are interested in spectroscopy and experimental physical chemistry. In addition to basic concepts of spectroscopy, this advanced course

covers cutting edge spectroscopy which is still under development such as 2D IR, optical force, correlated rotational alignment spectroscopy, and time-resolved electron microscopy and spectroscopy. Students are expected to have second-year levels knowledge of physical and quantum chemistry and spectroscopy.

CHM451 Inorganic Materials Analysis [무기재료분석]

This course covers the principles of analytical instruments which are needed in the characterisation of organic and inorganic materials, and provides students with the opportunity to learn how to operate them in laboratories. This course deals with many instruments for spectroscopic analysis, x-ray analysis, surface analysis, thermal analysis, mass spectrometry, and electron microscopy.

CHM452 Organometallic Chemsitry [유기금속화학]

The focus of this course is on the synthesis, structure and bonding, properties and reactivity of main group organometallics (including Grignard reagents, organolithium reagents, organophosphorus compounds, etc), organotransition metal chemistry and organometallic catalysis. The course is of particular relevance for students interested in synthetic chemistry.

CHM453 Bioinorganic Chemistry [생무기화학]

This course covers fundamental principles of inorganic chemistry in the context of the role of metals in biological systems. Special emphasis is put on the role of metals in biological systems, and the connection between fundamental knowledge of biological processes with respect to metals, and their relation to commonly known phenomena such as diseases, pollution, alternative energies, evolution and industrial processes.

CHM454 Solid State Chemistry [고체화학]

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: metal, ceramics, semiconductors, and polymers. Topics include: symmetry, basic crystallography, crystal structure, bonding in solids, characterization technique (X-ray diffraction, microscopy, and spectroscopy) and crystal defects.

CHM471 Block Copolymers [블록 코폴리머]

Block copolymers are increasingly attracting interest as well-defined architectural polymers. This course delivers fundamentals of synthetic and physical chemistry of block copolymers. Topics to be discusses involves modern controlled polymerisation techniques, phase behaviour of block copolymers, solution physical chemistry, and structure-function relationships. Application of block copolymers to biomedical sciences, pharmaceutics, and nano sciences will also be discussed.

CHM473 Nanomaterials Chemistry [나노재료화학]

This course introduces basic concepts of nanomaterials and nanochemistry and applications of basic concepts to modern materials for electronics, catalysis, and optics. Inorganic chemistry for synthesis and characterization of 2-D materials will also be covered.

CHM401~3 Special Topics in Chemisty I~III [화학특론 I~III]

In recent years nanoscience and nanotechnology have grown rapidly. Chemical science, in particular, presents a unique approach to building novel materials and devices with a molecular-scale precision. One can envision the advantages of nanoscale materials and devices in medicine, computing, scientific exploration, and electronics, where nanochemical science offers the promise of building objects atom by atom. This course reviews current developments in chemical science.

3) Mathematical Sciences (MTH)

MTH202 Ordinary Differential Equations [상미분방정식론]

Existence and uniqueness of solutions, linear systems, regular singular points. Analytic systems, autonomous systems, Sturm-Liouville Theory.

MTH230 Set Theory [집합론]

Set-theoretical paradoxes and means of avoiding them. Sets, relations, functions, order and well-order. Proof by transfinite induction and definitions by transfinite recursion. Cardinal and ordinal numbers and their arithmetic. Construction of the real numbers. Axiom of choice and its consequences.

MTH251 Mathematical Analysis I [해석학 I]

The real number system. Set theory. Topological properties of R^n, metric spaces. Numerical sequences and series, Continuity, connectedness, compactness. Differentiation and integration.

MTH252 Mathematical Analysis II [해석학 II]

Sequences and series of functions: Uniform convergence and continuity, Power series, special functions. Functions of several variables: Partial derivatives, Inverse function theorem, Implicit function theorem, transformation of multiple integrals. Integration of Differential forms.

MTH260 Elementary Number Theory [정수론]

Divisibility, congruences, numerical functions, theory of primes. Topics selected: Diophantine analysis, continued fractions, partitions, quadratic fields, asymptotic distributions, additive problems.

MTH271 Methods of Applied Mathematics [응용수학방법론]

Concise introductions to mathematical methods for problems formulated in science and engineering.

Functions of a complex variable, Fourier analysis, calculus of variations, perturbation methods, special functions, dimension analysis, tensor analysis. Introduction to numerical methods with emphasis on algorithms, applications and computer implementation issues.

MTH281 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.

MTH302 Modern Algebra I [현대대수학 I]

Groups, homomorphisms, automorphisms, permutation groups. Rings, ideals and quotient rings, Euclidean rings, polynomial rings. Extension fields, roots of polynomials.

MTH303 Modern Algebra II [현대대수학 II]

Further topics on groups, rings; the Sylow Theorems and their applications to group theory; classical groups; abelian groups and modules over a principal ideal domain. Algebraic field extensions; splitting fields and Galois theory; construction and classification of finite fields.

MTH313 Complex Analysis I [복소해석학 I]

Complex numbers and complex functions. The algebra of complex numbers, fractional powers, Logarithm, power, exponential and trigonometric functions. Differentiation and the Cauchy-Riemann equations. Cauchy's theorem and the Cauchy integral formula. Singularities, residues, Taylor series and Laurent series.

MTH314 Complex Analysis II [복소해석학 II]

Conformal mapping: Fractional Linear transformations. Riemann Mapping Theorem. Analytic continuation. Harmonic functions.Some advanced topics in complex analysis.

MTH321 Numerical Analysis [수치해석학]

Polynomial interpolation, Polynomial approximation, Orthogonal polynomials and Chebyshev polynomials. Least-squares approximations. Numerical differentiation and integration. Numerical methods for solving initial and boundary value problems for ODEs. Direct and iterative methods for solving linear systems. Numerical solutions of Nonlinear system of equations.

MTH330 Introduction to Geometry [기하학 개론]

A critical examination of Euclid's Elements; ruler and compass constructions; connections with Galois theory; Hilbert's axioms for geometry, theory of areas, introduction of coordinates, non-Euclidean geometry, regular solids, projective geometry.

MTH331 Scientific Computing [과학계산]

Fundamental techniques in scientific computation with an introduction to the theory and software of the topics. Monte Carlo simulation. Numerical linear algebra. Numerical methods of ordinary and

partial differential equations. Fourier and wavelet transform methods. Nonlinear equations. Numerical continuation methods. Optimization. Gas and Fluid dynamics.

MTH342 Probability [확률론]

Combinatorial analysis used in computing probabilities. The axioms of probability, conditional probability and independence of events. Discrete and continuous random variables. Joint, marginal, and conditional densities and expectations, moment generating function. Laws of large numbers. Binomial, Poisson, gamma, univariate, and bivariate normal distributions. Introduction to stochastic processes.

MTH343 Financial Mathematics [금융수학]

Review of random variables, expectation, variance, covariance and correlation. Binomial distribution. Properties of Normal random variables and the central limit theorem. Time value of money, compound interest rates and present value of future payments. Interest income. The equation of value. Annuities. The general loan schedule. Net present values. Comparison of investment projects Option pricing techniques in discrete and continuous time. Black-Scholes option pricing formula.

MTH344 Mathematical Statistics [수리통계학]

Probability and combinatorial methods. Discrete and continuos univariate and multivariate distributions. Expected values, moments. Estimation. Unbiased estimation. Maximum likelihood estimation. Confidence intervals. Tests of hypotheses. Likelihood ratio test. Nonparametric methods.

MTH351 General Topology [위상수학]

Set-theoretic preliminaries. Metric spaces, topological spaces, compactness, connectedness. Countability and separation axioms. Covering spaces and homotopy groups.

MTH361 Mathematical Modeling and Applications [수리모형방법론]

Formulation and analysis of mathematical models. Applications to physics, biology, economics, social sciences and other areas of science. Use of Mathematical and scientific software packages: Mathematica, Matlab, Maple, e.t.c.

MTH412 Dynamical Systems [동적 시스템]

This course provides tools to characterize qualitative properties of linear and nonlinear dynamical systems in both continuous and discrete time. The course covers stability analysis of differential equations, Hamiltonian systems, Pointcare mapping, and Reduction methods.

MTH413 Differential Geometry I [미분기하학 I]

The differential properties of curves and surfaces. Introduction to differential manifolds and Riemannian geometry. Second fundamental form and the Gauss map. Vector fields. Minimal surfaces. Isometries. Gauss Theorem and equations of compatibility. Parallel transport, Geodesics and Gauss Bonet theorem. The Exponential map.

MTH414 Differential Geometry II [미분기하학 II]

Plane curves: rotation index, isoperimetric inequality, Fenchel's theorem. Space curves: congruence, total curvature of a knot. Submanifolds of Euclidean spaces as level sets, Gauss map. Curves on a surface, geodesics. Gauss Lemma and a proof that geodesics minimise distance locally. Isometries and conformal maps.

MTH420 Fourier Analysis [푸리에 해석학]

Introduction to harmonic analysis and Fourier analysis methods, such as Calderon-Zygmund theory, Littlewood-Paley theory, and the theory of various function spaces, in particular Sobolev spaces. Some selected applications to ergodic theory, complex analysis, and geometric measure theory will be given.

MTH421 Introduction to Partial Differential Equations [편미분방정식개론]

Waves and Diffusions. Reflections and Sources. Boundary value problems. Fourier series. Harmonic functions. Green's Identities and Green's functions. Computation of solutions. Waves in space. Boundaries in the plane and in space. General eigenvalue problems. Distributions and Transforms. Nonlinear PDEs.

MTH432 Algebraic Topology [대수위상]

Fundamental group and covering spaces, simplicial and singular homology theory with applications, cohomology theory, duality theorem. Homotopy theory, fibrations, relations between homotopy and homology, obstruction theory, and topics from spectral sequences, cohomology operations, and characteristic classes.

MTH451 Advanced Linear Algebra [고급선형대수학]

More abstract treatment of linear algebra than Linear Algebra (MTH103). Tools such as matrices, vector spaces and linear transformations, bases and coordinates, eigenvalues and eigenvectors and their applications. Characteristic and minimal polynomial. Similarity transformations: Diagonalization and Jordan forms over arbitrary fields. Schur form and spectral theorem for normal matrices. Quadratic forms and Hermitian matrices: variational characterization of the eigenvalues, inertia theorems. Singular value decomposition, generalized inverse, projections, and applications. Positive matrices, Perron-Frobenius theorem. Markov chains and stochastic matrices. M-matrices. Structured matrices (Toeplitz, Hankel, Hessenberg). Matrices and optimization.

MTH461 Stochastic Processes [확률과정론]

Exponential Distribution and Poisson Process. Markov Chains. Limiting Behavior of Markov Chains. The main limit theorem and stationary distributions, absorption probabilities. Renewal theory and its applications. Queueing theory. Reliability theory. Brownian Motion and Stationary Processes. Martingales. Structure of a Markov process: waiting times and jumps. Kolmogorov differential

equations.

MTH480 Topics in Mathematics I [수학 특강 I]

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

MTH481 Topics in Mathematics II [수학 특강 II]

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

School of Business Administration

1. School Introduction

The School of Business Administration 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) Management (MGT)

Management field aims to provide education for the leaders in a highly globalized and diversified playing field with rapid technological and social changes.

GM track manor explores an organization's design and operations; an organization's economic, legal, ethical and sociopolitical environment; how an organization interacts with its environment in a creative and efficient way.

2) Finance & Accounting (FIA)

Students in Finance & Accounting are field 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.

3) Entrepreneurship (EPS)

Entrepreneurship is related not only to the domain of independent new ventures, but also to the long-term viability of extant firms. Organizations are required to be entrepreneurial to survive in the era of globalization in the market and dramatic technological change.

Entrepreneurship allows students to understand the role of entrepreneurship on a fast changing business environments. This track is not only focusing on the issues for the new startups, but also emphasizing the issues for the existing companies. The goal of this track is designed to provide intellectual knowledge as well as real business experience.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		
		1st Track	2nd Track	
Management(MGT)	Required	33	18	
	Elective	15	-	
Finance & Accounting(FIA)	Required	24	15	
	Elective	24	3	
Entrepreneurship (EPS)	Required	-	12	
	Elective	-	6	

* School of Business Administration students who choose both tracks should take 11 required courses from track of Management and 2 required courses from FIA .
* The "Credit Requirement" is just credits at least required and the major credits must be over 66credits for graduation.
* The overlapping courses will be approved for one department only and elective courses should be taken among the offered courses by School of Business Administration.
* Students can register courses in the Entrepreneurship for 2 track only.

3. Curriculum

□ Management (MGT)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	MGT202	Organizational Behavior	조직행동론	3-3-0	
	MGT204	Marketing Management	마케팅 관리	3-3-0	
	MGT205	Financial Accounting	재무회계	3-3-0	
	MGT207	Financial Management	재무관리	3-3-0	
	MGT209	Operations Management	생산관리	3-3-0	
	MGT308	Strategic Management	경영전략	3-3-0	
1TR : R 2TR : E	MGT101	Leadership and Teamwork	리더십과 팀워크	3-3-0	
	MGT201	Dynamics of IT	Dynamics of IT	3-3-0	
	MGT206	Managerial Accounting	관리회계	3-3-0	MGT205
	MGT210	Data Analysis & Decision Making	경영통계 분석	3-3-0	MTH211
	MGT211	Microeconomics	미시경제학	3-3-0	MGT106

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
	MGT203	International Business	국제경영학	3-3-0	
	MGT212	Business communication	비즈니스 커뮤니케이션	3-3-0	
	MGT302	Human Resource Management	인사관리	3-3-0	MGT202
	MGT303	Strategic Human Resource Management	전략적 인적자원 관리	3-3-0	
	MGT304	Diversity Management	인력 다양성 관리	3-3-0	
	MGT306	Business Ethics	기업경영 윤리	3-3-0	
	MGT307	Legal Environment of Business	경영과 법률 환경	3-3-0	
	MGT312	Macroeconomics	거시경제학	3-3-0	MGT211
	MGT315	Econometrics	계량경제학	3-3-0	MGT211
	MGT316	Industrial Organization	산업조직론	3-3-0	MGT211
	MGT317	International Economics	국제경제학	3-3-0	MGT211 MGT312
	FIA304	International Finance	국제재무관리	3-3-0	MGT207
	MGT330	Consumer Behavior	소비자행동	3-3-0	
	MGT331	International Marketing	국제마케팅	3-3-0	MGT204
	MGT332	Brand Management	브랜드관리론	3-3-0	MGT330
	MGT361	Technology Management	기술 경영	3-3-0	
	MGT362	Process & Quality Management	생산과 품질 관리	3-3-0	MGT209
	MGT363	Operations Research	계량경영학	3-3-0	
	MGT364	Database	데이터 베이스	3-3-0	
	MGT366	Advanced Business Programming	고급 경영 프로그래밍	3-3-0	ITP108
	MGT372	Internet Business and Marketing	인터넷 비지니스	3-3-0	
	MGT373	Strategic Management of IT	정보기술과 경영전략	3-3-0	MGT308, ISM201
Elective	MGT374	Mobile Business	모바일 비지니스	3-3-0	
	MGT410	Special Topics in MGT I	MGT 특론 I	3-3-0	
	MGT411	Special Topics in MGT II	MGT 특론 II	3-3-0	
	MGT412	Special Topics in MGT III	MGT 특론 III	3-3-0	
	MGT413	Game Theory	게임 이론	3-3-0	MGT211
	MGT414	Special Topics in MGT IV	MGT 특론 IV	3-3-0	
	MGT432	Marketing Research	마케팅 조사론	3-3-0	MGT204
	MGT433	Advertising Management	광고 관리론	3-3-0	MGT204
	MGT434	Experimental Design with Applications in Marketing	마케팅실험설계	3-3-0	MGT330
	MGT435	Case Studies in Marketing	마케팅사례연구	3-3-0	
	MGT441	Global Business Strategy	글로벌경영전략	3-3-0	
	MGT442	Case Studies in International Business	국제경영사례연구	3-3-0	
	MGT463	Simulation	시뮬레이션	3-3-0	MTH211
	MGT464	Stochastic Modeling & Applications	추계적 모델링 및 응용	3-3-0	MTH211
	MGT465	System Analysis and Design	경영정보시스템분석 및 설계	3-3-0	
	MGT466	Data Mining	데이터 마이닝	3-3-0	
	MGT471	Managing innovation and Change	혁신과 변화의 관리	3-3-0	
	MGT473	Entrepreneurship and Venture Management	창업과 벤처	3-3-0	
	MGT474	Social Entrepreneurship	사회적 기업의 창업	3-3-0	
	MGT491	Independent Study	개별연구	3-3-0	
	MGT492	Capstone Projects I	캡스톤 디자인 I	3-3-0	
	MGT493	Capstone Projects II	캡스톤 디자인 II	3-3-0	

▸ Recommended Course Tracks (MGT)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	(Financial Accounting)	(3-3-0)	(3-3-0)	Strategic Management	3-3-0	3-3-0				
	Leadership and Teamwork	3-3-0	3-3-0	Data Analysis &Decision Making		3-3-0				
	Dynamics of IT		3-3-0							
	Organizational Behavior		3-3-0							
	Marketing Management	3-3-0								
	Managerial Accounting	3-3-0	3-3-0							
	Financial Management	3-3-0	3-3-0							
	Operations Management		3-3-0							
	Microeconomics	3-3-0	3-3-0							
Total		12(3)	21(3)		3	6				42(6)
Elective	Business communication	3-3-0	3-3-0	Macroeconomics	3-3-0		Database	3-3-0		
	* International Business		3-3-0	International Economics		3-3-0	International Finance	3-3-0	3-3-0	
				Technology Management		3-3-0	Marketing Research		3-3-0	
				System Analysis and Design	3-3-0		Managing Innovation and Change		3-3-0	
				Operations Research		3-3-0	* Strategic Human Resource Management	3-3-0		
				Consumer Behavior		3-3-0	* Advertising Management	3-3-0		
				* Human Resource Management		3-3-0	* Experimental Design with Applications in Marketing		3-3-0	
				* Business Ethics	3-3-0		* Global Business Strategy		3-3-0	
				* Diversity Management		3-3-0	* Stochastic Modeling & Applications		3-3-0	
				* Legal Environment of Business	3-3-0		* Data Mining		3-3-0	
				* Industrial Organization	3-3-0					
				* Brand Management	3-3-0					
				* Process & Quality Management		3-3-0				
				* Advanced Business Programming	3-3-0					
				* Strategic Management of IT	3-3-0					
				* Internet Business and Marketing		3-3-0				
				* Mobile Business		3-3-0				
Total		3	6		24	27		12	21	93
Sum Total		15(3)	27(3)		27	33		12	21	135(6)

※ Elective courses can be changed by the faculty.
※ * to be determined.

□ Finance & Accounting (FIA)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	MGT205	Financial Accounting	재무회계	3-3-0	
	MGT206	Managerial Accounting	관리회계	3-3-0	MGT205
	MGT207	Financial Management	재무관리	3-3-0	
	MGT210	Data Analysis &Decision Making	경영통계 분석	3-3-0	MTH211
	MGT211	Microeconomics	미시경제학	3-3-0	MGT106
1TR : R 2TR : E	MGT101	Leadership and Teamwork	리더십과 팀워크	3-3-0	
	MGT201	Dynamics of IT	Dynamics of IT	3-3-0	
	FIA321	Intermediate Accounting 1	중급회계 1	3-3-0	MGT205
Elective	MGT306	Business Ethics	기업경영윤리	3-3-0	
	MGT307	Legal Environment of Business	경영과 법률환경	3-3-0	
	MGT312	Macroeconomics	거시경제학	3-3-0	MGT211
	MGT315	Econometrics	계량경제학	3-3-0	MGT211
	MGT317	International Economics	국제경제학	3-3-0	MGT211 MGT312
	MGT491	Independent Study	개별연구	3-3-0	
	MGT473	Entrepreneurship and Venture Management	창업과 벤처	3-3-0	
	FIA301	Investments	투자론	3-3-0	MGT210 MGT207
	FIA302	Money and Banking	금융시장론	3-3-0	MGT207
	FIA303	Futures and Options	선물과 옵션	3-3-0	MGT207
	FIA304	International Finance	국제재무관리	3-3-0	MGT207
	FIA305	Corporate Finance	기업재무론	3-3-0	MGT207
	FIA322	Intermediate Accounting 2	중급회계 2	3-3-0	MGT205
	FIA401	Financial Engineering	금융공학	3-3-0	MGT207 FIA303
	FIA402	Fixed Income Securities	채권투자	3-3-0	MGT207
	FIA403	Derivatives Market	파생상품시장	3-3-0	MGT207 FIA303
	FIA404	Risk Management	리스크관리	3-3-0	MGT207 FIA303
	FIA405	Security Valuation	기업가치평가	3-3-0	MGT205 MGT207
	FIA407	Case Studies in Finance	재무사례연구	3-3-0	MGT207
	FIA410	Special Topics in Finance I	재무특론 I	3-3-0	
	FIA411	Special Topics in Finance II	재무특론 II	3-3-0	
	FIA412	Special Topics in Accounting I	회계 특론 I	3-3-0	
	FIA413	Special Topics in Accounting II	회계 특론 II	3-3-0	
	FIA414	Applied Investment Management	투자실무	3-3-0	FIA301
	FIA415	Advanced Corporate Finance I	고급 기업재무론 I	3-3-0	MGT207
	FIA416	Advanced Corporate Finance II	고급 기업재무론 II	3-3-0	MGT207
	FIA422	Commercial Law	상법총론	3-3-0	
	FIA441	Financial Statement Analysis	재무제표분석	3-3-0	MGT205
	FIA442	Taxation	세무회계	3-3-0	MGT205
	FIA443	Strategic Cost Management	원가관리전략	3-3-0	MGT206
	FIA445	Auditing	감사학개론	3-3-0	MGT205
	FIA492	Capstone Projects I	캡스톤 디자인 I	3-3-0	
	FIA493	Capstone Projects II	캡스톤 디자인 II	3-3-0	

▸ Recommended Course Tracks (FIA)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	(Financial Accounting)	(3-3-0)	(3-3-0)	Intermediate Accounting1	3-3-0					
	Managerial Accounting	3-3-0	3-3-0							
	Financial Management	3-3-0	3-3-0							
	Data Analysis &Decision Making		3-3-0							
	Microeconomics		3-3-0							
	Leadership and Teamwork	3-3-0	3-3-0							
	Dynamics of IT		3-3-0							
Total		9(3)	18(3)		3					
Elective				Investments	3-3-0	3-3-0	Financial Statement Analysis		3-3-0	
				Futures and Option		3-3-0	Financial Engineering	3-3-0		
				Macroeconomics	3-3-0		Risk Managemnet		3-3-0	
				International Finance	3-3-0	3-3-0	Case Studies in Finance	3-3-0		
				International Economics		3-3-0	Taxation	3-3-0		
				* Business Ethics	3-3-0		* Fixed Income Securities		3-3-0	
				* Money and Banking	3-3-0		* Derivatives Market	3-3-0		
				* Econometrics		3-3-0	* Security Valuation		3-3-0	
				* Corporate Finance		3-3-0	* Applied Investment Management	3-3-0		
				* Strategic Cost Management	3-3-0		* Advanced Corporate Finance I	3-3-0		
							* Advanced Corporate Finance II		3-3-0	
							* Commercial Law	3-3-0		
							* Auditing	3-3-0		
Total					18	18		24	15	75
Sum Total		9(3)	18(3)		21	18		24	15	105(6)

※ Elective courses can be changed by the faculty.
※ * to be determined.

□ Entrepreneurship (EPS)

Course is	Course No.	Course Title	Course Title (Kor.)	Cred.-Lect.-Exp.	Remarks (Prerequisite)
Required	MGT204	Marketing Management	마케팅 관리	3-3-0	
	MGT308	Strategic Management	경영전략	3-3-0	
	MGT361	Technology Management	기술경영	3-3-0	
	MGT473	Entrepreneurship and Venture Management	창업과 벤처	3-3-0	
Elective	MGT474	Social Entrepreneurship	사회적 기업의 창업	3-3-0	
	EPS491	Capstone Projects I	캡스톤 디자인 I (창업프로젝트)	3-3-0	
	EPS492	Capstone Projects II	캡스톤 디자인II (창업프로젝트)	3-3-0	
	IID404	Product Service System Design	제품 서비스 시스템 디자인	3-2-2	
	IID232	3D CAD & Prototyping	3D CAD와 프로토타이핑	3-2-2	

▸ Recommended Course Tracks (EPS)

Grade	Sophomore			Junior			Senior			Sum Total
division	Course title	Semester (Credit)		Course title	Semester (Credit)		Course title	Semester (Credit)		
		1st	2nd		1st	2nd		1st	2nd	
Required	Marketing Management	3-3-0		Entrepreneurship and Venture Management	3-3-0					
	Strategic Management		3-3-0	Technology Management		3-3-0				
Elective				Product Service System Design	3-2-2		Social Entrepreneurship		3-3-0	
				3D CAD & Prototyping		3-2-2	Capstone Projects I	3-3-0		
							Capstone Projects II		3-3-0	
Total		3	3		6	6		3	6	27
Sum Total		3	3		6	6		3	6	27

※ Elective courses can be changed by the faculty.

4. History of Courses Change of 2014-2015

Acad. Yr.	2014		2015
Management	MGT318 International Finance	⇨	FIA304 International Finance
			MGT212 Business communication **(New)**
			MGT303 Strategic Human Resource Management **(New)**
			MGT304 Diversity Management **(New)**
			MGT412 Special Topics in MGT III **(New)**
			MGT414 Special Topics in MGT IV **(New)**
			MGT474 Social Entrepreneurship **(New)**
Finance & Accounting	MGT318 International Finance	⇨	FIA304 International Finance
	FIA406 Corporate Finance	⇨	FIA305 Corporate Finance
	FIA410 Special Topics in FIA I	⇨	FIA410 Special Topics in Finance I
	FIA411 Special Topics in FIA II	⇨	FIA411 Special Topics in Finance I
	FIA412 Special Topics in FIA III	⇨	FIA412 Special Topics in Accounting I
			FIA413 Special Topics in Accounting II **(New)**
			FIA414 Applied Investment Management **(New)**
			FIA415 Advanced Corporate Finance I **(New)**
			FIA416 Advanced Corporate Finance II **(New)**
			FIA422 Commercial Law **(New)**

5. Course Descriptions

1) Management [MGT]

MGT101 Leadership and Teamwork [리더십과 팀워크]

This course provides theoretical backgrounds and practical tools for effective management of organization and for improving leadership capability. The main topics include personality, motivation,

leadership and team management, organizational design and culture, and organizational change, in both micro and macro perspectives. The purpose of this course is to help prepare students to assume increasingly responsible leadership roles in their personal, professional, and academic lives. As such, the course focuses not only on significant theories of leadership and their applicability to leaders of the past and present, but also includes substantial hands-on, experiential and learning opportunities in which leadership will be put into action.

MGT201 Dynamics of IT [Dynamics of IT]

This course introduces business and social applications of information technologies (IT). The main focus of the course is on introducing managerial insights into the strategic use of IT. Students will develop familiarity with the principles of information systems through the analysis of real-world business cases. At the end of the semester, students will be expected to understand technical and strategic foundations for the effective use of information systems in organizations and society

MGT202 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.

MGT203 International Business [국제경영학]

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.

MGT204 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.

MGT205 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.

MGT206 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.

MGT207 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.

MGT209 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.

MGT210 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.

MGT211 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.

MGT212 Business communication [비지니스 커뮤니케이션]

Developing excellent communication skills is extremely important to your career success, whether you are already working or are about to enter today's workplace. Communication skills are critical to effective job placement performance, career advancement and organizational success. Employers often rank communication skills among the most-requested competencies. Writing skills are more important than ever because technology enables us to transmit messages more rapidly, more often and to greater numbers of people than ever before. Communicating with peers, managers, clients, and customers who differ in race, cultural background, education, ability, gender, age and lifestyle is commonplace and requires special skills. Business Communication will introduce you to a variety of technical and business writing theories and practices designed to be applicable to the production of

business communication in the real world. It teaches.

MGT302 Human Resource Management [인사관리]

The purpose of this course is to provide undergraduate learners with a basic understanding of the concept, principles and techniques of human resource management. Content to be explored includes, but is not limited to, human resource planning and strategy, staffing (recruiting and selection), training, performance appraisal, compensation, employee relations, diversity, legal issues and contemporary issues.

MGT303 Strategic Human Resource Management [전략적 인적자원 관리]

This course is designed to understand how companies can strategically manage human resources as a source of competitive advantage. This calls for a departure from a traditional view of HR as an administrative function to a view of HR as a strategic partner. Throughout this course, students will be able to apply the knowledge about strategic management to the functions and roles of human resource management. By integrating organizational strategy and HR practices, students can learn how the system of human resource management can be designed and implemented with the clear goal of contributing to the formulation and implementation of the organization's competitive strategy.

MGT304 Diversity Management [인력 다양성 관리]

This course takes a multidisciplinary approach to the challenges encountered by individuals, groups, managers and organizations as they strive to deal with an increasingly diverse workforce. It aims to develop students'understanding and critical awareness of issues associated with managing a workforce characterized by diversity in age, gender, race, religion, disability, and sexual orientation. It will explore issues both conceptually and experientially and focus on problem solving so that students will improve their ability as a future employee or manager to address diversity issues in organizations.

MGT306 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.

MGT307 Legal Environment of Business [경영과 법률 환경]

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.

MGT308 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.

MGT312 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.

MGT315 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.

MGT316 Industrial Organization [산업조직론]

Industrial organization is concerned with the workings of markets and industries, in particular the way firms compete with each other. Its emphasis is on the study of the firm strategies that are characteristic of market interaction: price competition, product positioning, advertising, research and development, and so forth.

MGT317 International Economics [국제경제학]

This course discusses topics in International Trade and International Macroeconomics. Theoretical analyses will be presented in lecture as a basis for discussions on various policy issues. The topics will include patterns of international trade and production; gains from trade; tariffs and other impediments to trade; foreign exchange markets; exchange rate determination theories; balance of payments; capital flows; financial crises; monetary/fiscal policy coordination in a global economy.

FIA304 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.

MGT330 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.

MGT331 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.

MGT332 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.

MGT361 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.

MGT362 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.

MGT363 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.

MGT364 Database [데이터베이스]

This course deals with the fundamental concepts of current database systems. Specific topics will include data modeling, database system architecture, and query processing. The course also covers advanced issues such as concurrency controls and disaster recovery methods.

MGT366 Advanced Business Programming [고급 경영 프로그래밍]

This subject examines the principles, techniques and methodologies for the design of business software systems using visual programming tools and the object-oriented approach. This subject describes the concepts of inheritance, encapsulation, construction, access control and overloading. Students will be provided with both the framework and the building blocks with which they can define and implement objects of their own and use them in conjunction with a visual programming system.

MGT372 Internet Business and Marketing [인터넷 비즈니스]

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.

MGT373 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.

MGT374 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.

MGT410 Special Topics in MGT I [MGT 특론 I]

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

MGT411 Special Topics in MGT II [MGT 특론 II]

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

MGT412 Special Topics in MGT III [MGT 특론 III]

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

MGT413 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.

MGT414 Special Topics in MGT IV [MGT 특론 IV]

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

MGT432 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.

MGT433 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

MGT434 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.

MGT435 Case Studies in Marketing [마케팅사례연구]

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

MGT441 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.

MGT442 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.

MGT463 Simulation [시뮬레이션]

This course deals with phenomena that are of a stochastic (rather than deterministic) nature: that is,

some aspects of the system under study are subject to random variations. Systems with a stochastic component include a wide range of applications such as inventory, reliability, computer, communication, production, and transportation systems. This course provides a unified approach to the modeling, analysis and simulation of stochastic systems. Analytical tools include the Poisson process, Markov chains and queueing theory. In parallel to the mathematical models, we develop the concept of discrete event simulation.

MGT464 Stochastic Modeling & Applications [추계적 모델링 및 응용]

This course aims to help students understand the nature of stochastic systems and learn how to model and analyze such systems. The emphasis is on problem formulation, modeling techniques, and realistic applications. The majority of the class will focus on Markov models in discrete time.

MGT465 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.

MGT466 Data Mining [데이터마이닝]

Data mining is comprised techniques from statistics, AI, and computer science. It is applied not only to conventional engineering and science problems, but also to various business areas such as manufacturing, marketing and finance. This course introduces basic data mining problems (clustering, classification, and association analysis) and the respective algorithms and techniques. In addition, students will learn about actual business problems, goals, and the environment in which data mining is applied. Cases in various areas will be studied. Students are strongly encouraged to identify and solve real world business problems using data mining techniques so that they improve their relevance to human interface design.

MGT471 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.

MGT473 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.

MGT474 Social Entrepreneurship [사회적 기업의 창업]

Social entrepreneurs combine the knowledge and skills used in traditional business, with a passionate commitment to having a meaningful and sustainable social impact. Rather thanthe relentless and selfish pursuit of personal enrichment through profit, social entrepreneurs apply their passion and skill to enrich the lives of people who are poor, sick or disenfranchised. The best social entrepreneurs find creative ways to help the disadvantaged help themselves, by building innovative and sustainable new -social enterprises that can be scaled to achieve significant social change.

MGT490 Interdisciplinary Project [창의시스템 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.

MGT491 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.

MGT492 Capstone Projects I [캡스톤 디자인 I]

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.

MGT493 Capstone Projects II [캡스톤 디자인 II]

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.

2) Finance & Accounting (FIA)

MGT101 Leadership and Teamwork [리더십과 팀워크]

This course provides theoretical backgrounds and practical tools for effective management of organization and for improving leadership capability. The main topics include personality, motivation, leadership and team management, organizational design and culture, and organizational change, in

both micro and macro perspectives. The purpose of this course is to help prepare students to assume increasingly responsible leadership roles in their personal, professional, and academic lives. As such, the course focuses not only on significant theories of leadership and their applicability to leaders of the past and present, but also includes substantial hands-on, experiential and learning opportunities in which leadership will be put into action.

MGT201 Dynamics of IT [Dynamics of IT]

This course introduces business and social applications of information technologies (IT). The main focus of the course is on introducing managerial insights into the strategic use of IT. Students will develop familiarity with the principles of information systems through the analysis of real-world business cases. At the end of the semester, students will be expected to understand technical and strategic foundations for the effective use of information systems in organizations and society

MGT205 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.

MGT206 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.

MGT207 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.

MGT210 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.

MGT211 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.

MGT306 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.

MGT307 Legal Environment of Business [경영과법률 환경]

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.

MGT312 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.

MGT315 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.

MGT317 International Economics [국제경제학]

This course discusses topics in International Trade and International Macroeconomics. Theoretical analyses will be presented in lecture as a basis for discussions on various policy issues. The topics will include patterns of international trade and production; gains from trade; tariffs and other impediments to trade; foreign exchange markets; exchange rate determination theories; balance of payments; capital flows; financial crises; monetary/fiscal policy coordination in a global economy.

MGT473 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.

MGT491 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.

FIA301 Investment Analysis [투자론]

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 [선물과 옵션]

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.

FIA304 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.

FIA305 Corporate Finance [기업재무론]

This course is an elective course for students taking finance/accounting department in School of Business Administration. We will initially focus on the institutional features of corporate financing and governance. Then, course deals with the theory of corporate financing such as capital budgeting and capital structure under perfect market conditions. After establishing this basic framework, we will incorporate various market imperfections, such as, taxes, bankruptcy costs, agency costs, and asymmetric information, into the analysis. The course “Financial anagement” is a prerequisite for students who are taking this course on advanced financial management contents. This course aims at understanding market efficiency hypothesis, capital structure, dividend policy and working capital

management, which are based on fundamental financial theories including the present value model, capital budgeting, portfolio theory, CAPM and cost of capital. Moreover, this course will provide a simple introduction to corporate financial analysis, financial planning and derivatives.

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.

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.

FIA402 Fixed Income Securities [채권투자]

This course is designed to introduce fixed income markets including money markets and bond markets. Students are going to understand the time value of money and the relation between price and yield of the bond. The derivatives products underlain by money or bond such as swaps or options will be introduced as well. Most of explanations will be applied to practical market situations.

FIA403 Derivatives Market [파생상품 시장]

This course covers advanced topics in derivative security markets. The purpose of the course is to provide students with comprehensive theories in derivative securities and practical issues in complicated derivative markets. It includes the quantitative valuations, technical properties and applications, hedging and trading strategies of basic and exotic derivatives. Futures and Options (FIA303) is a prerequisite for this course.

FIA404 Risk Management [리스크 관리]

This course is designed to study effective ways of managing financial risks from the perspective of corporations and financial institutions. Major topics include ALM(Asset liability management), VaR, interest rate risk management, credit risk management, and exchange risk management. Other topics include practical cases and statistical tools for risk manage- ment. Finally, this course deals with theories and recent advances in structured products, interest and credit-related derivatives as a tool

for risk management. Students are required to have a solid understanding of basics of futures, options and swaps.

FIA405 Security Valuation [기업가치 평가]

This course is an elective course for students taking finance/accounting department in School of Business Administration. This course will expose students to the primary equity research, analysis, and valuation techniques utilized by investment professionals. This course will cover several approaches to corporate valuation: discounted cash flow (DCF) valuation, relative valuation, contingent valuation. Security valuation could be best learned by doing valuation on his/her own with securities that are traded on the market. Thus, each student will carry out a term project which requires him/her to apply all types of valuation approach they learn during classes with team members.

FIA407 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 I [Finance 특론 I]

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

FIA411 Special Topics in Finance II [Finance 특론 II]

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

FIA412 Special Topics in Accounting I [Accounting 특론 I]

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

FIA413 Special Topics in Accounting II [Accounting 특론 II]

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

FIA414 Applied Investment Management [투자실무]

This course is intended to provide students with working knowledge of applied investment management. Main topics include deciding on the optimal allocation problems, identifying multiple risk factors, assessing the performance, and quantifying the expected return and risk properties of investment opportunities. The course begins by how traditional optimal allocation problems should be modified under real situations such as short shale constraints, differences in lending and borrowing rates, or imposing maximum allocations on particular asset classes. This course also covers topics of

investment in commodities and global equities for creating more diversified portfolios. The focus then turns to portfolio strategies and assesments. Portfolio strategies may include portable alpha and futures overlay strategy. The problems addressed are those of the managers of mutual funds, endowments, mutual funds, index funds, exchange-traded-funds(ETFs), and hedge funds.

FIA415 Advanced corporate finance I [고급 기업재무론 I]

The course focuses on corporate governance and merger and acquisition. The corporate form, in contrast to other business form, frequently involves the separation of ownership and control of the assets of the business. The separation result in a number of conflicts of interest between managers and shareholders. In order to mitigate such conflicts of interest, corporate governance structure have been developed and implemented in corporations. This course will explore issues associated with corporate governance such as principal-agency relationship, board of directors, effective corporate governance, elements of a company's statement of corporate governance polices that investment analysts should assess, and the valuation implication of corporate governance. Merger adds value only if the two companies are worth more together than apart. The merger and acquisition part of this course covers why two companies could be worth more together and how to get the merge deal done. The specific topics include motivation behind M&A, various valuation methods for target company, post-merger value, the effect of price and payment method, the distribution of benefits in a merger

FIA416 Advanced corporate finance II [고급 기업재무론 II]

This course deals with valuation concepts in detail. Valuation is the estimation of an asset's value based on variables perceived to be related to future investment returns, on comparisons with similar assets, or, when relevant, on estimates of immediate liquidation proceeds. Skill in valuation is a very important element of success in investing. The topic includes valuation concepts, industry and company analysis in a global context (e.g, valuation in emerging markets), valuation models (FCF valuation, market-based valuation, residual income valuation, and private company valuation).

FIA422 Commercial Law [상법총론]

The course on Commercial Law aims to provide students with a firm understanding of the legal and regulatory mechanisms that govern companies and how they operate and function in a business environment. Through this course, students build up working knowledge of the procedural and substantive law governing key aspects of company formation, organization and control; management; finance; corporate rescue' and corporate insolvency.

FIA441 Financial Statement Analysis [재무제표분석]

The goal of this course is to develop skills essential to using financial information and accounting statements for capital market decisions. The course is designed to prepare students to interpret and analyze financial statements.

FIA442 Taxation [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.

FIA443 Strategic Cost Management [원가관리 전략]

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.

FIA445 Auditing [감사학 개론]

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.

FIA492 Capstone Projects I [캡스톤 디자인 I]

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.

FIA493 Capstone Projects II [캡스톤 디자인 II]

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.

3) Entrepreneurship (EPS)

MGT204 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.

MGT308 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.

MGT361 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.

MGT473 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.

MGT474 Social Entrepreneurship [사회적 기업의 창업]

Social entrepreneurs combine the knowledge and skills used in traditional business, with a passionate commitment to having a meaningful and sustainable social impact. Rather thanthe relentless and selfish pursuit of personal enrichment through profit, social entrepreneurs apply their passion and skill to enrich the lives of people who are poor, sick or disenfranchised. The best social entrepreneurs find creative ways to help the disadvantaged help themselves, by building innovative and sustainable new -social enterprises that can be scaled to achieve significant social change.

EPS491 Capstone Projects I [캡스톤 디자인 I]

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.

EPS492 Capstone Projects II [캡스톤 디자인 II]

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.

IID232 3D CAD & Prototyping [3D CAD와 프로토타이핑]

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

IID404 Product Service System Design [제품서비스 시스템디자인]

The objective of this course is to investigate the integrated concept of design products and their systems. 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 systems. The course will emphasize team work and collaborative learning to solve theoretical and practical design issues.