2026

Undergraduate Curriculum Guide by Department

POSTECH

POHANG UNIVERSITY OF SCIENCE AND TECHNOLOGY

포항공과대학교

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List of Science and Tech Core (STC) Courses

Department	Course Code	Course Title
Mathematics	MATH200	Differential Equations
	MATH203	Applied Linear Algebra
	MATH210	Applied Complex Variables
	MATH230/MATH231/IMEN272	Probability and Statistics/Statistics for Experimental Research/Probability and Statistics for Engineering
	MATH261	Discrete Mathematics
Physics	PHYS201	Introduction to Quantum Physics
	PHYS202	Introduction to the Theory of Relativity
	PHYS203	Mechanics
Chemistry	CHEM221	Organic Chemistry I
	CHEM231	Introduction to Nanochemistry
	CHEM243	Chemical Analysis
	CHEM261	Chemistry for Medicine and Life
Life Sciences	LIFE217	Cell Biology
	LIFE218	The Principles of Life Sciences
	LIFE219	Convergence of Biology and Engineering
Materials Science and Engineering	AMSE201	Fundamentals of Materials Science and Engineering
	AMSE208	Structure of Materials (For students enrolled in 2021 or later)
	AMSE211	Materials Design
	AMSE412	Nanoscience and Nanotechnology (For students enrolled in 2020 or before)
Mechanical Engineering	MECH240	Solid Mechanics
	MECH250	Thermodynamics
Industrial and Management Engineering	IMEN203	Financial Accounting
	IMEN260/IMEN261	Operations Research I /Introduction to Operations Research
Electronics and Electrical Engineering	EECE231/DISU231	Circuit Theory/Electric Circuits
	EECE233	Signals and Systems
	EECE236	Learning About Electrical Engineering Using MatLab
Computer Science and Engineering	CSED211	Introduction to Computer Software systems
	CSED232	Principles of Software Construction
	CSED233	Data Structure
Chemical Engineering	CHEB201	Physical Chemistry for Chemical Engineering I
	CHEB206	Organic Chemistry for Chemical Engineers I
	CHEB208	Fundamentals in Engineering Biology
	CHEB214	Energy and Environmental Engineering
IT Convergence Engineering	CITE241/MECH361/EECE480	Introduction to Biomedical Engineering
Semiconductor Engineering	SEMI202	Physics for Semiconductors
	SEMI203/EECE211	Semiconductor Devices I/Semiconductor Electronics I
	SEMI206	Introduction to Semiconductor Materials

English Program – Courses by Proficiency Level

Placement		Course Title		Note	
				Required/ Elective	Alternative English Test Scores Accepted for Level Placement
Tier 3	Speaking + Writing	Basic English Ⅰ Basic English Ⅱ		Both required, Cannot be taken concurrently	TOEFL iBT: 90 (22+ in both Speaking and Writing) IELTS: 7+ (Speaking 7+, Writing +6.5+)
Tier 2	Speaking	Intermediate Listening & Speaking Campus Everyday English Intermediate Academic Discussion	Choose one	May take the courses concurrently	TOEFL iBT: 100 (25+ in both Speaking and Writing) IELTS: 7.5+ (Speaking 8+, Writing7+)
	Writing	Intermediate Writing Practical Grammar Intermediate Reading	Choose one		
Tier 1	Speaking	Advanced Listening and Speaking Advanced Academic Discussion	Choose one	May take the courses concurrently Optional	TOEFL iBT: 110 (27+ in both Speaking and Writing) IELTS: 8이상 (Speaking 8.5+, Writing 7.5+)
	Writing	Thesis Advanced Writing Advanced Reading	Choose one		

-Alternative English test scores are accepted for level placement only if submitted before the start of your 3th semester or the end of your 2th semester.

*Test scores must be submitted before –7days of the course add/drop period for placement to apply to the current semester.

-Approved Alternative English Tests

Test	Note
TOEFL iBT	a) "My Best Score" is not accepted. b) TPO (TOEFL Practice Online): Only tests administered by POSTECH are accepted. *When TPO sessions are held for incoming freshmen, current students may be allowed to participate on a space-available basis.
IELTS	

Korean Program – Courses by Proficiency Level

Course Title	Alternative Korean Test Scores Accepted for Level Placement
KLC-Korean Language and Culture 1	**TOPIK Ⅰ-1** <Score(80~139)>
KLC-Korean Language and Culture 2	**TOPIK Ⅰ-2** <Score(140~200)>
KLC-Korean Language and Culture 3	**TOPIK Ⅱ-3** <Score(120~149)>
KLC-Korean Language and Culture 4	**TOPIK Ⅱ-4** <Score(150~189)>

-Alternative Korean test scores are accepted for level placement only if submitted before the start of your 3th semester or the end of your 2th semester.

*Test scores must be submitted before –7days of the course add/drop period for placement to apply to the current semester.

Mueunjae School of Undergraduate Studies (MSUS)

1. Overview of MSUS

The Mueunjae School of Undergraduate Studies (MSUS) was established in the 2018 academic year, when POSTECH adopted a single-track admissions system. Under this system, all incoming freshmen (except those in the Department of Semiconductor Engineering) are admitted without a declared major. MSUS helps students adapt quickly and smoothly to university life, while offering a variety of opportunities to explore different fields before selecting a major.

The name "*Mueunjae*" (無垠齋) was the pen name of POSTECH's founding president, Dr. Hogil Kim, and expresses the philosophy that "there are no boundaries in learning." The name reflects the university's commitment to interdisciplinary education and flexible academic pathways.

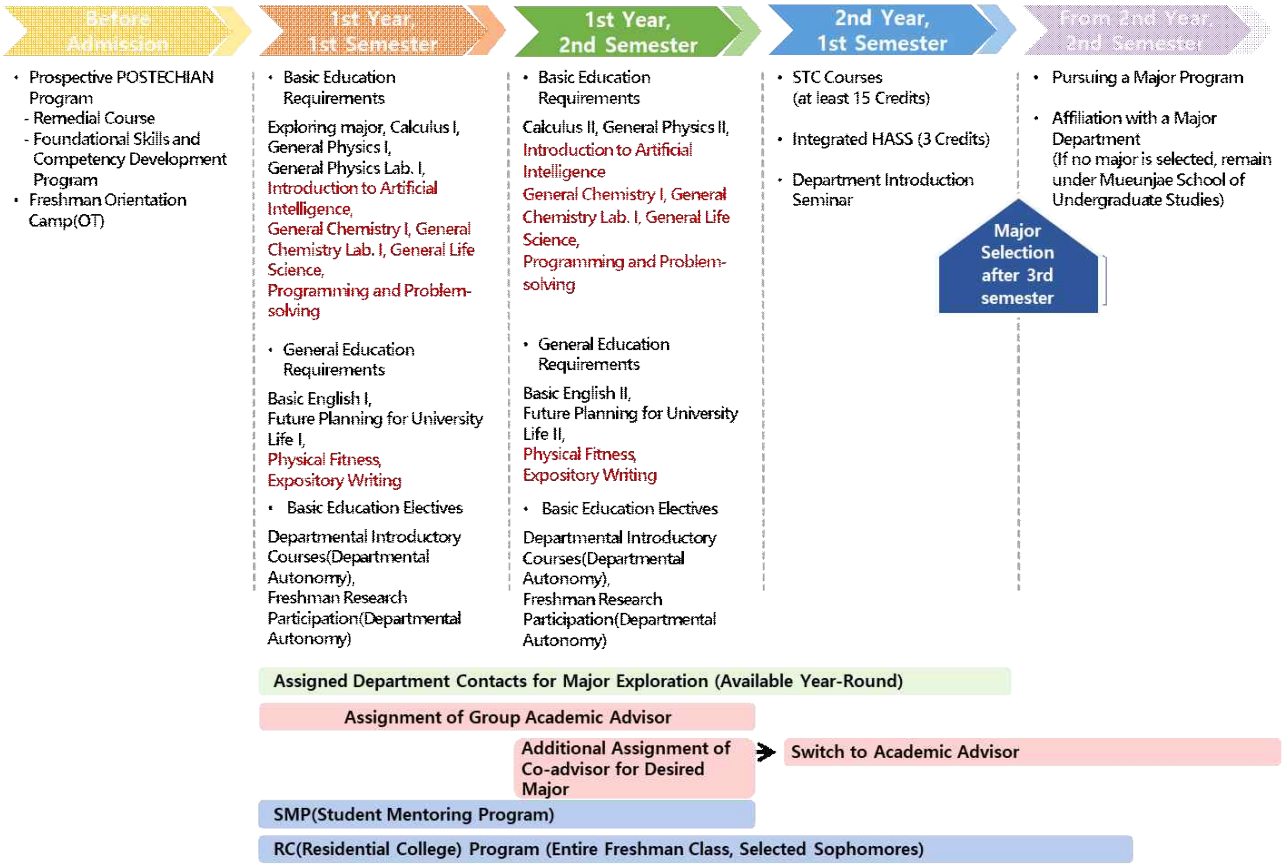
At MSUS, we divide freshmen into 15 groups, each led by two academic advisors and a Student Advisor (SA). All students reside in the Residential College (RC), where two Resident Assistants (RA) are assigned to each floor. Our system ensures that students receive comprehensive support in all areas of university life—including academic advising, course planning, major exploration, career guidance, and social adjustment.

We also offer a wide range of academic and co-curricular programs, such as "Future Planning for University Life," "Exploring Academic Major," "Departmental Introductory Courses," and "Freshman Research Participation." In addition, our students benefit from one-on-one advising with professors, mentoring by SAs and RAs, the Student Mentoring Program (SMP), group activities, and RC programs. Through these highly personalized and focused offerings, our program delivers the distinctive advantages of POSTECH's elite, student-centered educational model.

2. Educational Goals

At MSUS, we aim to cultivate integrative thinking among freshmen, support their successful transition to university life, and guide them in identifying future academic directions. Through major exploration classes, foundational required courses, and introductory departmental offerings (such as Departmental-Introductory Courses and Freshman Research Participation), our program encourages students to reflect deeply on their interests and goals—ultimately empowering them to choose a major that aligns with their aptitudes and aspirations.

3. Major Exploration and Curriculum Roadmap



※ Courses highlighted in red under Basic & General Education may be taken in different semesters depending on the class section.
※ Students granted credits via special examinations or AP (Advanced Placement) may modify their study plan accordingly.

4. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	

Category	Course Title	Credits	Note
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus Ⅰ (3) and Ⅱ (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab Ⅰ (1)	7	
	General Chemistry Ⅰ (3), General Chemistry Lab Ⅰ (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry Ⅱ (3), General Chemistry Lab Ⅱ (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Varies by department and major		Refer to the Summary of Curriculum Requirements for each department.
ME	Varies by department and major		
FE			
Subtotal		**-**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required..

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

※ List of STC Courses

Department	Course Code	Course Title
Mathematics	MATH200	Differential Equations
	MATH203	Applied Linear Algebra
	MATH210	Applied Complex Variables

Department	Course Code	Course Title
	MATH230/MATH231/IMEN272	Probability and Statistics/Statistics for Experimental Research/Probability and Statistics for Engineering
	MATH261	Discrete Mathematics
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	CSED233	Data Structure
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	CHEB214	Energy and Environmental Engineering
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* English Program – Courses by Proficiency Level

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Tier 2	Speaking	Intermediate Listening & Speaking Campus Everyday English Intermediate Academic Discussion	Choose one	May take the courses concurrently	TOEFL iBT: 100 (25+ in both Speaking and Writing) IELTS: 7.5+ (Speaking 8+, Writing7+)
	Writing	Intermediate Writing Practical Grammar Intermediate Reading	Choose one		
Tier 1	Speaking	Advanced Listening & Speaking Advanced Academic Discussion	Choose one	May take the courses concurrently Optional	TOEFL iBT: 110 (27+ in both Speaking and Writing) IELTS: 8+ (Speaking 8.5+, Writing 7.5+)
	Writing	Thesis Advanced Writing Advanced Reading	Choose one		

-Alternative English test scores are accepted for level placement only if submitted before the start of your 3th semester or the end of your 2th semester.
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Test	Note
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IELTS	

5. Course List

Category	Course Code	Course Title	Available Semester	Credits	Note
BER	MSUS101	Exploring Academic Majors	1	1	▪ All 2024-entry freshmen are required to take these courses.
GER	MSUS102/103	Future Planning for University Life Ⅰ and Ⅱ	1, 2	0.5 each	
BEE	(4-letter Major Code)100	Departmental Introductory Courses	2	1	▪ Offered and managed by the respective department.
	(4-letter Major Code)199	Freshman Research Participation	2	1	

① Departmental Introductory Courses and Freshman Research Participation may also be offered in the first semester, at the discretion of each department, to provide students with broader opportunities.
② Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

6. Course Overview

MSUS101 – Exploring Academic Majors ····· (1-0-1)

This course is designed to help students explore various academic departments before selecting their majors. It introduces the characteristics of each major, including key academic disciplines, curricular structures, and degree requirements. Over ten weeks, each department provides a two-hour introduction session to present comprehensive information about its programs. In addition, students participate in a week of departmental visits and additional exploration activities, encouraging deeper, more active engagement with potential majors.

MSUS101A – Exploring Academic Majors: Alternative ····· (2-0-2)

This version, designed for students enrolled in 2018 and 2019, serves the same purpose as MSUS101: to help students independently explore different departments and gain a structured understanding of their academic fields, curricula, and degree systems before selecting their majors.

MSUS102, 103 – Future Planning for University Life Ⅰ and Ⅱ ····· (0.5-0-0.5)

These are GER courses offered in the first and second semesters of the freshman year to support a smooth transition into university life and academic planning. Students must complete both courses for a total of 1 credit.

Emphasizing active participation through small group sessions, the courses develop key personal competencies such as stress management, teamwork, and interpersonal communication. They also offer lectures, discussion sessions, and meetings with senior students to help freshmen adjust to university life.

MSUS102A, 103A – Future Planning for University Life Ⅰ and Ⅱ: Alternative A ····· (1-0-1)

Offered to students enrolled in 2017 or earlier who are retaking or have not yet completed the course.

MSUS102B, 103B – Future Planning for University Life Ⅰ and Ⅱ: Alternative B ····· (1-0-1)

Offered to students enrolled in 2018 and 2019 who are retaking or have not yet completed the course.

(4-letter Major Code)100 – Departmental Introductory Courses ····· (1-0-1)

These courses introduce the academic background, core issues, problem approaches, and major fields of research within each department, providing students with a foundational understanding to make informed decisions when selecting their major.

Course Code	Department	Course Title (including Subtitle)	
		Korean Title	English Title
MATH100	Mathematics	학과입문(수학)	Introduction to Mathematics
PHYS100	Physics	학과입문(물리)	Introduction to Physics
CHEM100	Chemistry	학과입문(화학)	Introduction to Chemistry
LIFE100	Life Sciences	학과입문(생명과학)	Introduction to Life Sciences
AMSE100	Materials Science and Engineering	학과입문(신소재공학)	Fundamentals of Materials Science and Engineering
MECH100	Mechanical Engineering	학과입문(기계공학)	Introduction to Mechanical Engineering
IMEN100	Industrial and Management Engineering	학과입문(산업경영공학)	Introduction to Industrial and Management Engineering
EECE100	Electronics and	학과입문(전자전기공학)	Introduction to Electrical Engineering

Course Code	Department	Course Title (including Subtitle)	
		Korean Title	English Title
	Electrical Engineering		
CSED100	Computer Science and Engineering	학과입문(컴퓨터공학)	Introduction to Computer Science and Engineering
CHEB100	Chemical Engineering	학과입문(화학공학)	Introduction to Chemical Engineering
CITE100	IT Convergence Engineering	학과입문(IT융합공학)	Introduction to Convergence IT Engineering
SEMI100	Semiconductor Engineering	학과입문(반도체공학)	Introduction to Semiconductor Engineering

(4-letter Major Code)199 – Freshman Research Participation ····· (0-2-1)

This course offers first-year students opportunities to engage in lab-based activities, helping them understand how to plan and carry out research, while also introducing the rewards and enjoyment of the research process.

Course Code	Department	Course Title
MATH199	Mathematics	Freshman Research Participation
PHYS199	Physics	Freshman Research Participation
CHEM199	Chemistry	Freshman Research Participation
LIFE199	Sciences	Freshman Research Participation
AMSE199	Materials Science and Engineering	Freshman Research Participation
MECH199	Mechanical Engineering	Freshman Research Participation
IMEN199	Industrial and Management Engineering	Freshman Research Participation
EECE199	Electronics and Electrical Engineering	Freshman Research Participation
CSED199	Computer Science and Engineering	Freshman Research Participation
CHEB199	Chemical Engineering	Freshman Research Participation
CITE199	IT Convergence Engineering	Freshman Research Participation
SEMI199	Semiconductor Engineering	Freshman Research Participation

Division of Humanities and Social Sciences

1. Educational Goals

The Division of Humanities and Social Sciences aims to cultivate thoughtful reflection on humanity and society. Its liberal arts education examines human life and social structures from both the humanities—such as literature, philosophy, and history—and the social sciences—including political science, sociology, economics, and psychology.

Through this integrated perspective and an appreciation of human expression in the arts, the program seeks to inspire imaginative engagement with the question of what it means to be human. By combining professional knowledge with humanistic insight through an interdisciplinary curriculum, the Division aims to nurture global leaders equipped to shape the future.

2. Curriculum Overview

The Division of Humanities and Social Sciences at POSTECH was reestablished under its current name in the fall semester of 1999, transitioning from its previous title, the Division of Liberal Arts and Sciences.

We are committed to equipping the next generation of scientific leaders with a strong foundation in the humanities and social sciences by offering essential education designed to foster well-rounded intellectual development alongside specialized training in science and technology.

Our curriculum emphasizes the development of English proficiency, critical thinking, imagination, moral reasoning, and communication skills.

The curriculum consists of GER, including Basic Requirements and Integrated HASS courses, as well as Advanced HASS courses classified under HSSE.

Basic Requirements include Writing, the English Program, and Physical Education. Integrated HASS comprises two courses: Art and Humanities, and Crossing boundaries of Science and Society. Advanced HASS courses offer deeper engagement with topics in the humanities, social sciences, and the arts.

3. Course List

Category	Discipline	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note	
GER	Basic Requirements	GEDU101	Expository Writing	3-0-2	2 credits	
		GEDU111 GEDU112	Basic English Ⅰ Basic English Ⅱ	3-0-2 3-0-2	Required for C Level Both required Cannot be taken concurrently	
		GEDU121 GEDU127 GEDU128	Intermediate Listening&Speaking Campus Everyday English Intermediate Academic Discussion	3-0-2 3-0-2 3-0-2	Speaking : Choose one	Required for A Level Choose two; one from Writing and another from Speaking
		GEDU126 GEDU131 GEDU132	Intermediate Writing Practical Grammar Intermediate Reading	3-0-2 3-0-2 3-0-2	Writing : Choose one	
		GEDU134 GEDU137	Advanced Listening & Speaking Advanced Academic Discussion	3-0-2 3-0-2	Speaking : Choose one	Required for A Level Choose two; one from Writing and another from Speaking
		GEDU136 GEDU141 GEDU142	Thesis Advanced Writing Advanced Reading	3-0-2 3-0-2 3-0-2	Writing : Choose one	
		* Your English proficiency level will be certified based on the initial placement test. You may then apply to take a higher-level placement test if desired. * The English Program applies to students enrolled in 2026 and later. Students placed in Tier 1 will receive an additional 4 credits.				
		GEDU151 GEDU152 GEDU153 GEDU154 GEDU155 GEDU156 GEDU157 GEDU158 GEDU159 GEDU161 GEDU162 GEDU163 GEDU164 GEDU165 GEDU169	Physical Fitness Kumdo Golf Basketball Dance Racquet Ball Badminton Swimming Ski Orienteering Rowing Soccer Table Tennis Tennis Special Topics in Physical Education	0-3-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1 0-2-1	2 credits required Get 1 credit from Physical Fitness, and get 1 more from the rest in the list: Kumdo (Korean Swordsmanship), Golf, Basketball, Dance, Racquet Ball, Badminton, Swimming, Ski, Orienteering, Rowing, Soccer, Table Tennis, Tennis, and Special Topics in Physical Education	
		GEDU171 GEDU172 GEDU173 GEDU174	Korean Language and Culture 1 Korean Language and Culture 2 Korean Language and Culture 3 Korean Language and Culture 4	3-0-2 3-0-2 3-0-2 3-0-2	2 credits	
		* The Korean Program applies to students(Only new students who have entered as foreigners) enrolled in 2026 and later instead of Expository Writing. If you pass the KLC4, you will receive an additional 2 credits.				
	Integrated HASS	HASS201 HASS202	Art and Humanities Crossing boundaries of Science and Society	3-0-3 3-0-3	3 credits required for students enrolled in 2018 and later If you take both, 3 excess credits will count toward HSSE.	
	HASS-COMPASS	HASS203 HASS203K	HASS-COMPASS K-HASS-COMPASS	3-0-3 3-0-3	3 credits required for students enrolled in 2026 and later	
HSSE - HASS (Humanities)	Literature	HUMN311 HUMN312 HUMN413 HUMN414 HUMN415 HUMN416 HUMN417 HUMN418 HUMN419	Understanding of Literature Understanding Popular Literature Literature and Mass Culture Cosmopolitanism and Narrative Imagination Culture Contents and Digital Storytelling Understanding Contemporary Korean Literature Understanding the World Literature Literature of Social Reflection Special Topics in Literature	3-0-3 3-0-3 3-0-3 3-0-3 3-0-3 3-0-3 3-0-3 3-0-3 3-0-3	18 credits required in HSSE - HASS *Must include 3 credits in Social Sciences and an additional 3 credits in Humanities or Arts at least.	

Category	Discipline	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note
HSSE - HASS (Humanities)	Philosophy	HUMN322	Classics in Eastern and Western Philosophy	3-0-3	18 credits required in HSSE - HASS *Must include 3 credits in Social Sciences and an additional 3 credits in Humanities or Arts at least.
		HUMN323	Discourse on Philosophical Thoughts	3-0-3	
		HUMN324	Knowledge and Reality	3-0-3	
		HUMN422	Applied Ethics	3-0-3	
		HUMN424	Political Philosophy	3-0-3	
		HUMN425	Philosophy of Flourishing Navigating the Good Life	3-0-3	
		HUMN429	Special Topics in Philosophy	3-0-3	
	History	HUMN331	The World History of 20th Century	3-0-3	
		HUMN333	Western Culture History	3-0-3	
		HUMN334	Traditional Society and Culture of Korea	3-0-3	
		HUMN335	Understanding Modern History of Korea	3-0-3	
		HUMN432	Understanding Modern History of Asia	3-0-3	
		HUMN433	Understanding Modern History of Europe	3-0-3	
		HUMN434	American History	3-0-3	
		HUMN439	Special Topics in History	3-0-3	
HSSE - HASS (Social Sciences)	Politics	SOSC311	Understanding Modern Politics	3-0-3	
		SOSC312	Understanding International Politics	3-0-3	
		SOSC411	Political Society and Democracy	3-0-3	
		SOSC412	Politics and Policymaking	3-0-3	
		SOSC419	Special Topics in Politics	3-0-3	
	Social Studies	SOSC331	Understanding Modern Society	3-0-3	
		SOSC334	Social Studies of Economics	3-0-3	
		SOSC336	Introduction to Anthropology	3-0-3	
		SOSC337	Introduction to Human Evolution	3-0-3	
		SOSC338	Emerging Social Issues and Data Analysis	3-0-3	
		SOSC339	Understanding Info. Society	3-0-3	
		SOSC431	The Structure and Culture of Korean Society	3-0-3	
		SOSC433	Gender Studies	3-0-3	
		SOSC436	Marriage and Sex in Contemporary Societies	3-0-3	
		SOSC439	Special Topics in Social Science	3-0-3	
	Psychology	SOSC341	Psychology: Human Mind, Brain and Behavior	3-0-3	
		SOSC342	Modern Society and Mental Health	3-0-3	
		SOSC441	Cognitive Psychology	3-0-3	
		SOSC449	Special Topics in Psychology	3-0-3	
	Communication	SOSC351	Media and Society	3-0-3	
		SOSC354	Group Communication and Leadership	3-0-3	
		SOSC355	Digital Media Literacy	3-0-3	
		SOSC451	Persuasion and Social Influence	3-0-3	
		SOSC459	Special Topics in Communication	3-0-3	
HSSE - HASS (Social Sciences)	Law	SOSC361	Introduction to Law	3-0-3	18 credits required in HSSE - HASS *Must include 3 credits in Social Sciences and an additional 3 credits in Humanities or Arts at least.
		SOSC362	Understanding Intellectual Property Law	3-0-3	
		SOSC469	Special Topics in Law	3-0-3	
	Linguistics	SOSC371	Understanding Human Language	3-0-3	
		SOSC479	Special Topics in Linguistics	3-0-3	
HSSE - HASS (Arts)	Art Studies	ARTS312	Understanding Art	3-0-3	
		ARTS313	Understanding Music	3-0-3	
		ARTS315	The Origin of Images and visual Literacy	3-0-3	
		ARTS316	Introduction to Film	3-0-3	
		ARTS317	Introduction to History of Western Music	3-0-3	
		ARTS411	Art and Society	3-0-3	
		ARTS412	Art, Science, and Technology	3-0-3	
		ARTS413	Introduction to Contemporary Art	3-0-3	
		ARTS414	Introduction to Performance Arts	3-0-3	
		ARTS419	Special Topics in Music and Art Studies	3-0-3	

Category	Discipline	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note	
HSSE - Interdisciplinary Studies	Interdisciplinary Studies	CONF319	Special Topics in Confluence	3-0-3	*For Interdisciplinary Studies, this course may be counted as a Basic Course for Interdisciplinary Minor in Science and Technology Studies.	
HSSE for Interdisciplinary Minor	Economics and Finance	CMEF301	Principles of Economics	3-0-3	These count as Basic Courses for the Interdisciplinary Minor in Economics and Finance. Three courses (9 credits) may also be counted toward HSSE.	
		CMEF302	Microeconomics	3-0-3		
		CMEF303	Macroeconomics	3-0-3		
		CMEF304	Financial Economics	3-0-3		
		CMEF305	Financial Management	3-0-3		
		CMEF306	Sustainability & ESG	3-0-3		
		CMEF401	Econometrics	3-0-3	These count as Advanced Courses for the Interdisciplinary Minor in Economics and Finance.	
		CMEF402	Money and Banking	3-0-3		
		CMEF405	Introduction to Fixed Income Markets	3-0-3		
		CMEF406	Game Theory	3-0-3		
		CMEF407	Industrial Organization	3-0-3		
		CMEF408	Economics of Information	3-0-3		
		CMEF409	Law and Economics	3-0-3		
		CMEF410	Political Economy	3-0-3		
		CMEF411	Market Design	3-0-3		
		CMEF414	Behavioral-Experimental Economics	3-0-3		
		CMEF499	Special Topics in Economics	3-0-3		
HSSE for Interdisciplinary Minor	Science and Technology Studies	CMST301	Logic and Critical Thinking	3-0-3	These count as Basic Courses for the Interdisciplinary Minor in Science and Technology Studies.	Three courses (9 credits) may also be counted toward HSSE.
		CMST302	History of Science	3-0-3		
		CMST303	Philosophy of Science	3-0-3		
		CMST304	Science Technology Studies	3-0-3		
		CMST305	Sociology of Science	3-0-3		
		CMST307	History of Science and Technology in Korea	3-0-3		
		ARTS315	The Origin of Images and visual Literacy	3-0-3		
		SOSC337	Introduction to Human Evolution	3-0-3		
		CONF319	Special Topics in Confluence	3-0-3		
		CMST401	Policy for Science and Technology		These count as Advanced Courses for the Interdisciplinary Minor in Science and Technology Studies.	
		CMST402	Science Communication	3-0-3		
		CMST404	History of Science and Technology in East Asia	3-0-3		
		CMST406	Philosophy of Spacetime and Matter	3-0-3		
		CMST408	Body and Technology	3-0-3		
		CMST409	Evolution and Human Society	3-0-3		
		CMST410	Risk Society and Communications	3-0-3		
		CMST411	Artificial Intelligence and Law	3-0-3		
		CMST412	Modern Society and Science	3-0-3		
		ARTS412	Art, Science, and Technology	3-0-3		
		SOSC412	Politics and Policymaking	3-0-3		
		CMST499	Special Topics in Science and Technology Studies	3-0-3		
HSSE		GEDU182	Presentation and Debate	3-0-3		
		GEDU184	Critical Essay Writing	3-0-3		
		GEDU185	Reading Discussion	3-0-3		
FE		GEDU181	Ethics of Research	3-0-2	Recognized within the FE credit limit set by each department.	
		GEDU186	Artistic Promenade	3-0-2		
		GEDU187	Understanding the Arts	3-0-2		

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

* English Program – Courses by Proficiency Level

Placement		Course Title		Note	
				Required/ Elective	Alternative English Test Scores Accepted for Level Placement
Tier 3	Speaking + Writing	Basic English Ⅰ Basic English Ⅱ		Both required, Cannot be taken concurrently	TOEFL iBT: 90 (22+ in both Speaking and Writing) IELTS: 7+ (Speaking 7+, Writing +6.5+)
Tier 2	Speaking	Intermediate Listening & Speaking Campus Everyday English Intermediate Academic Discussion	Choose one	May take the courses concurrently	TOEFL iBT: 100 (25+ in both Speaking and Writing) IELTS: 7.5+ (Speaking 8+, Writing7+)
	Writing	Intermediate Writing Practical Grammar Intermediate Reading	Choose one		
Tier 1	Speaking	Advanced Listening and Speaking Advanced Academic Discussion	Choose one	May take the courses concurrently Optional	TOEFL iBT: 110 (27+ in both Speaking and Writing) IELTS: 8+ (Speaking 8.5+, Writing 7.5+)
	Writing	Thesis Advanced Writing Advanced Reading	Choose one		

-Alternative English test scores are accepted for level placement only if submitted before the start of your 3th semester or the end of your 2th semester.
*Test scores must be submitted before –7days of the course add/drop period for placement to apply to the current semester.

-Approved Alternative English Tests

Test	Note
TOEFL iBT	a) "My Best Score" is not accepted. b) TPO (TOEFL Practice Online): Only tests administered by POSTECH are accepted. *When TPO sessions are held for incoming freshmen, current students may be allowed to participate on a space-available basis.
IELTS	

* Korean Program – Courses by Proficiency Level

Course Title	Alternative Korean Test Scores Accepted for Level Placement
KLC-Korean Language and Culture 1	**TOPIK Ⅰ-1** <Score(80~139)>
KLC-Korean Language and Culture 2	**TOPIK Ⅰ-2** <Score(140~200)>
KLC-Korean Language and Culture 3	**TOPIK Ⅱ-3** <Score(120~149)>
KLC-Korean Language and Culture 4	**TOPIK Ⅱ-4** <Score(150~189)>

-Alternative Korean test scores are accepted for level placement only if submitted before the start of your 3th semester or the end of your 2th semester.
*Test scores must be submitted before –7days of the course add/drop period for placement to apply to the current semester.

4. Course Description

·General Education Requirements·

【Basic Requirements】

GEDU101 – Expository Writing ····· **(3-0-2)**

This course helps students master the writing process and key techniques to produce texts suited to specific contexts. Through this process, students develop core communication skills, along with the critical thinking and problem-solving abilities essential in STEM (science, technology, engineering, and mathematics) fields.

GEDU111 – Basic English Ⅰ ····· **(3-0-2)**

All lectures and coursework are conducted in English, focusing on foundational training in listening, speaking, reading, and writing. This is a prerequisite course graded on a Satisfactory/Unsatisfactory basis.

GEDU112 – Basic EnglishⅡ ····· **(3-0-2)**

All lectures and coursework are conducted in English, offering more in-depth training in listening, speaking, reading, and writing to strengthen communicative fluency. This is a prerequisite course graded on a Satisfactory/Unsatisfactory basis.

GEDU121 – Intermediate Listening & Speaking ····· **(3-0-2)**

Students read plays, essays, stories, biographies, and poems and discuss themes such as authors' life, family, work, gender, human limits, freedom, and responsibility to cultivate foundational conversational skills.

GEDU126 – Practical Grammar ····· **(3-0-2)**

This grammar course supports effective writing. Students learn fundamental grammar rules and practice sentence-combining techniques. They progress from combining simple sentences to composing well-structured short papers and essays, gaining confidence in English composition.

GEDU127 – Campus Everyday English ····· **(3-0-2)**

Offered during the summer session, this course immerses students in everyday English through real-life activities such as shopping, dining out, attending theater performances, and engaging in sports, while living alongside native speakers.

GEDU128 - **Intermediate Academic Discussion** ····· **(3-0-2)**

This course focuses on improving students' speaking abilities by enhancing their collaborative skills. Students will be encouraged to lead and manage group discussions, helping them develop effective communication and leadership in collaborative settings.

GEDU131 – Intermediate Writing ····· **(3-0-2)**

Students study English sentence structure, paragraph development, expression variety, and logical flow, then apply these skills to essays and research papers to improve accuracy in written English.

GEDU132 – Intermediate Reading ····· (3-0-2)

Students read texts on topics such as education, culture, language, business, and controversial issues. They write summaries and reviews, present their opinions, and participate in discussions. Regular writing assignments based on readings enhance both reading comprehension and writing skills.

GEDU134 – Advanced Academic Discussion ····· (3-0-2)

This course enhances students' advanced collaboration and critical thinking skills by guiding them to take leadership roles in group discussions. It is designed to enable students to address important global issues with a level of proficiency beyond intermediate, fostering their ability to lead and engage in thoughtful, high-level discussions.

GEDU136 – Advanced Reading ····· (3-0-2)

Students read and analyze essays and fiction that address critical issues in science, civilization, economics, education, religion, culture, and other aspects of modern society. They write critical analyses of the authors' arguments to strengthen their reading comprehension and academic writing skills.

GEDU137 – Advanced Listening & Speaking ····· (3-0-2)

This course emphasizes fluent and logical self-expression. Students read essays, newspaper and magazine articles, and academic texts, then present their opinions through structured discussions and presentations to build advanced speaking proficiency.

GEDU141 – Thesis ····· (3-0-2)

Students learn the structure of academic papers and research reports through targeted writing exercises. The course culminates in the drafting of a research paper suitable for submission to an international journal and an accompanying oral presentation. Not available for credit toward graduate programs.

GEDU142 – Advanced Writing ····· (3-0-2)

Students study advanced writing techniques with a focus on clarity, variety, and logical development. They apply these techniques to essays that are refined through multiple revisions, resulting in a final polished composition.

GEDU151 – Physical Fitness ····· (0-3-1)

This course begins with a personal fitness assessment and follows with a customized 16-week exercise plan to improve health and physical performance. Students also learn scientific principles for fitness and wellness management.

GEDU152 – Kumdo (Korean Swordsmanship) ····· (0-2-1)

Through hands-on practice in kumdo (劍道), or Korean swordsmanship, students build both physical and mental discipline. The course introduces core principles of traditional martial arts—mind, sword, and body techniques—for lifelong well-being and physical activity.

GEDU153 – Golf ····· (0-2-1)

Golf is a sport that harmonizes human movement with the natural environment. It requires efficient energy transfer in the swing and precision in directing the ball toward the target. Success depends on an

integration of biomechanics, physiology, and mental focus.

GEDU154 – Basketball ····· (0-2-1)

Basketball is a dynamic indoor sport that requires stamina, agility, and quick reflexes, making it especially popular among young people. Students first learn fundamental skills such as passing, dribbling, and shooting. They then practice offensive and defensive plays in mini-games before progressing to full-team matches.

GEDU155 – Dance ····· (0-2-1)

Once a prominent form of refined social activity in Western high society, dance is an artful indoor sport that promotes physical fitness while helping students develop cultural adaptability in a globalized world. This course offers an accessible introduction to dance, allowing students to understand and enjoy it with ease.

GEDU156 – Racquet Ball ····· (0-2-1)

Racquetball develops core physical attributes such as agility, reflexes, flexibility, and endurance—all fundamental to human movement. Played in a fast-paced, six-walled environment, it also helps sharpen decision-making skills. This course focuses on mastering essential techniques, including forehand and backhand strokes.

GEDU157 – Badminton ····· (0-2-1)

Badminton is a fast-paced, agile sport that is relatively easy for beginners to learn. Students acquire key skills such as footwork, overhand and underhand strokes, and match play, progressing to a level where they can confidently enjoy the game.

GEDU158 – Swimming ····· (0-2-1)

Swimming is a full-body exercise that promotes balanced physical development and is considered a fundamental physical activity, alongside walking, running, and jumping. Because movements are performed in water, it is easy to learn for both children and older adults, making it a highly accessible and valuable recreational activity for all ages.

GEDU159 – Ski ····· (0-2-1)

This course introduces the basics of skiing—such as the snowplow and stem turn—helping students build physical strength, enjoy the excitement of winter sports, and develop safety awareness and social skills. It is offered as a four-day intensive program at a ski resort during the winter session, weather permitting.

GEDU161 – Orienteering ····· (0-2-1)

Orienteering is a sport that requires navigational skills to move from one point to another using a map and compass, often in diverse and unfamiliar terrain. Well-suited to Korea's landscape of low mountains and rolling hills, this nature-friendly sport enhances reasoning, decision-making, and insight, while offering a fun and engaging outdoor experience.

GEDU162 – Rowing ····· (0-2-1)

Rowing is a team water sport in which participants use oars to propel a boat forward by combining

their individual strengths into a unified force. It involves full-body muscle engagement and demands high cardiovascular endurance, emphasizing teamwork at the same time. Typically practiced on lakes and rivers, rowing offers an extra benefit of being immersed in nature and fresh air, contributing greatly to both physical and mental well-being.

GEDU163 – Soccer ····· (0-2-1)

In soccer, players control the ball using only their head, feet, and body—excluding the hands and arms. The game demands a mix of high-intensity sprints, lateral and backward movements, and controlled actions, along with continuous adaptation to changing game situations. As a result, this course helps students build both aerobic and anaerobic capacity while also fostering emotional and cognitive growth through increased confidence, creativity, and quick thinking.

GEDU164 – Table Tennis ····· (0-2-1)

Table tennis is an ideal recreational sport for people of all ages. It carries low risk, can be played year-round, and provides excellent physical activity. With simple rules and techniques that are easy to learn, it is both highly accessible and rewarding.

GEDU165 – Tennis ····· (0-2-1)

This course teaches the fundamental techniques of tennis, including grip, stance, footwork, backswing, forward swing, and follow-through, along with essential strokes such as the forehand, backhand, and serve. Students practice groundstrokes tailored to their skill levels and also learn the rules, gameplay, and spectator etiquette needed to enjoy tennis as a lifelong sport.

GEDU169 – Special Topics in Physical Education ····· (0-2-1)

This course is designed to support the pilot offering of various sports programs, allowing flexible responses to changes in the physical education environment and the diverse needs of students.

GEDU171 – Korean Language and Culture 1 ····· (3-0-2)

This course starts with the basics of Hangul, including the learning of Korean consonants and vowels. It then focuses on fundamental conversational expressions used in everyday life, such as self-introductions, greetings, numbers, and time expressions. Students will acquire practical Korean language skills essential for daily communication, along with an introduction to Korean culture.

GEDU172 – Korean Language and Culture 2 ····· (3-0-2)

This is an intermediate-level Korean language course designed for international undergraduate students who have completed KLC 1 or possess basic proficiency in Hangul and conversational Korean. The course aims to enhance communication skills in various academic and everyday situations in Korea (e.g., finding directions, ordering food, making appointments). Students will expand their practical vocabulary and sentence structures and strengthen their expression and confidence through repetitive practice in real-life scenarios.

GEDU173 – Korean Language and Culture 3 ····· (3-0-2)

This is an advanced Korean language course designed for international undergraduate students who have completed KLC 2 or possess basic conversational proficiency. The course is designed to help students express their thoughts and experiences naturally and effectively in various social situations

beyond everyday life. It focuses on improving speaking skills. Students will learn practical language expressions and strategies to construct sentences and lead conversations, while also deepening their understanding of the cultural context necessary for effective communication in Korean. The course aims to build practical communication competence in the language.

GEDU174 – Korean Language and Culture 4 ····· (3-0-2)

This is the final stage of advanced Korean language training, designed for international undergraduate students who have completed KLC Level 3 or are preparing to transition from beginner to intermediate proficiency. The course is structured to help students develop the ability to express their opinions logically, compare and contrast concepts or objects, explain reasons, express emotions, and make recommendations. Emphasizing the natural use of vocabulary and sentence structures essential for intermediate-level communication, the course focuses on strengthening students' expressive abilities, critical thinking, and language application skills in a comprehensive manner.

【Integrated HASS】

HASS201 – Art and Humanities ····· (3-0-3)

This course serves as an interdisciplinary foundation in literature, history, and the arts. It aims to cultivate critical thinking, imagination, and creativity in understanding human life and culture, grounded in a broad appreciation of the humanities and the arts. Each semester, the course leads students to explore a specific theme through lectures, discussions, and collaborative learning, examining key ideas and works from literature, history, and the arts related to the chosen topic.

HASS202 – Crossing boundaries of Science and Society ····· (3-0-3)

This course offers an integrated exploration of science, technology, and major contemporary issues through diverse approaches from the social sciences as well as science and technology studies. It fosters a deeper understanding of the nature of science and technology, their relationship with society, the historical and social contexts of scientific inquiry, and the broader societal dimensions of scientific activity. Drawing on perspectives from political science, economics, sociology, and psychology, the course examines the dynamic interactions between science, technology, and society within diverse sociocultural contexts. Each semester, the course focuses on a central theme and includes interdisciplinary faculty lectures, group discussions, and student presentations.

【HASS-COMPASS】

HASS203 – HASS-COMPASS ····· (3-0-3)

HASS-Compass is a mandatory general education course for all undergraduate students. It offers a multidisciplinary relay of lectures by faculty from the humanities, arts, and social sciences, as well as guest lectures by external experts and cultural experiences, aiming to serve as an "intellectual compass." Through this course, students will broaden their global perspectives, gain a deeper understanding of the world beyond their major, and lay a foundational framework for embracing diverse viewpoints.

HASS203K – K-HASS-COMPASS ····· (3-0-3)

K-HASS-Compass is a mandatory general education course designed for international undergraduate

students. It offers a multidisciplinary relay of lectures by faculty from the humanities, arts, and social sciences, along with guest lectures by external experts and cultural experiences, aiming to serve as an "intellectual compass." Through this course, students will broaden their global perspectives, gain a deeper understanding of the world beyond their major, and establish a foundational framework for embracing diverse viewpoints.

·Humanities and Social Sciences Electives - HASS Humanities·

【Literature】

HUMN311 – Understanding of Literature ····· (3-0-3)

This course aims to provide students with a foundational understanding of literature. Specifically, it helps students develop a critical eye for the various forms and products of literature encountered through public education and daily life; acquire the knowledge necessary for deeper literary appreciation; and examine and discuss various types of literary works to cultivate a broad and enriched perspective on literature.

HUMN312 – Understanding Popular Literature ····· (3-0-3)

This course is designed to develop a balanced perspective on popular literature that surrounds us. To this end, students study the general characteristics and functions of literature, and examine the specific features of popular literature in that context. More specifically, they explore the distinctive traits of various sub-genres of popular literature. Ultimately, the course equips students with the ability to critically assess and categorize works of popular literature.

HUMN413 – Literature and Mass Culture ····· (3-0-3)

This course explores the relationship between literature and the cultural role of mass audiences in contemporary society. By examining mass cultural trends that are closely tied to literary developments, students gain insight into the interconnections between literature, humanity, and society.

HUMN414 – Cosmopolitanism and Narrative Imagination ····· (3-0-3)

In a society increasingly driven by limitless competition and extreme efficiency, it is ever more important for individuals to recognize themselves as "cosmopolitans" (global citizens) equipped with critical thinking and empathy. Narrative texts play a crucial educational role in cultivating these capacities. In this course, students engage with literary and artistic works that stimulate narrative imagination, write critical responses, and participate in discussion. Through this process, they are encouraged to reflect on the importance of self-awareness and consider what it means to live a humane life, practice coexistence, and act in solidarity.

HUMN415 – Culture Contents and Digital Storytelling ····· (3-0-3)

This course examines the characteristics and influence of cultural content conveyed through mass media, along with the forms and social meanings of stories developed in various aspects of life. Through collaborative learning, students create their own cultural content to deepen and broaden their understanding of contemporary society's cultural landscape.

HUMN416 – Understanding Contemporary Korean Literature ····· (3-0-3)

This course enhances students' critical perspective by engaging with contemporary Korean novels and poetry. It aims to help students better understand and connect with contemporary realities through literature. To this end, class sessions are based on text analysis and student-led discussions centered on major themes in modern Korean literature.

HUMN417 – Understanding the World Literature ····· (3-0-3)

Through key works of world literature, this course explores the universal and specific functions and meanings of literature. Students analyze selected texts in depth, cultivating both aesthetic sensibility and creative thinking.

HUMN418 – Literature of Social Reflection ····· (3-0-3)

This course aims to foster students' critical thinking and a comprehensive understanding of the self, others, and the world through reading diverse literature, writing response papers, and engaging in profound discussions. Moreover, by composing essays on each theme, students will be able to introspect and equip themselves with the capacity to articulate their ideas with sufficient logical grounds and evidence.

HUMN419 – Special Topics in Literature ····· (3-0-3)

This course addresses timely and relevant topics in the field of literature through structured, in-depth discussion

【Philosophy】

HUMN322 – Classics in Eastern and Western Philosophy ····· (3-0-3)

This course involves close reading and discussion of classic texts from the Eastern and Western worlds to help students understand diverse modes of contemplation and cultivate independent thinking. Eastern philosophy topics include the Hundred Schools of Thought (諸子百家) in China, Indian philosophy, and Buddhist thought. In Western philosophy, students examine the works of Plato, Aristotle, Descartes, Hume, and Kant.

HUMN323 – Discourse on Philosophical Thoughts ····· (3-0-3)

This introductory course explores major philosophical debates—such as transcendentalism vs. naturalism, theism vs. secularism, rationalism vs. sentimentalism, universalism vs. relativism, and idealism vs. realism—in relation to religion, art, science, history, and ideology.

HUMN324 – Knowledge and Reality ····· (3-0-3)

This course explores key questions in epistemology, such as: What is the nature of knowledge? Under what conditions is knowledge possible? How is knowing different from simply believing? It also addresses core metaphysical questions, such as: What exists? Who am I, and what is a human being? Does God exist? What is truth?

HUMN422 – Applied Ethics ····· (3-0-3)

Normative ethics explores right and wrong, good and evil, and justice and injustice in the context of relationships between individuals, society, and other beings. This course applies theories of normative ethics to develop solutions to real-world practical issues. Major topics include life and medicine, information, the environment and animals, business, family/sexuality/love, state power, and social and economic justice.

HUMN424 – Political Philosophy ····· (3-0-3)

This course examines core political concepts such as liberty, equality, justice, ownership, rights, and law. Key questions include: How is society structured through power? What are liberty and equality, and why do they matter? What legitimizes state authority? What rights and freedoms should the state protect? What is the nature of law? What are citizens' obligations to a just state?

HUMN425 – Philosophy of Flourishing Navigating the Good Life ····· (3-0-3)

This course provides education aimed at cultivating fundamental character and life skills. By integrating the wisdom of classical literature and insights from modern science, it lays the foundation for living a sustainable and meaningful life. Through this, the course seeks to help students develop the essential competencies required of global leaders, beyond just technical expertise.

HUMN429 – Special Topics in Philosophy ····· (3-0-3)

This course offers in-depth, structured discussion on selected current issues in philosophy, encouraging students to explore constructive solutions through philosophical inquiry.

【History】

HUMN331 – The World History of 20th Century ····· (3-0-3)

This course examines major global issues of the 20th century—not from the historical perspective of an individual nation, but from that of the world as a whole. Topics include imperialism and nationalism, fascism and anti-fascism, the Cold War and the collapse of the socialist bloc, revolution in the Third World, and the rise of neoliberalism and civil society theories.

HUMN333 – Western Culture History ····· (3-0-3)

This course explores how Western societies differ from those of the East by studying the three cultural foundations of Western civilization: (1) human-centered Hellenism from the classical Mediterranean world; (2) Hebraism—Christian God-centered culture—from the late Roman Empire through the Middle Ages; and (3) Germanism, which contributed to the formation of feudal society as a new structure beyond ancient kinship ties.

HUMN334 – Traditional Society and Culture of Korea ····· (3-0-3)

This course examines the living conditions and social structures of pre-modern Korean society through the lens of social and cultural history, fostering a deeper understanding of Korea's historical traditions and offering insight into how they might be meaningfully inherited today.

HUMN335 – Understanding Modern History of Korea ····· (3-0-3)

Korean history since the opening of ports in 1876 can be framed around two central themes: the quest

to build an independent nation-state and the effort to overcome national division. From a critical and reflective point of view, this course explores the development of these efforts and the challenges faced along the way.

HUMN432 – Understanding Modern History of Asia ····· (3-0-3)

This course examines the trajectory and future direction of Asia's efforts to modernize and build a nation-state, focusing on the setbacks and recoveries experienced since the Opium Wars.

HUMN433 – Understanding Modern History of Europe ····· (3-0-3)

The transition from feudalism to modernity in Europe was driven by the rise of the urban bourgeoisie and the civil revolutions it initiated. Throughout this course, students study the 17th-century English Glorious Revolution, the 18th-century American War of Independence, and the French Revolution, which dismantled feudal remnants and ushered in modern capitalism and imperialism. The course also explores how the imperialist global order contributed to international conflicts and wars throughout the 19th and 20th centuries.

HUMN434 – American History ····· (3-0-3)

This course provides a comprehensive study of American history through political, economic, social, and cultural lenses. It aims to offer a structured understanding of America's historical role and influence in global history, as well as its potential future direction.

HUMN439 – Special Topics in History ····· (3-0-3)

This course covers selected, cross-regional topics that go beyond the boundaries of Korean and Eastern/Western history. Topics are delivered through invited experts or interdisciplinary co-teaching formats.

·Humanities and Social Sciences Electives - HASS Social Sciences·

【Politics】

SOSC311 – Understanding Modern Politics ····· (3-0-3)

What role does politics play in modern society? This course analyzes contemporary political phenomena and explores the key characteristics of modern politics. Topics include modern political ideologies, forms of governance, political institutions in major countries, comparative politics, political processes, and international relations, providing students with an overview of core concepts and current debates in political science.

SOSC312 – Understanding International Politics ····· (3-0-3)

This course introduces key concepts in international politics, such as border disputes, international cooperation and conflict, war, and global tensions, while assessing the current landscape of global affairs. Students explore major transformations and fundamental dynamics in global relations—from the rise of sovereign states and imperialism to the world wars, global Americanization, the emergence of multicultural societies, and the formation of a new world order.

SOSC411 – Political Society and Democracy ····· (3-0-3)

This course analyzes the social foundations of political power, political development, and the persistence of social movements. It also focuses on the structure of political organizations and the role of propaganda, communication, and the formation of public opinion in shaping political action.

SOSC412 – Politics and Policymaking ····· (3-0-3)

To become a policy expert in the field of science and technology, students must not only have technical knowledge but also the ability to understand and analyze the political dynamics involved in the policy-making process. This course explores the influence of politics on public policy formation from a comparative political perspective. By analyzing various policy cases, it aims to help students critically understand real-world policy environments.

SOSC419 – Special Topics in Politics ····· (3-0-3)

This course offers structured, in-depth exploration of major issues in political science, such as Cold War and post–Cold War politics, globalization, and nationalism. Students engage in structured discussions to seek constructive solutions to current political challenges.

【Sociology】

SOSC331 – Understanding Modern Society ····· (3-0-3)

Modern society—shaped by rapid urbanization, industrialization, and informatization—is becoming increasingly complex. This course examines key features of modern society, contemporary social issues, popular culture, and modern social ideologies, offering students a foundational perspective for understanding today's intricate world.

SOSC334 – Social Studies of Economics ····· (3-0-3)

This course closely examines key economic concepts and investigates how economic principles and market capitalism are grounded in science and shaped by their social context. Taking political, sociological, cultural, and anthropological approaches to economic activity, the course critically reflects on how commonly accepted concepts and practices in economics have been historically shaped and how they are applied in real-world contexts.

SOSC336 – Introduction to Anthropology ····· (3-0-3)

This course aims to develop an understanding of human beings as cultural entities. Students examine diverse sociocultural systems around the world to better understand cultural diversity and shared human concerns, while gaining a reflective perspective on their own culture.

SOSC337 – Introduction to Human Evolution ····· (3-0-3)

This course examines fossil and archaeological evidence related to human evolution, grounded in modern evolutionary theory. It covers foundational concepts of evolution, phylogenetics, basic anatomy, and introductory genetics. Students will trace the evolutionary journey from early primate origins through Australopithecus and Paranthropus, culminating in the emergence of Homo sapiens.

SOSC338 – Emerging Social Issues and Data Analysis ····· (3-0-3)

This course teaches students how to identify significant social issues and analyze them using data from diverse sources. In doing so, it enhances students' understanding of contemporary society and fosters the ability to respond proactively to future changes and challenges.

CMCC339 – Understanding Info. Society ····· (3-0-3)

This course aims to explore the characteristics, trends, and implications of the information society that has emerged alongside the rise of information technology. It examines the social impacts of the introduction and spread of information technology, while also reflecting on both the positive and negative effects it has on the quality of individual life in daily life.

SOSC431 – The Structure and Culture of Korean Society ····· (3-0-3)

This course analyzes the structure and development of Korean society and the cultural dynamics and conflicts that have emerged over time, using both humanities and social science perspectives. It also explores how key political, economic, and social events throughout Korean history have shaped the country's social structure.

SOSC433 – Gender Studies ····· (3-0-3)

This course explores how gender differences between women and men relate to individual identity, class, family, work, love, and marriage in contemporary society, and how gender operates as a fundamental organizing principle of social life. It encourages students to examine gender relations and the lives of diverse women from fresh, critical perspectives. Through this process, students will gain new insights into the varied experiences of women and develop an awareness of how their own lives are shaped by society. Ultimately, the course aims to foster a "feminist imagination"—a way of envisioning the kind of society and world they wish to help create.

SOSC436 – Marriage and Sex in Contemporary Societies ····· (3-0-3)

Although central to our lives, the topics of marriage and sexuality remain underexplored in academic discourse. This course takes an interdisciplinary approach—drawing on cross-cultural studies, anthropology, sociology, and evolutionary biology—to examine changes in marriage, sex, gender roles, and family in modern society.

SOSC439 – Special Topics in Social Science ····· (3-0-3)

This course addresses current issues in sociology through structured, in-depth discussion, seeking constructive solutions to the problems at hand.

【Psychology】

SOSC341 – Psychology: Human Mind, Brain, and Behavior ····· (3-0-3)

Psychology is the scientific study of human beings—ourselves. By understanding its principles, students gain deeper insights into themselves and others, leading to better personal and social adaptation. This course provides an overview of major topics, research methods, and findings in modern psychology, fostering a scientific understanding of the human mind and behavior. Key topics include research

methods, states of consciousness, growth, learning, memory, social influence, personality, and psychological disorders and treatments.

SOSC342 – Modern Society and Mental Health ····· (3-0-3)

This course equips students with psychological knowledge to help them cope with the various adjustment challenges posed by rapidly changing modern society and to support personal growth. Topics include interpersonal perception, self-conception, communication, friendship and love, shifting gender roles, marriage and adaptation, and stress management. Students engage in personal projects and small group research to analyze their own real-life adaptation issues and seek practical solutions.

SOSC441 – Cognitive Psychology ····· (3-0-3)

This course examines the theories of cognitive psychology, the scientific study of higher-order mental processes involved in human information processing, including perception, memory, thinking, language, and problem-solving. It also analyzes the relationships between cognitive psychology (the study of the mind), neuroscience (the study of the brain), and computer science (the study of computation). In addition, the course explores how findings from cognitive psychology are applied to the field of human factors and ergonomics.

SOSC449 – Special Topics in Psychology ····· (3-0-3)

This course addresses current issues in psychology through structured, in-depth discussion, seeking constructive solutions to the problems at hand.

【Communication】

SOSC351 – Media and Society ····· (3-0-3)

This course introduces the foundational theories and models in the field to examine how the constantly evolving forms and content of media influence individuals and society. Students explore how individuals select, use, and perceive media, as well as how media affects the attitudes, beliefs, and behaviors of both individuals and groups.

SOSC354 – Group Communication and Leadership ····· (3-0-3)

This course explores the fundamental role of communication in forming and maintaining human relationships. Students learn how people initiate, sustain, and end relationships by examining key research and theories in the field of interpersonal communication.

SOSC355 – Digital Media Literacy ····· (3-0-3)

In today's rapidly changing media landscape, individuals are no longer just consumers of media content but also producers, sharers, and distributors. This course broadens the scope of traditional media literacy education—which focused on the critical consumption of television, radio, and newspapers—by offering knowledge about the production, consumption, and distribution of diverse and emerging digital content. Based on a broader understanding of digital media, students develop their communication capabilities and community-centered competencies to lead autonomous lives in the digitally interconnected 21st century.

SOSC451 – Persuasion and Social Influence ····· (3-0-3)

This course serves as an introduction to the field of persuasion, covering various theories of persuasion, research on persuasive communication, and the formation of social and political attitudes. Topics include the dynamics of attitude change, interpersonal persuasion, coercive persuasion through propaganda, unconscious persuasion, and media-based persuasion such as public campaigns.

SOSC459 – Special Topics in Communication ····· (3-0-3)

This course emphasizes the critical role of communication in shaping public opinion, fostering mutual understanding and harmony, and building a shared future in society. It includes a range of significant topics, such as interpersonal and group communication, broadcasting, film, journalism, and mass communication. Specific content may vary each semester.

【Law】

SOSC361 – Introduction to Law ····· (3-0-3)

This course provides an introductory overview of law, focusing on the basic legal knowledge essential for citizens in a democratic constitutional state. Topics include key institutional frameworks of modern democratic society, such as constitutional rights, the fundamental principles of civil and criminal law, civil disobedience, human rights movements, and public interest litigation movements. In addition, students explore theories and case studies related to law and justice to develop a foundational understanding of law and cultivate their capacity for legal reasoning.

SOSC362 – Understanding Intellectual Property Law ····· (3-0-3)

This course focuses on understanding how scientific and engineering activities such as experiments, research, and inventions are legally processed. Centered on patent and copyright law, it explores how to secure and defend one's intellectual property rights. In particular, students examine the fundamental concepts behind diverse topics such as technology licensing, patent disputes, taxation of intellectual property, cybercrime, and e-commerce, and study specific case studies to learn practical approaches to related issues.

SOSC469 – Special Topics in Law ····· (3-0-3)

This course selects fundamental legal issues or pressing topics in modern society within the field of law for in-depth, structured discussion. Through these explorations, students are encouraged to revisit the spirit of law and gain a deeper understanding of its role in contemporary society.**

【Linguistics】

SOSC371 – Understanding Human Language ····· (3-0-3)

This course serves as an introductory survey of linguistics, covering the core components of language—from phonemes and phonology to nearly all the fields of theoretical linguistics, including word structure, sentence structure, utterance semantics, and discourse analysis. Using English as a foundation, students explore linguistic theories through a diverse range of language data, including Asian, European, African, and Inuit languages.

SOSC479 – Special Topics in Linguistics ····· (3-0-3)

This course explores fundamental questions about language as a core function of human cognition: Why does language take its current form, and through what mechanisms is it acquired? These questions are examined through the lens of cognitive linguistics. Students critically examine how language influences cognition and gain insight into this interaction.

·Humanities and Social Sciences Electives - HASS Arts·

【Arts】

ARTS312 – Understanding Art ····· (3-0-3)

This course examines the development of art from ancient civilizations to the present within the broader context of human history. By studying some of the greatest works from different eras and regions, students gain insight into the societies that produced the masterpieces and develop the ability to critically interpret visual culture.

ARTS313 – Understanding Music ····· (3-0-3)

This course aims to cultivate knowledge of fundamental elements of music, its media, its compositional structures and principles, and theoretical and practical aspects of listening. In doing so, students will gain emotional depth, creativity, and a well-rounded character.

ARTS315 – The Origin of Images and Visual Literacy ····· (3-0-3)

In today's society—marked by the growing dominance of visualization across all fields—visual literacy (the capacity to understand and interpret images and videos) has become as essential as traditional text literacy. This course provides an overview of the history of images as tools of communication rather than as objects of aesthetic appreciation. It aims to foster a critical understanding of society and culture through the lens of visual literacy.

ARTS316 – Introduction to Film ····· (3-0-3)

This course provides a general overview of the history, current trends, and future prospects of cinema, along with an introduction to the technologies used in filmmaking. Students gain both theoretical and practical knowledge of film appreciation and also explore the intersections between film and science/technology.

ARTS317 – Introduction to History of Western Music ····· (3-0-3)

This course aims to help students understand the historical and artistic developments from ancient times to the Romantic period, with a focus on music. It fosters humanistic thinking by exploring the connections between music and other disciplines such as politics, society, philosophy, and science.

ARTS411 – Art and Society ····· (3-0-3)

This course explores how the development of art has reflected the cultural characteristics and historical conditions of each era and society, and how art, in turn, can influence social dynamics.

ARTS412 – Art, Science, and Technology ····· (3-0-3)

Art has always evolved in dialogue with the scientific and technological advancements of its era. This course explores how science and technology have been used to express societal ideals through representative artworks and architectural achievements from antiquity to the present. It also investigates how shifting worldviews and values, shaped by scientific discoveries, are reflected in artistic expression.

ARTS413 – Introduction to Contemporary Art ····· (3-0-3)

This course surveys various fields within contemporary art, examining their commonalities, differences, and mutual influences. It also explores how the development of contemporary art interacts not only with traditional humanities disciplines—such as society, politics, culture, history, and aesthetics—but also with modern fields like economics and science/technology. Through this process, students expand their perspective on contemporary society and culture.

ARTS414 – Introduction to Performance Arts ····· (3-0-3)

This course introduces students to the diverse forms of art on stage—including theater, dance, music, and performance art. Through lectures on the historical development of performance arts in both Eastern and Western traditions, as well as on key elements of each field, students gain foundational knowledge of performance art.

ARTS419 – Special Topics in Music and Art Studies ····· (3-0-3)

This course aims to broaden students' understanding of the arts through structured and in-depth exploration of diverse fields and topics in music and art.

·Humanities and Social Sciences Electives - Interdisciplinary Studies ·

【Interdisciplinary Studies】

CONF319 – Special Topics in Confluence ····· (3-0-3)

This course features special topics in the field of confluence, an interdisciplinary exploration across the humanities, social sciences, and natural sciences. It aims to foster and broaden students' integrative creativity and humanities- and social science-based insight into human beings and the world.

·Humanities and Social Sciences Electives - Interdisciplinary Minors·

【Interdisciplinary Minor in Economics and Finance】

CMEF301 – Principles of Economics ····· (3-0-3)

Beyond analyzing the market economy, this course introduces economic reasoning as a way to understand society and human behavior. It covers the fundamentals of microeconomics, which analyzes

the behavior of individual economic agents, and macroeconomics, which examines the national and global economy.

CMEF302 – Microeconomics ····· (3-0-3)

This course examines how economic agents—such as consumers, businesses, and governments—behave rationally to maximize their objectives under given constraints. Topics include consumer choice and demand theory, firm choice and supply theory, analysis of market structures including competition and monopoly, the resource allocation function of markets, market failures, and the role of government intervention.

CMEF303 – Macroeconomics ····· (3-0-3)

This course analyzes the interactions among major macroeconomic actors—households, businesses, governments, and foreign sectors—and how their decisions influence the overall economy. Students learn key macroeconomic indicators such as national income, price levels, unemployment, and interest rates, and apply macroeconomic models to understand how these variables are determined. The course also provides an in-depth analysis of real-world economic issues such as inflation and unemployment.

CMEF304 – Financial Economics ····· (3-0-3)

This course examines how financial assets are valued and how investors make decisions regarding consumption and investment. Topics include single-period financial models, state pricing, risk-neutral pricing, the fundamental theorem of asset pricing (FTAP), incomplete markets, the Modigliani-Miller (M&M) theorem, multi-period models, martingales, the term structure of interest rates, the valuation of financial derivatives, optimal consumption and investment, and the capital asset pricing model (CAPM).

CMEF305 – Financial Management ····· (3-0-3)

This introductory course offers a broad overview of key principles in financial management. Topics include the valuation of bonds and stocks, investment decision-making, asset management, the capital asset pricing model, capital structure, and options.

CMEF306 – Sustainability & ESG ····· (3-0-3)

This course deepens students' understanding of sustainability and explores key trends and case studies in environmental, social, and governance (ESG) practices. It also clarifies the distinctions and relationships among ESG, corporate citizenship, and corporate social responsibility (CSR).

CMEF401 – Econometrics ····· (3-0-3)

This course introduces statistical methods used to evaluate the empirical validity of economic theories using real-world data. Students gain an understanding of the fundamentals of regression analysis and learn how to diagnose and resolve common issues in its application.

CMEF402 – Money and Banking ····· (3-0-3)

This course examines the interplay among financial institutions, regulatory systems, and monetary policy, and how government and financial markets influence the broader economy. Topics include the financial system, interest rates, the efficient market hypothesis, the banking industry, banking regulation, central banking, money demand and supply, monetary policy, transmission mechanisms, and the relationship between money and prices.

CMEF405 – Introduction to Fixed Income Markets ····· (3-0-3)

This course covers the core principles and characteristics of the bond market. Topics include interest rates and yields, the role of central banks, repurchase agreement (repo) markets, government bond auctions, yield curves and the term structure of interest rates, credit risk and corporate bonds, mortgage-backed securities, and fixed income derivatives.

CMEF406 – Game Theory ····· (3-0-3)

Game theory explores the strategic behavior and decision-making processes of rational economic agents. Students learn foundational concepts such as strategic-form games, extensive-form games, and Nash equilibrium, and apply them to economic phenomena including firm strategies, public choice, auctions, and contracts.

CMEF407 – Industrial Organization ····· (3-0-3)

As an extension of microeconomics, this course delves into the theory of the firm and market structures. It explores the theoretical basis for real-world business strategies such as price and quantity competition, advertising, price discrimination, collusion, and vertical integration. The course also evaluates the rationale for and impact of government intervention and regulation in markets.

CMEF408 – Economics of Information ····· (3-0-3)

In real-world society, individual and economic decision-making often occurs under conditions of information uncertainty. Therefore, it is important to understand how agents make optimal choices with limited information and how information is produced, acquired, and transmitted. This course addresses major phenomena resulting from information scarcity or asymmetry among economic agents and teaches students how to analyze these issues using economic methodologies.

CMEF409 – Law and Economics ····· (3-0-3)

Law is one of the most important institutional mechanisms in modern society. It can both restrict and protect individual autonomy, exerting significant influence over personal behavior and society as a whole. This course aims to help students understand how various laws in contemporary society affect human actions and behaviors.

CMEF410 – Political Economy ····· (3-0-3)

Politics and economics are deeply interconnected. Government policies and regulations significantly influence economic and social activities, while economic agents may also gain and exert political power in various ways. This course uses positive economic methodologies to analyze and understand the connection between political and economic systems.

CMEF411 – Market Design ····· (3-0-3)

Market design is a field that applies economic methodologies to develop rules and institutions for markets, organizations, and collectives. The structure of these rules can significantly affect economic agents' behavior and outcomes, ultimately influencing the well-being of markets, institutions, and society at large. This course teaches students how to design efficient and rational market mechanisms and provides opportunities for hands-on application.

CMEF414 – Behavioral-Experimental Economics ····· (3-0-3)

In recent years, economics has increasingly drawn on psychological insights to explain human behaviors and economic phenomena that traditional models fail to capture. This course explores key topics at the intersection of economics and psychology, focusing on major hypotheses of behavioral economics and the empirical evidence supporting them. Students also learn how to design laboratory and field experiments to test these hypotheses and develop skills in interpreting experimental results.

CMEF499 – Special Topics in Economics ····· (3-0-3)

This course offers in-depth, structured discussions on current and emerging issues in the field of economics. Students explore the latest challenges and seek informed, forward-looking approaches to problem-solving through critical analysis and interdisciplinary engagement.

【Interdisciplinary Minor in Science and Technology Studies】

CMST301 – Logic and Critical Thinking ····· (3-0-3)

Logic is the foundation of our ability to describe, explain, predict, and understand the world. This course fosters critical thinking by equipping students with tools from classical and symbolic logic, as well as deductive and non-deductive reasoning, to analyze, explore, transform, and create ideas across real, virtual, historical, and hypothetical domains.

CMST302 – History of Science ····· (3-0-3)

This course examines the development of science from antiquity to the present, with a focus on Western science. It begins with an overview of Greek natural philosophy and the science of the ancient and medieval periods, follows the rise of modern science during the Scientific Revolution, and concludes with the development and evolution of individual scientific disciplines such as physics, chemistry, and biology.

CMST303 – Philosophy of Science ····· (3-0-3)

Based on classical philosophy of science—which uses symbolic logic to model hypothesis testing and scientific explanation—this course aims to expand the methodological toolkit of science by introducing non-deductive approaches such as analogical and dialectical reasoning.

CMST304 – Science Technology Studies ····· (3-0-3)

This course provides an overview of major methodological perspectives in science and technology studies, including the structure of scientific revolutions, logical positivism and post-empiricism, social constructivism, cultural anthropology, postmodern and postcolonial science, feminist theories of science, technological systems theory, realism and instrumentalism, and experimental philosophy.

CMST305 – Sociology of Science ····· (3-0-3)

Modern science and technology have brought many benefits but also caused serious problems such as environmental pollution, nuclear proliferation, human alienation, and global warming. This course explores the dual nature of modern science and technology from a sociological perspective and examines the potential for developing the sociology of science and technology as a distinct academic field.

CMST307 – History of Science and Technology in Korea ····· (3-0-3)

This course explores the characteristics and nature of science and technology in Korea by examining

their historical development in the nation. Topics include achievements during the reign of King Sejong, the role of science during modernization, and the formation of Korea's modern scientific landscape. Students will also learn about significant cultural heritages such as Cheomseongdae (瞻星臺, or the star observatory), the Emille Bell (the Bell of King Seongdeok), the Tripitaka Koreana, and the Cheugugi (測雨器, or the rain measuring tool).

CMST401 – Policy for Science and Technology ····· (3-0-3)

Scientific and technological progress of a nation depends not only on innovation but also on the policy frameworks that support it. In this course, students examine case studies of effective policies from around the world to identify key elements of desirable and practical approaches.

CMST402 – Science Communication ····· (3-0-3)

As science plays an increasingly important role in society, the effective communication of scientific achievements is more critical than ever. . This course examines how science is portrayed across media—including newspapers, magazines, television, and film—and explores ways to enhance communication between science and the public. Special focus is placed on socially responsible communication of scientific risks, particularly in light of rising public concerns about science and technology in the 20th and 21st centuries.

CMST404 – History of Science and Technology in East Asia ····· (3-0-3)

Focusing on China, Korea, and Japan, this course examines the development and features of East Asian science and technology—including astronomy, calendar systems, mathematics, traditional medicine, geomancy, alchemy, gunpowder, the compass, and printing. It also considers their relevance today and introduces diverse historical perspectives on nature and knowledge.

CMST405 – Art and Science ····· (3-0-3)

This course explores the intersection of science and art. Lectures are delivered by art historians, artists, historians of science, and scientists, covering a wide range of topics that illuminate how artistic and scientific practices intersect and inform one another.

CMST406 – Philosophy of Spacetime and Matter ····· (3-0-3)

This course examines how fundamental concepts necessary for understanding nature—such as time, space, motion, matter, fields, and change—have been interpreted and explored historically, and how they are formalized and applied in modern scientific theories. It also addresses unresolved conceptual issues and paradoxes in contemporary science, encouraging students to reflect on creative approaches to foundational inquiry.

CMST408 – Body and Technology ····· (3-0-3)

This course explores how advances in genetics and biotechnology have reshaped the meanings of the body and technology, and how technological interventions—such as plastic surgery and gene therapy—transform the social significance of the human body. The course also examines the use of technology as an extension of the body, and discusses how digital technologies impact the human body, in relation to broader technological developments.

CMST409 – Evolution and Human Society ····· (3-0-3)

This course introduces evolutionary social science, an interdisciplinary field that analyzes human nature and social phenomena through the lens of evolutionary theory. Drawing on recent findings from evolutionary theory, paleoanthropology, human genetics, archaeology, neuroscience, and related disciplines, students examine the evolutionary foundations of human nature and social diversity. The course investigates the evolutionary processes that shaped the human body, brain, and mind; the universal traits of the human species; and the influence of cultural evolution on modern life and sociocultural systems.

CMST410 – Risk Society and Communications ····· (3-0-3)

This course investigates the defining characteristics of today's "risk society" and examines how phenomena such as terrorism, disease, environmental pollution, and disasters are deeply intertwined with communication. Students explore the increasingly complex relationship between risk and communication shaped by technologies like social media, mobile platforms, AI, and the Internet of Things. The course introduces theoretical frameworks and communication models to analyze how risks are constructed, perceived, and managed; how information is processed during crises; how risks intensify social inequality; and what factors influence public responses. Students also develop practical skills to effectively communicate risks to both the public and the media.

CMST411 – Artificial Intelligence and Law ····· (3-0-3)

Amid the Fourth Industrial Revolution, this course emphasizes the basic legal literacy required of science and technology professionals. It explores key legal issues surrounding artificial intelligence technologies that support today's intelligent information society. Through the study of relevant legal theory, case practice, and policy, students gain a foundational understanding of AI law and develop the reasoning and problem-solving skills needed to address real-world legal challenges in this evolving field.

CMST412 – Modern Society and Science ····· (3-0-3)

By examining how science has evolved in modern society within its historical context, this course invites students to better understand the nature of contemporary science and its embeddedness in broader social structures.

CMST499 – Special Topics in Science and Technology Studies ····· (3-0-3)

This course is offered in a special topics format to explore current issues in science and technology studies, including bioethics, gender and science, and key themes in the history of science.

·Humanities and Social Sciences Electives·

GEDU182 – Presentation and Debate ····· (3-0-3)

In response to the growing importance of communication skills in today's society, this course aims to enhance students' abilities in public speaking, discussion, and debate. Through repeated practice and feedback involving video/audio recordings, students will develop effective communication strategies as well as critical and logical thinking skills for analyzing and structuring discussions.

GEDU184 – Critical Essay Writing ····· (3-0-3)

This course gives students an opportunity to explore the nature of human beings and society as well as

common societal issues through various forms of writing, including essays, columns, and book reviews. By refining and organizing their thoughts, students develop persuasive writing skills. Through peer review and discussion, they cultivate the qualities of a reflective and socially responsible intellectual and professional.

GEDU185 – Reading Discussion ····· (3-0-3)

This course aims to cultivate the intellectual literacy and communication skills essential for students in science and engineering. It guides them through effective approaches to reading and discussion, covering major texts in the humanities, social sciences, and natural sciences. Students develop competencies in reading comprehension, summary writing, presentation, discussion, and collaboration.

·Free Electives·

GEDU181 – Ethics of Research ····· (3-0-2)

This course explores ethical dilemmas in research, such as compromises to academic integrity driven by funding competition, and the disregard for human and environmental consequences under corporate pressure or the allure of technological potential.

GEDU186 – Artistic Promenade ····· (3-0-2)

Developed as part of an academic exchange with the Korea National University of Arts (KNUA), this course offers an overview of the history and contemporary landscape of various artistic and cultural fields. Faculty from KNUA—including leading scholars and practitioners in music, drama, film, TV and multimedia, dance, visual arts, and Korean traditional arts—deliver weekly lectures on different topics. Students gain both theoretical knowledge and firsthand insight into the lives and creative experiences of the invited artists, offering an enriched learning experience beyond textbooks.

GEDU187 – Understanding the Arts ····· (3-0-2)

This course serves as a continuation of "Artistic Promenade", an introductory course developed through academic exchange with the Korea National University of Arts. It aims to provide students with a broad understanding of the history, present, and future of various fields within culture and the arts, while also offering opportunities for hands-on practice and creative work across different disciplines. Covering both theoretical foundations and practical techniques in various arts, the course enables students to approach each genre and topic through both conceptual and practice-oriented perspectives. Featuring a distinguished faculty composed of leading scholars and professionals in each respective field, the course is designed to deliver vivid and practical knowledge and real-world insight.

Department of Mathematics

1. Educational Goals

Mathematics, with its long-standing history and tradition, is a foundational discipline in the natural sciences that combines both theoretical elegance and practical utility. It not only represents the culmination of intellectual inquiry at the pinnacle of human logical reasoning, but also serves as the language of science. Its usefulness has been demonstrated not only in the natural sciences and engineering—where it has traditionally played a central role—but also in the analysis of social and economic phenomena, extending its reach into virtually all academic disciplines.

The Department of Mathematics offers a curriculum that spans both the classical fields of mathematics—algebra, analysis, and geometry—and modern areas such as applied and computational mathematics, which have developed alongside advances in science and engineering. Our program is designed to cultivate flexible thinking and a solid mathematical foundation, preparing students for theoretical exploration in the mathematical sciences as well as for contributions to scientific and technological innovation and to society at large.

2. Curriculum Overview

Rooted in thousands of years of accumulated knowledge and continuing to evolve at a remarkable pace, mathematics serves as both the conceptual framework and the language of science—the roots and trunk that support its growth. Its fundamental principles are not only central to the study of complex phenomena in the natural sciences but are also broadly applicable across the social sciences, humanities, engineering, politics, economics, and environmental studies. These principles are most effectively discovered, analyzed, and explained through abstraction and mathematical formalization. Exploring and establishing such principles and methodologies is a vital part of the discipline itself.

Pure mathematics seeks to uncover and understand traditional mathematical principles, and its extensive depth and scope have long been recognized. At the same time, newer fields have seen rapid development in recent decades. Notable examples include applied mathematics, which connects theoretical foundations to real-world applications in science and engineering, and computational mathematics, which is closely linked to the development of computing and information science.

In response to this evolving landscape, the Department of Mathematics aims to nurture highly capable professionals equipped with both theoretical insight and practical skills, so that they can make meaningful contributions to cutting-edge scientific progress and to the broader needs of society. Our undergraduate curriculum ensures a balanced foundation across key areas of pure mathematics (algebra, analysis, geometry, topology), applied mathematics (nonlinear analysis, applied statistics, fluid dynamics), and computational mathematics (numerical analysis, combinatorics, coding theory, cryptography). In addition, it is designed to prepare students for more advanced and specialized research at the graduate level and beyond.

Revised for students entering since 2018, our curriculum encourages students to move beyond passive,

uniform learning and instead take the initiative in shaping their own academic plans according to their interests, aptitude, and academic progress. Our goal is to cultivate creative, independent mathematicians through a flexible yet rigorous educational environment. To support this approach, each student is assigned a faculty advisor to assist with course selection and long-term academic planning.

The core of our mathematics major consists of one MR(Major Requirements) course and a set of eight DME (Designated Major Elective) courses. From these eight electives, students must complete four courses: two from MATH200, MATH210, MATH230, and MATH261, and two from MATH301, MATH311, MATH321, and MATH351. (Students are encouraged to take the remaining courses from this group as ME to deepen and broaden their mathematical perspective.)

Restrictions on the selection of ME courses have been minimized, allowing students the freedom to choose courses based on their academic goals and interests.

To graduate from the Department of Mathematics, students must complete a minimum of 125 credits, which include:
– 12 credits in GER (General Education Requirements)
– 18 credits in HSSE (Humanities and Social Sciences Electives)
– 26 credits in BER (Basic Education Requirements)
– 5 credits in BEE (Basic Education Electives)
– 15 credits in MR (Major Requirements)
– 33 credits in ME (Major Electives) (including at least 18 credits in mathematics-designated courses)
– 16 credits in FE (Free Electives)

To encourage academic exploration beyond the standard course offerings, students may enroll in Independent Mathematics Study, which allows for self-directed research under faculty supervision, conducted individually or in small groups.

▶ Graduation Thesis/Graduation Qualification Exam

To obtain a bachelor's degree in Mathematics, students must complete either a graduation thesis or a graduation qualification exam.

A. Graduation Thesis
Students who opt to write a thesis must submit an application form and work under the supervision of a faculty advisor. The completed thesis is subject to review and approval by a departmental evaluation committee before final submission.

B. Graduation Qualification Exam in Mathematics
The graduation qualification exam, administered once each semester, evaluates whether students have attained a comprehensive understanding of the core knowledge covered in required courses, including those in BER and MR. Students who wish to take the exam must submit an application at the beginning of the semester.

▶ Guidelines for Double Major and Minor in Mathematics

A. A student pursuing a double major in Mathematics should:

-Complete at least 35 credits, including 3 credits in a MR, 12 credits in DME, and 12 credits in ME offered by the Department of Mathematics.
-Fulfill the graduation requirement by either submitting a bachelor's thesis or, at the student's request, taking the graduation qualification exam.

B. A student minoring in Mathematics should:

-Complete at least 21 credits, including 3 credits in a MR, 12 credits in DME, and 6 credits in ME.
-Not double-count credits earned from MR or ME courses in the student's primary major toward the mathematics minor.

C. *Probability and Statistics*, *Statistics for Experimental Research*, and *Basic Engineering Statistics* are considered equivalent courses. However, Statistics for *Experimental Research* and *Basic Engineering Statistics* are not accepted as DME for either the Mathematics major or minor.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life Ⅰ (0.5) and Ⅱ (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus Ⅰ (3) and Ⅱ (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab Ⅰ (1)	7	
	General Chemistry Ⅰ (3), General Chemistry Lab Ⅰ (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry Ⅱ (3), General Chemistry Lab Ⅱ (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Complete Applied Linear Algebra (3 credits) and at least 12 credits in DME.	**15**	Refer to the Summary of Curriculum Requirements for each department.
ME	All DME and STC courses offered by the university are recognized. Complete at least 18 credits in major courses offered by the Department of Mathematics. Advanced AI courses offered by other departments are also recognized.	**33**	

FE		16	
Subtotal		125	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Credit Recognition Guidelines for Graduate-level Courses

Type				Category	Maximum Credits Recognized	Applicable to	Reference
Math Department	Graduate School	Major Course	500-level Courses	ME	No limits	Effective for all academic years	See *학사운영지침 (III.교과과정 운영, 마. 전공선택, 바. 자유선택) *POSTECH Academic Guidelines, Section III-Curriculum Management, E. ME and F. FE
			600-level Courses				
			700-level Courses				
			800-level Courses				
		Research Course	Thesis Research	N/A	-	-	
			Seminar	N/A	-	-	
Other Department	Graduate School	Major Course	500-level Courses	FE (Counts as a ME if the course is included in your department's list of "Approved ME Courses Offered by Other Departments".)	No limits	Effective for all academic years	
			600-level Courses				
			700-level Courses				
			800-level Courses				
		Research Course	Thesis Research	N/A	-	-	
			Seminar	N/A	-	-	

5. Credits for Field Training Courses

Course Code	Course Title	Credits	Category	Note
INTN300	Internship Program	1~12	FE	- 1 credit is awarded for every 4 weeks of fieldwork. - Up to 4 credits may be counted toward graduation requirements. - Each department determines the credit category (FE, ME, etc.). ※ INTN300 and ENTP493C: A combined total of up to 4 credits will be recognized toward graduation.
ENTP493C	Special Topics in Entrepreneurship: CUop Internship	1~3	FE	
INTN301	Tech+ Innovation	1~12	FE	- 1 credit is awarded for every 120 hours of activity per semester. - Up to 4 credits may be counted toward graduation requirements. ※ INTN301 and INTN302: A combined total of up to 4 credits will be recognized toward graduation.
INTN302	Tech+ Star	1~12	FE	

※ No more than 9 credits in Field Training courses may be recognized toward graduation.

6. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Recommended Prerequisite
MR	MATH203	Applied Linear Algebra	3-1-3	
DME	MATH200	Differential Equations	3-1-3	Choose two out of the four courses
	MATH210	Applied Complex Variables	3-1-3	
	MATH230	Probability and Statistics	3-1-3	
	MATH261	Discrete Mathematics	3-1-3	
	MATH301	Modern Algebra Ⅰ	3-1-3	Choose two out of the four courses
	MATH311	Analysis Ⅰ	3-1-3	
	MATH321	General Topology	3-0-3	
	MATH351	Introduction to Numerical Analysis	3-0-3	
ME	MATH201	Primer of Mathematics	2-0-2	
	MATH202	Set Theory	3-0-3	
	MATH231	Statistics for Experimental Research	3-1-3	* Available for students from other departments
	MATH302	Modern Algebra Ⅱ	3-0-3	Modern Algebra Ⅰ
	MATH304	Introduction to Number Theory	3-0-3	
	MATH312	Analysis Ⅱ	3-0-3	Analysis Ⅰ
	MATH313	Introduction to Partial Differential Equations	3-0-3	Analysis Ⅰ
	MATH333	Computational Statistics	3-1-3	
	MATH342	Engineering Mathematics	3-1-3	
	MATH360	Principles of Software Construction	3-0-3	
	MATH400	Linear Algebra	3-0-3	Modern Algebra Ⅰ
	MATH401	Algebraic Curves	3-0-3	Modern Algebra Ⅱ
	MATH402	Computational Linear Algebra and Its Applications	3-0-3	
	MATH403	Introduction to Group Representations	3-0-3	Applied Linear Algebra, Modern Algebra Ⅰ
	MATH410	Theory of Analytic Functions	3-0-3	Applied Complex Variables
	MATH412	Theory of Ordinary Differential Equations	3-0-3	Analysis Ⅰ
	MATH415	Fourier Series	3-0-3	Analysis Ⅰ
	MATH422	Introduction to Geometric Topology	3-0-3	General Topology
	MATH426	Introduction to Differential Geometry	3-1-3	
	MATH428	Modern Geometry	3-0-3	Applied Linear Algebra Modern Algebra General Topology
	MATH430	Introduction to Mathematical Statistics	3-0-3	Probability and Statistics
	MATH431	Introduction to Probability Theory	3-0-3	Probability and Statistics
	MATH432	Mathematical Data Science	3-0-3	
	MATH434	Introduction to Actuarial Mathematics	3-0-3	Probability and Statistics
	MATH442	Mathematics for AI	3-0-3	Calculus Ⅰ and Ⅱ
	MATH443	Mathematical Modeling	3-0-3	Probability and Statistics
	MATH445	Mathematical Continuum Mechanics	3-0-3	
	MATH446	Large scale Fluid Dynamics	3-0-3	
	MATH447	Tensor Analysis	3-0-3	
	MATH448	Introduction to Coding Theory	3-0-3	
	MATH449	Introduction to Cryptography	3-0-3	

Category	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Recommended Prerequisite
	MATH451	Applied Numerical Analysis	3-0-3	Introduction to Numerical Analysis
	MATH461	Introductory Combinatorics	3-0-3	
	MATH464	Graph Theory with Applications	3-0-3	Discrete Mathematics
	MATH472	Introduction to Financial Engineering	3-0-3	
	MATH484	Logic and Foundation	3-0-3	
	MATH409-489	Topics	1-0-1, 2-0-2, 3-0-3	
	MATH490A-Z	Seminar A-Z	1-0-1	
	ATH491A-Z	Independent Study A-Z	1-3-3	

7. Major Course List by Year and Semester (1/2)

MR (Major Requirements)
DME (Designated Major Electives)
ME (Major Electives)

구 분		Year 2		Year 3		Year 4	
		1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester
Spring -entry students	MR	**MATH203** Applied Linear Algebra					
	DME	**MATH200** Differential Equations **MATH230** Probability and Statistics	**MATH210** Applied Complex Variables **MATH261** Discrete Mathematics **MATH301** Modern Algebra Ⅰ	**MATH311** Analysis Ⅰ **MATH351** Introduction to Numerical Analysis	**MATH321** General Topology		
	ME			**MATH302** Modern Algebra Ⅱ **MATH304** Introduction to Number Theory **MATH313** Introduction to Partial Differential Equations	**MATH312** Analysis Ⅱ	**MATH403** Introduction to Group Representations **MATH415** Fourier Series **MATH422** Introduction to Geometric Topology **MATH431** Introduction to Probability Theory **MATH443** Mathematical Modeling	**MATH400** Linear Algebra **MATH401** Algebraic Curves **MATH402** Computational Linear Algebra and Its Applications **MATH410** Theory of Analytic Functions **MATH412** Theory of Ordinary Differential Equations **MATH426** Introduction to Differential Geometry **MATH428** Modern Geometry **MATH432** Mathematical Data Science **MATH442** Mathematics for AI **MATH451** Applied Numerical Analysis **MATH461** Introductory Combinatorics

7. Major Course List by Year and Semester (2/2)

MR (Major Requirements)
DME (Designated Major Electives)
ME (Major Electives)

구 분		Year 2		Year 3		Year 4	
		1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester
Fall -entry students	MR	**MATH203** Applied Linear Algebra					
	DME	**MATH210** Applied Complex Variables **MATH261** Discrete Mathematics	**MATH200** Differential Equations **MATH230** Probability and Statistics **MATH311** Analysis Ⅰ	**MATH301** Modern Algebra Ⅰ **MATH321** General Topology	**MATH351** Introduction to Numerical Analysis		
	ME			**MATH312** AnalysisⅡ	**MATH302** Modern Algebra Ⅱ **MATH304** Introduction to Number Theory **MATH313** Introduction to Partial Differential Equations	**MATH400** Linear Algebra **MATH401** Algebraic Curves **MATH402** Computational Linear Algebra and Its Applications **MATH410** Theory of Analytic Functions **MATH412** Theory of Ordinary Differential Equations **MATH426** Introduction to Differential Geometry **MATH428** Modern Geometry **MATH432** Mathematical Data Science **MATH442** Mathematics for AI **MATH451** Applied Numerical Analysis **MATH461** Introductory Combinatorics	**MATH403** Introduction to Group Representations **MATH415** Fourier Series **MATH422** Introduction to Geometric Topology **MATH431** Introduction to Probability Theory **MATH443** Mathematical Modeling

8. Course Description

MATH100 - Introduction to Mathematics ····· **(1-0-1)**

This course introduces students to the nature of mathematics as a discipline and its applications across various scientific and industrial fields in the 21st century. The course provides an overview of the Department's curriculum and student involvement opportunities—helping students envision possible academic and career paths in mathematics.

MATH101 - Calculus Ⅰ ····· **(3-1-3)**

Differentiation and integration of single-variable functions; limits and continuity; convergence of sequences and series; first-order differential equations; dot and cross products of spatial vectors.

MATH102 - CalculusⅡ ····· **(3-1-3)**

Differentiation and integration of multivariable functions; line and surface integrals; Green's theorem; Stokes' theorem.

MATH103 - Calculus ····· **(4-1-4)**

Series and convergence tests; Taylor's theorem; partial differentiation; multiple integrals; Green's theorem; Stokes' theorem.

MATH199 - Freshman Research Participation ····· **(0-2-1)**

This course provides first-year students with an introduction to mathematical research under faculty supervision. It emphasizes student-led inquiry and includes seminar-style presentations of research outcomes.

MATH200 – Differential Equations ····· **(3-1-3)**

Higher-order ordinary differential equation (ODE); series solutions; Laplace transform; convolution; systems of ODE.

MATH201 – Primer of Mathematics ····· **(2-0-2)**

This course provides an overview of undergraduate and advanced-level mathematical research, including major global research areas and achievements in mathematics.

MATH202 – Set Theory ····· **(3-0-3)**

It is a foundational course in abstract set theory, covering the structure and properties of infinite sets and compact sets in metric spaces. Topics include: countable and uncountable sets; well-ordered sets; the Axiom of Choice; cardinal and ordinal numbers; metric spaces; and compact sets.

MATH203 – Applied Linear Algebra ····· **(3-1-3)**

Systems of linear equations; matrices and Gaussian elimination; matrix inverses; Gram-Schmidt orthogonalization; vertical orthogonal projections; least squares method; eigenvalues and eigenvectors; diagonalization; signature matrices.

MATH210 – Applied Complex Variables ····· **(3-1-3)**

Analytic functions; Cauchy-Riemann equations; complex integration; Taylor and Laurent series; residues and poles; Cauchy's theorem; conformal mappings.

MATH230 – Probability and Statistics ····· **(3-1-3)**

This course covers basic concepts of probability, expected value, probability distributions, parameter estimation, hypothesis testing, correlation, and analysis of variance. Designed for science and engineering students, the course emphasizes practical examples with minimal theoretical detail.

MATH231 – Statistics for Experimental Research (for Non-Major Students) ····· **(3-1-3)**

Equivalent to MATH230, this course focuses on statistical fundamentals and applications tailored for students engaged in experimental research.

MATH261 – Discrete Mathematics ····· **(3-1-3)**

Sets and relations; algorithm analysis; recurrence relations; graph theory; Boolean algebra; logic circuits; languages and grammars; design and implementation of finite-state machines (FSMs); Turing machines.

MATH301, 302 – Modern Algebra Ⅰ and Ⅱ ····· **(3-1-3, 3-0-3)**

Group theory; ring theory; ideals and maximal ideals; polynomial rings; the Fundamental Theorem of Finitely Generated Abelian Groups; field theory; Galois theory.

MATH304 – Introduction to Number Theory ····· **(3-0-3)**

Divisibility; primes and their distribution; congruences and residues; reduced residue systems; primitive roots; quadratic residues; continued fractions.

MATH311, 312 – Analysis Ⅰ and Ⅱ ····· **(3-1-3, 3-0-3)**

Real and complex number systems; set theory; metric spaces; sequences and series; Riemann–Stieltjes integrals; multivariable calculus; uniform convergence; uniform continuity; power series; Fourier series; inverse and implicit function theorems; Lebesgue measure.

MATH313 – Introduction to Partial Differential Equations ····· **(3-0-3)**

Recommended Prerequisite: MATH311

Parabolic; hyperbolic; and elliptic partial differential equations (PDE); Dirichlet and Neumann boundary value problems; existence and uniqueness theorems; maximum principles; potential theory; separation of variables; Fourier series solutions; Hilbert spaces.

MATH321 – General Topology ····· **(3-0-3)**

Set theory and logic; general topological spaces; continuous functions; metric spaces; connectedness; compactness; separation and countability axioms; Urysohn's lemma; Tychonoff's theorem.

MATH333 – Computational Statistics ····· **(3-1-3)**

Statistical inference and data processing using software packages; high-dimensional data visualization; bootstrap techniques; Markov Chain Monte Carlo (MCMC) methods.

MATH342 – Engineering Mathematics ····· **(3-1-3)**

Introductory PDEs for engineering and physics; vector calculus; separation of variables; Fourier series and integrals; overview of numerical methods; tensor methods in fluid dynamics and electromagnetism; applications of complex variables in engineering.

MATH351 – Introduction to Numerical Analysis ····· **(3-0-3)**

Recommended Prerequisite: MATH203

Numerical methods for solving linear and nonlinear equations; interpolation and polynomial approximation; numerical differentiation and integration; initial value problems for ODEs; stability analysis.

MATH360 – Principles of Software Construction ····· **(3-0-3)**

Refer to CSED232 for equivalent content.

MATH400 – Linear Algebra ····· **(3-0-3)**

Recommended Prerequisite: MATH301

Rings and modules; finitely generated abelian groups and their decomposition; linear transformations and matrices; Jordan canonical form; characteristic polynomials.

MATH401 – Algebraic Curves ····· **(3-0-3)**

Recommended Prerequisite: MATH302

Affine spaces and algebraic sets; Hilbert's Nullstellensatz; affine and projective algebraic varieties; Riemann –Roch theorem.

MATH402 – Computational Linear Algebra and Its Applications ····· **(3-0-3)**

This course focuses on matrix computation algorithms and their underlying principles. It emphasizes the importance of high-performance computing, which is essential for applications such as machine learning, and introduces algorithms and techniques for efficient implementation. The course also presents a variety of applied problems to highlight the central role of matrix computations.

MATH403 – Introduction to Group Representations ····· **(3-0-3)**

Prerequisites recommended: MATH203, MATH301

Group representations; group characters and their properties; character tables; induced representations; Mackey's Theorem; transitive groups; induced characters of symmetric groups; applications including Burnside's Theorem.

MATH410 – Theory of Analytic Functions ····· **(3-0-3)**

Recommended Prerequisite: MATH210

Schwarz Lemma; conformal mapping; Rouché's theorem; Hurwitz's theorem; the topological properties of H(G); harmonic functions related to the Poisson Integral Formula.

MATH412 – Theory of Ordinary Differential Equations ····· **(3-0-3)**

Recommended Prerequisite: MATH311

Power series solutions; Bessel functions; planar dynamical systemsl the Poincaré-Bendixson theorem; Lyapunov methods; existence and uniqueness theorems; approximate solutions; Sturm-Liouville systems; eigenfunction expansions.

MATH415 – Fourier Series ····· **(3-0-3)**

Recommended Prerequisite: MATH311

This course covers the origin, fundamental properties, convergence, and applications of Fourier series. It also explores the basic properties and various applications of the Fourier transform in real space, followed

by an introduction to the Fourier transform in n-dimensional Euclidean space R^n.

MATH422 – Introduction to Geometric Topology ····· (3-0-3)

Recommended Prerequisite: MATH321

Triangulation; classification of surfaces; maps and graphs; and fundamental groups.

MATH426 – Introduction to Differential Geometry ····· (3-1-3)

Differential forms; Frenet formulas; covariant vectors; connection forms; structure equations; second fundamental form; curvature; geodesics; parallel transport of vector fields; Gauss-Bonnet theorem.

MATH428 – Modern Geometry ····· (3-0-3)

Recommended Prerequisite: MATH203, MATH301, MATH321

Euclidean geometry; groups of isometries; regular polyhedra; projective geometry; projective groups; hyperbolic geometry; the Poincaré model; local metrics.

MATH430 – Introduction to Mathematical Statistics ····· (3-0-3)

Recommended Prerequisite: MATH230

Order statistics; maximum likelihood estimators; Pitman estimators; sufficient statistics; confidence intervals; Cramér-Rao bound; Fisher information matrix; variance bounds of estimators.

MATH431 – Introduction to Probability Theory ····· (3-0-3)

Recommended Prerequisite: MATH230

Random variables; distribution functions; moment generating functions; properties of random variables; limit theorems; conditional expectation; combinatorial identities.

MATH432 – Mathematical Data Science ····· (3-0-3)

An introduction to understanding data from a mathematical perspective; helping students interpret data and machine learning/artificial intelligence using mathematical language.

MATH434 – Introduction to Actuarial Mathematics ····· (3-0-3)

Recommended Prerequisite: MATH230

This course covers the fundamental theories of insurance and the application of basic probability and statistical theories to analyze risk factors relevant to insurance design and evaluation. Students learn about regression analysis; the construction and interpretation of life tables; time series analysis of value fluctuations; and risk diversification based on probabilistic models.

(Topics include: Actuarial models; stochastic modeling principles; premium rates and losses; life table analysis; regression models; time series analysis; and simulation)

MATH442 – Mathematics for Artificial Intelligence ····· (3-0-3)

Recommended Prerequisite: MATH101, MATH102

This course first covers the fundamental mathematics underlying data science, then explores basic machine learning algorithms and their applications.

MATH443 – Mathematical Modeling ····· (3-0-3)

Recommended Prerequisite: MATH230

This course covers the transformation of real-world phenomena into mathematical models and the use of mathematical reasoning to solve them, with examples drawn from population dynamics and epidemic models.

MATH445 – Mathematical Continuum Mechanics ····· (3-0-3)

Elasticity; fluid dynamics; Cauchy stress tensor; pressure momentum; force; turbulence; hyperelasticity; Eulerian and Lagrangian coordinates; and vorticity.

MATH446 – Large scale Fluid Dynamics ····· (3-0-3)

This course explores the fundamental assumptions and principles behind the governing equations of global-scale fluid motion (oceans and atmosphere); uses mathematical solutions to understand the mechanisms of global circulation.

MATH447 – Tensor Analysis ····· (3-0-3)

Coordinate transformations; contravariant and covariant tensors; metric tensor; Ricci tensor; applications in geometry and geodesics; fundamental forms; applications to analytical mechanics; Newtonian laws; and continuum mechanics.

MATH448 – Introduction to Coding Theory ····· (3-0-3)

This course examines error-correcting codes from a mathematical perspective, providing foundational background knowledge necessary for understanding coding theory.
(Topics include: introductory concepts; linear codes; Hamming and Golay codes; finite fields; cyclic codes; BCH codes; weight distributions; the MacWilliams equation; design theory; the Assmus-Mattson theorem; and some unique codes.)

MATH449 – Introduction to Cryptography ····· (3-0-3)

This course introduces cryptography from a mathematical standpoint, covering its core theoretical foundations.
(Topics include: classical cryptosystems; basic number theory; data encryption standard (DES); RSA algorithm; discrete logarithms and the ElGamal system; digital signatures; secret sharing schemes; introductory elliptic curve cryptosystems.)

MATH451 – Applied Numerical Analysis ····· (3-0-3)

Recommended Prerequisite: MATH351

Numerical solutions to polynomial equations; Newton's method; orthogonal polynomials and least squares; indirect methods for systems of equations; eigenvalues and eigenvectors; boundary value problems in ODEs; numerical solutions to PDEs.

MATH461 – Introductory Combinatorics ····· (3-0-3)

Generating functions; recurrence relations; Polya enumeration; covering circuits; colorings.

MATH464 – Graph Theory with Applications ····· (3-0-3)

Recommended Prerequisite: MATH261

Graphs and trees; cycles; Euler tours; Hamiltonian cycles; Ramsey; Turán; Schur; Kuratowski's theorems; networks.

MATH472 – Introduction to Financial Engineering ····· **(3-0-3)**

See IMEN387.

MATH484 – Logic and Foundation ····· **(3-0-3)**

Boolean algebra; first-order logic; inductive functions; Zermelo-Fraenkel set theory; ordinals and ordering; axiom of choice; incompleteness theorems.

MATH409 - 489 Special Lectures in Mathematics Ⅰ, Ⅱ, and Ⅲ ····· **(1-0-1, 2-0-2, 3-0-3)**

MATH490 – Seminar A-Z ····· **(1-0-1)**

Students select a topic under faculty supervision, and conduct research and presentations to deepen their understanding of mathematical concepts covered in regular courses. May be taken multiple times.

MATH491 – Independent Study A-Z ····· **(1-3-3)**

Students undertake research on a chosen topic in Mathematics through both lectures and experimental work in coordination with the instructor. May be taken multiple times.

Department of Physics

1. Educational Goals

Physics is a fundamental science that seeks to understand, explain, and predict natural phenomena based on the most essential principles. Modern physics has been widely applied in adjacent fields of science and engineering, and its academic achievements have significantly contributed not only to the advancement of cutting-edge technologies but also to our understanding of the origins of the universe and life itself.

The POSTECH Department of Physics aims to cultivate creative, enterprising, and globally minded leaders in science and technology. To this end, it offers a curriculum that teaches the core concepts and methodologies of both theoretical and experimental physics, thereby nurturing future generations of innovative thinkers capable of pioneering new paradigms in science.

2. Curriculum Overview

Methodologically, traditional physics is broadly divided into two main streams: theoretical physics, which seeks unified laws to mathematically describe phenomena; and experimental physics, which verifies theories and discovers new phenomena through experimentation. These two branches are complementary and closely interconnected, enabling a more complete understanding of physical phenomena.

Physics encompasses a vast range of subfields, including condensed matter physics, fluid and plasma physics, atomic and molecular physics, optics, nuclear and particle physics, biophysics, complex systems, and Computational Physics. It also provides foundational support for neighboring scientific disciplines such as materials science, astronomy, geoscience, chemistry, and biology—through subfields like materials physics, astrophysics, geophysics, chemical physics, and biophysics.

Beyond the natural sciences, the methodologies of physics have increasingly been adopted in fields such as econometrics and financial engineering, further expanding its utility. In the knowledge-driven society of the future, there will be growing demand not simply for individuals with vast knowledge, but for those who can apply core methodologies to lead innovation. Graduates of the Department are therefore expected to play pivotal roles not only in traditional areas of physics, but also in interdisciplinary and emerging fields.

The Department has designed its undergraduate curriculum to move beyond the conventional focus on preparing students solely for graduate studies in physics. It equips both future physicists and students planning to enter other disciplines with a solid foundation in the methods of physics. To this end, the curriculum is organized into modules, allowing students—whether they plan to major in Physics or pursue other academic or professional goals—to select courses that match their needs.

Core subjects such as General Physics, Mechanics, Electromagnetism, Quantum Mechanics, and Statistical

Physics are systematically integrated across the undergraduate and graduate levels. This approach reduces redundancy while broadening the range of topics available. Exceptional undergraduates are also encouraged to take graduate-level courses in advance, enabling them to begin research early when they enter graduate school.

In their first year, students learn the fundamental principles and concepts of physics through General Physics: Mechanics & Waves and General Physics: Electromagnetism & Optics, or the honors versions (General Physics(H): Mechanics & Waves and General Physics(H): Electromagnetism & Optics). They also acquire foundational experimental skills through General Physics LabⅠ and General Physics LabⅡ: Design and Construction. In the second and third years, students take theoretical courses such as Mechanics, Electromagnetism I and II, Quantum Physics I and II, and Thermal Physics, alongside experimental courses such as Physics Lab-Capstone Design I and II, Physics Lab III, and Physics Lab III (Honors). A wide range of ME courses is also available to support students pursuing graduate studies or exploring other career paths.

To expose undergraduates to current research trends and provide them with hands-on experience under faculty supervision, the curriculum includes courses such as Trends in Physics Research, Physics Research I and II, and Physics Seminar, where students present their work through seminars and written reports. The Physics Fabrication Lab helps students build foundational experimental research skills through hands-on training in mechanical fabrication. The curriculum also includes Mathematical Physics, which focuses on the mathematical methods traditionally used in the field. For students preparing for graduate study, Intermediate Mathematical Methods for Physics is available to introduce more advanced mathematical concepts. In addition, Computational Physics is offered to teach techniques for analyzing physical phenomena and conducting computer simulations.

A key feature of this curriculum is its departure from theory-centered, one-way instruction. Instead, it emphasizes a balanced integration of theoretical and experimental education, while also providing opportunities for discussion and presentation. This approach helps students develop creative problem-solving abilities and strong communication skills.

Because physics serves as the foundation for other natural sciences and engineering disciplines, this program is also designed to prepare graduates for success in graduate studies or professional fields beyond physics. Even in these other areas, students are equipped with a solid academic foundation and the capacity to think critically and creatively, thanks to the rigorous and versatile training provided by the program.

▶ Undergraduate Thesis

-Students majoring in Physics who are expected to graduate must submit a bachelor's thesis.
-The thesis may follow one of the following formats: *New Physics (Saemulli), JKPS (Journal of the Korean Physical Society), PRL (Physical Review Letters)*, or the university's graduate thesis format.
-Timeline for submission and evaluation:
Students must have their thesis draft reviewed by their research advisor by November 30th (or May 30th for summer graduates). The final revised thesis, approved by the advisor, must then be submitted to

the Department office by December 31st (or June 30th for summer graduates).

▶ Guidelines for Double Major and Minor

For a double major in Physics, students must complete all MR offered by the Department, plus at least 11 credits in ME courses offered by the Department (including Introduction to Quantum Physics and Introduction to the Theory of Relativity, if desired), for a total of at least 38 credits. The undergraduate thesis requirement is waived.

For a minor in Physics, students must complete at least 21 credits, as follows:
-9 credits in MR: Mechanics, Electromagnetism I, and Quantum Physics I
-3 credits in ME: Choose one from Electromagnetism II, Quantum Physics II, or Thermal Physics
-9 additional credits: Choose from among MR or ME courses offered by the Department

Students from other departments who wish to enroll in a course offered by the Department of Physics with recommended prerequisites must consult the instructor in advance.

The courses Introduction to Modern Physics and Trends in Physics Research are graded on a Satisfactory/Unsatisfactory (S/U) basis.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR		27	
ME	At least 9 credits in ME offered by the Department (Except for Introduction to Quantum Physics and Introduction to the Theory of Relativity)	27	All STC courses offered by other departments are accepted. All MR from other departments are accepted.
FE		15	

Subtotal	130	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite	Note
MR	PHYS203	Mechanics	3-1-3		STC
	PHYS206	Electromagnetism Ⅰ	3-1-3		
	PHYS250	Physics Laboratory-Capstone Design Ⅰ	0-6-3		
	PHYS351	Physics Laboratory-Capstone Design Ⅱ	0-6-3		
	PHYS301	Quantum Physics Ⅰ	3-1-3		
	PHYS302	Quantum Physics Ⅱ	3-1-3	Quantum Physics Ⅰ	
	PHYS304	Thermal Physics	3-1-3		
	PHYS307	Electromagnetism Ⅱ	3-1-3	Electromagnetism Ⅰ	
DME	PHYS352	Physics Lab Ⅲ	0-6-3		Required to complete one of the two courses
	PHYS353	Physics Lab Ⅲ (Honors)	0-6-3		
ME	PHYS109	Introduction to Modern Physics	1-0-1		
	PHYS200A～Z	Special Topics in Basic Physics	Varied Credits		Up to 3 credits
	PHYS201	Introduction to Quantum Physics	3-1-3		STC
	PHYS202	Introduction to the Theory of Relativity	3-1-3		STC
	PHYS209	Mathematical Methods for Physics	3-1-3		
	PHYS312	Computational Physics	2-2-3	Mechanics	
	PHYS315	Introduction to Astrophysics	3-0-3		
	PHYS360	Pioneers in Physics	3-0-3		
	PHYS399A-D	Research Participation A-D	0-3-1		
	PHYS401	Solid State Physics	3-0-3	Quantum Physics Ⅰ, Thermal Physics	
	PHYS403	Nuclear and Elementary Particle Physics	3-0-3	Quantum Physics Ⅰ and Ⅱ	
	PHYS406	Plasma Physics	3-0-3	Mechanics, Electromagnetism Ⅰ	
	PHYS407	Introduction to Accelerator Physics	3-0-3		
	PHYS408	Intermediate Mathematical Methods for Physics	3-1-3		
	PHYS410	Optical Physics	3-0-3	Electromagnetism Ⅰ, Quantum Physics Ⅰ	
	PHYS412	Physics Fabrication Lab	0-6-3		
	PHYS413	Biological Physics	3-0-3		
	PHYS420	Special Topics in Condensed Matter Physics	3-0-3		
	PHYS422	Special Topics in Modern Physics	3-0-3		
	PHYS431	Physics Research Ⅰ	0-6-3		
	PHYS432	Physics Research Ⅱ	0-6-3		
	PHYS434	Physics Seminar	3-0-3		
	PHYS441	Extramural Research Internship	Varied Credits (1~8)		Up to 4 credits are counted toward graduation.
	PHYS460	Trends in Physics Research	1-0-1		

5. Major Course List by Year and Semester

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BER	MATH101	Calculus Ⅰ	BER	MATH102	Calculus Ⅱ
	BER	PHYS101 PHYS101H	General Physics: Mechanics & Waves or General Physics(H): Mechanics & Waves	BER	PHYS102 PHYS102H	General Physics: Electromagnetism & Optics or General Physics(H): Electromagnetism & Optics
	BER	PHYS103	General Physics Lab Ⅰ	BER	LIFE103	General Life Science
	BER	CHEM101	General Chemistry Ⅰ	BER	CSED101	Programming and Problem Solving
	BER	CHEM102	General Chemistry Lab Ⅰ	BEE	PHYS104	General Physics Lab II: Design and Construction
	BER	MSUS101	Exploring Academic Majors	BEE	PHYS100	Introduction to Physics
	BEE	PHYS110	General Physics Recitation: Mechanics & Waves	BEE	PHYS199	Freshman Research Participation
				BEE	PHYS111	General Physics Recitaion: Electromagnetism & Optics
Sophomore	ME	PHYS201	Introduction to Quantum Physics	MR	PHYS206	Electromagnetism Ⅰ
	ME	PHYS202	Introduction to the Theory of Relativity	ME	PHYS209	Mathematical Methods for Physics
	MR	PHYS203	Mechanics	MR	PHYS250	Physics Laboratory-Capstone Design Ⅰ
Junior	MR	PHYS301	Quantum Physics Ⅰ	DME	PHYS352 PHYS353	Physics LabⅢ or Physics LabⅢ (Honors)
	MR	PHYS307	Electromagnetism Ⅱ	MR	PHYS302	Quantum Physics Ⅱ
	MR	PHYS351	Physics Laboratory-Capstone Design Ⅱ	MR	PHYS304	Thermal Physics
				ME	PHYS312	Computational Physics
				ME	PHYS460	Trends in Physics Research
Senior	ME	PHYS401	Solid State Physics	ME	PHYS403	Nuclear and Elementary Particle Physics
	ME	PHYS408	Intermediate Mathematical Methods for Physics	ME	PHYS406	Plasma Physics
	ME	PHYS410	Optical Physics	ME	PHYS412	Physics Fabrication Lab
	ME	PHYS413	Biological Physics	ME	PHYS432	Physics Research Ⅱ
	ME	PHYS431	Physics Research Ⅰ			

6. Curriculum Roadmap

- Spring Entry

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester (9 credits)	Spring Semester (9 credits)	Fall Semester (13 credits)	Spring Semester (15 credits)	Fall Semester (12 credits)
*PHYS201 Introduction to Quantum Physics (3) *PHYS202 Introduction to Relativity (3) *PHYS203 Mechanics (3)	PHYS206 Electromagnetism Ⅰ (3) PHYS209 Mathematical Methods for Physics (3) PHYS250 Physics Laboratory-Capstone Design Ⅰ (3)	PHYS301 Quantum Physics Ⅰ (3) PHYS307 Electromagnetism Ⅱ (3) PHYS351 Physics Laboratory-Capstone Design Ⅱ (3)	PHYS352 Physics Laboratory Ⅲ (3) or PHYS353 Physics Laboratory Ⅲ Honor (3) PHYS302 Quantum Physics Ⅱ (3) PHYS304 Thermal Physics (3) PHYS312 Computers for Physics (3) PHYS460 Trends in Physics Research (1)	PHYS401 Solid State Physics (3) PHYS408 Intermediate Mathematical Methods for Physics (3) PHYS410 Optical Physics (3) PHYS413 Biological Physics (3) PHYS431 Physics Research Ⅰ (3)	PHYS403 Nuclear and Elementary Particle Physics (3) PHYS406 Plasma Physics (3) PHYS412 Practical Physics Lab. (3) PHYS432 Physics Research Ⅱ (3)

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

- Fall Entry

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester (9 credits)	Fall Semester (17 credits)	Spring Semester (9 credits)	Fall Semester (15 credits)	Spring Semester (16 credits)
*PHYS201 Introduction to Quantum Physics (3) *PHYS203 Mechanics (3) PHYS206 Electromagnetism Ⅰ (3)	*PHYS202 Introduction to Relativity (3) PHYS301 Quantum Physics Ⅰ (3) PHYS307 Electromagnetism Ⅱ (3)	PHYS209 Mathematical Methods for Physics (3) PHYS250 Physics Laboratory-Capstone Design Ⅰ (3) PHYS302 Quantum Physics Ⅱ (3) PHYS304 Thermal Physics (3) PHYS460 Trends in Physics Research (1)	PHYS351 Physics Laboratory-Capstone Design Ⅱ (3) PHYS408 Intermediate Mathematical Methods for Physics (3) PHYS431 Physics Research Ⅰ (3)	PHYS312 Computers for Physics (3) PHYS352 Physics Laboratory Ⅲ (3) or PHYS353 Physics Laboratory Ⅲ Honor (3) PHYS403 Nuclear and Elementary Particle Physics (3) PHYS406 Plasma Physics (3) PHYS432 Physics Research Ⅱ (3)	PHYS401 Solid State Physics (3) PHYS410 Optical Physics (3) PHYS412 Practical Physics Lab. (3) PHYS413 Biological Physics (3)

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

7. Approved ME Offered by Other Departments

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note
All STC courses and MR from other departments are accepted.				

8. Course Description

PHYS101, 102 – General Physics: Mechanics & Waves, General Physics: Electromagnetism & Optics ····· (3-1-3)

General Physics introduce the basic concepts and methods of physics through lectures. General Physics: Mechanics & Waves primarily covers mechanics and thermal phenomena, including topics such as time and space, force equilibrium, Newton's laws, momentum, the conservation laws, motion under central forces, rigid body motion, continuum mechanics, waves, and thermal phenomena.

General Physics: Electromagnetism & Optics focuses on the concepts and methods of electromagnetism and optics through lectures, covering electric fields and potentials, electric current and magnetic fields, induction laws, dielectrics and magnetic materials, electromagnetic waves, and optics, along with some basic concepts of quantum physics.

PHYS101H, 102H – General Physics(H): Mechanics & Waves, General Physics(H): Electromagnetism & Optics ····· (3-1-3)

These courses cover the content of General Physics: Mechanics & Waves and General Physics: Electromagnetism & Optics in greater depth, with an elevated level of instruction that includes applied problems extending the fundamental concepts of physics.

PHYS103 – General Physics Lab Ⅰ ····· (0-2-1)

This course reinforces understanding of the fundamental principles covered in General Physics: Mechanics & Waves through experiments.

PHYS104 – General Physics LabⅡ: Design and Construction ····· (0-2-1)

This is a student-driven laboratory course based on individual creativity, moving beyond conventional textbook-centered, standardized experiments. Students actively participate in all processes necessary to achieve assigned tasks, including designing and constructing experimental apparatus, data analysis, demonstrations, and presentations, representing a new paradigm of experimental learning.

PHYS109 – Introduction to Modern Physics ····· (1-0-1)

This course provides conceptual knowledge of applications of physics in modern society and current research trends in modern physics to foster a broad understanding of the field.

PHYS110, 111 – General Physics Recitation: Mechanics & Waves, General Physics Recitaion: Electromagnetism & Optics (1-0-1)

These courses enhance students' ability to follow General Physics: Mechanics & Waves and General Physics: Electromagnetism & Optics by providing supplementary explanations of basic concepts, additional practice problems, and Q&A sessions aligned with the progress of the main lectures.

PHYS200A~Z – Special Topics in Basic Physics ····· (Varied Credits)

This course covers basic physics topics relevant to the development of the field.

PHYS201 – Introduction to Quantum Physics ····· (3-1-3)

This course reduces the emphasis on mathematics to focus on the concepts of quantum mechanics, providing students—who are mostly familiar with classical mechanics—an opportunity to develop a quantum-mechanical way of thinking.

PHYS202 – Introduction to the Theory of Relativity ····· (3-1-3)

This course introduces the basic concepts of special and general relativity. It explores the fundamentals of special relativity in detail, then discusses physics observed by accelerated observers before moving on to the basic principles of general relativity. It also covers physical phenomena related to black holes and provides a basic introduction to cosmology.

PHYS203 – Mechanics ····· (3-1-3)

This course addresses Newtonian mechanics of particles and rigid bodies using a more analytical approach than the introductory mechanics covered in General Physics I. Topics include Newtonian mechanics, the conservation laws, gravitational potential, coordinate systems, and the central force problem.

PHYS206 – Electromagnetism Ⅰ ····· (3-1-3)

This course covers electromagnetic phenomena at a higher level than General Physics II. Topics include charges and fields, potentials, conductors, Laplace's equation and its solutions, magnetic fields and vector potentials, field energy, magnetostatics, and Maxwell's equations.

PHYS209 – Mathematical Methods for Physics ····· (3-1-3)

This course introduces fundamental mathematical techniques commonly used in physics. Topics include vector analysis, linear algebra, coordinate transformations, Fourier series, complex variables, ordinary differential equations, and selected special functions.

PHYS250, 351 – Physics Laboratory-Capstone Design Ⅰ and Ⅱ ····· (0-6-3)

This course develops students' ability to independently solve both fundamental and applied problems required in advanced physics experiments, based on the theoretical knowledge acquired during their undergraduate studies. Students plan, design, and execute the entire process of a project on their own.

PHYS301 – Quantum Physics Ⅰ ····· (3-1-3)

This course covers the basic concepts and structure of quantum physics, including applications to simple systems. Topics include wave-particle duality, the uncertainty principle, wave functions and the Schrödinger equation, operator methods, one-dimensional problems, the harmonic oscillator, and the hydrogen atom.

PHYS302 – Quantum PhysicsⅡ ····· (3-1-3)

Recommended Prerequisite: Quantum Physics Ⅰ (PHYS301)

Building on the basic concepts learned in Quantum Physics I, this course introduces angular momentum and spin, approximation methods such as perturbation theory, and radiation theory, leading to an understanding of various phenomena in atomic physics.

PHYS304 – Thermal Physics ····· (3-1-3)

This course examines heat and many-body phenomena using statistical mechanics, which explains material properties probabilistically in terms of microscopic constituents such as molecules and atoms.

PHYS307 – ElectromagnetismⅡ ····· (3-1-3)

Recommended Prerequisite: Electromagnetism Ⅰ (PHYS206)

This course deepens understanding of electric and magnetic phenomena through applications of Maxwell's equations. Topics include the electrodynamics of fluids, electromagnetic waves, waveguides, wave optics, and special relativity.

PHYS312 – Computational Physics ····· **(2-2-3)**

Recommended Prerequisite: Mechanics (PHYS203)

This course introduces the role of computers in modern science and their applications in physics. Students perform computer-based simulations of real physics problems, building intuitive understanding of physical phenomena and familiarity with computational research tools. The course provides tools for exploring the complex and diverse phenomena in physics more effectively.

PHYS315 – Introduction to Astrophysics ····· **(3-0-3)**

This course provides foundational knowledge about astronomy and the universe, one of the fundamental fields of interest for modern scientists. The course helps students develop literacy in the field and consider it as a potential area of specialization. Topics include the basics of astronomical observation, the structure of the sun and solar system, black holes, galaxies, the macroscopic structure of the universe, standard cosmology, and the Big Bang theory.

PHYS352 – Physics Lab Ⅲ ····· **(0-6-3)**

This course reinforces understanding of the fundamental principles and basic theories of physics through experiments that measure and analyze fundamental physical properties. Topics include mechanics, electromagnetism, optics, and modern physics.

PHYS353 – Physics Lab Ⅲ (Honors) ····· **(0-6-3)**

This course provides advanced experimental training necessary before entering graduate school. It includes experiments on condensed matter, atomic/molecular/optical physics, and biophysics.

PHYS360 – Pioneers in Physics ····· **(3-0-3)**

Through biographies of key figures in the history of physics, this course examines the trends of the discipline in their historical context and explores how the achievements of great physicists influenced the progress of physics.

PHYS399A–D – Research Participation A-D ····· **(0-3-1)**

Through participation in faculty research projects, students acquire practical skills and become more familiar with physics research.

PHYS401 – Solid State Physics ····· **(3-0-3)**

Recommended Prerequisites: Quantum Physics Ⅰ (PHYS301), Thermal Physics (PHYS304)

This course provides a fundamental understanding of physical phenomena in solids. Key topics include crystal structures, lattice vibrations, electron theory of metals, thermal properties, and band theory.

PHYS403 – Nuclear and Elementary Particle Physics ····· **(3-0-3)**

Recommended Prerequisites: Quantum Physics Ⅰ (PHYS301) and Quantum PhysicsⅡ (PHYS302)

This course introduces nuclear and elementary particle phenomena from a unified perspective, reflecting modern theories of matter's ultimate structure. Topics include quarks, elementary particles, basic properties of nuclei, nuclear forces, strong and weak interactions of elementary particles, symmetries, and the conservation laws.

PHYS406 – Plasma Physics ····· **(3-0-3)**

Recommended Prerequisites: Mechanics (PHYS203) and Electromagnetism I (PHYS206)

This course is an introduction to plasma phenomena, particularly those in magnetic fields. Topics include charged particle motion in magnetic fields, plasma waves, equilibrium and stability, linear and nonlinear theory, diagnostic methods, and an overview of applications.

PHYS407 – Introduction to Accelerator Physics ····· (3-0-3)

This course covers the structure and principles of linear and circular accelerators, including basic theories of particle beam physics.

PHYS408 – Intermediate Mathematical Methods for Physics ····· (3-1-3)

This course explores advanced mathematical techniques essential for physics research, building on Mathematical Methods for Physics (PHYS209). Topics include the calculus of variations, integral equations, special functions, and group theory.

PHYS410 – Optical Physics ····· (3-0-3)

Recommended Prerequisites: Electromagnetism I (PHYS206) and Quantum Physics I (PHYS301)

This course covers wave and quantum optics. Topics include wave solutions of Maxwell's equations, polarization, interference, diffraction, light-matter interactions, lasers, holography, and fiber optics.

PHYS412 – Physics Fabrication Lab ····· (0-6-3)

This course aims to help students who plan to specialize in experimental physics by developing a broad understanding of mechanical systems and acquiring fundamental concepts and skills related to fabrication required in experimental physics. The course includes design for fabrication, hands-on machining, and construction of experimental apparatus, with a particular emphasis on fostering creativity.

PHYS413 – Biological Physics ····· (3-0-3)

This course introduces the fundamentals of biophysics, which applies physical concepts and methods to understand biological phenomena. It covers biophysics-based approaches to phenomena at the molecular and cellular levels, developing students' ability to view living systems from a physics perspective.

PHYS420 – Special Topics in Condensed Matter Physics ····· (3-0-3)

Extending topics from Statistical Physics and Solid State Physics, this course explores various phenomena in condensed matter. Topics include many-body theory, surface phenomena, phase transitions and critical phenomena, nonequilibrium phenomena and complex systems, superconductivity and superfluidity, semiconductors, polymers, and synchrotron applications.

PHYS422 – Special Topics in Modern Physics ····· (3-0-3)

This course introduces recent theories in modern physics at a level appropriate for undergraduates. Content varies by instructor.

PHYS431, 432 – Physics Research Ⅰ and Ⅱ ····· (0-6-3)

Students gain research experience in theoretical and experimental physics under faculty supervision. Training includes presenting research results through seminars and written reports.

PHYS434 – Physics Seminar ····· (3-0-3)

Under faculty guidance, students select and present on a topic, gaining exposure to current research areas, experience reading scientific papers, and practice in presentation and discussion.

PHYS441 – Extramural Research Internship ····· (Varied Credits)

This course encourages undergraduate and graduate students to participate in international collaborative research to develop global competencies.

PHYS460 – Trends in Physics Research ····· (1-0-1)

This course is offered in the form of seminars, introducing recent research topics presented by department faculty and invited speakers. It helps senior students understand current research trends and choose a direction for their own research projects in Physics Research (PHYS431 and PHYS432).

Department of Chemistry

1. Educational Goals

Chemistry is a fundamental science that investigates the structure and properties of matter and explores the creation of new substances through chemical transformations. It underpins advances in fields crucial to human well-being, such as medicine, materials, and energy. Without progress in areas like pharmaceuticals, agrochemicals, fertilizers, and synthetic resins, modern life would still struggle with disease and hunger. Likewise, future breakthroughs in electronics, life sciences, and renewable energy depend on chemists who develop innovative materials, discover new chemical reactions, and refine analytical techniques to harness scientific discoveries. Chemistry continues to provide the foundation for progress in a wide range of science and technology through the creative and persistent efforts of chemists.

The Department of Chemistry's curriculum covers the traditional four fields—organic, physical, analytical, and inorganic chemistry—while also addressing modern areas such as macromolecular chemistry and biochemistry. Students are additionally exposed to emerging disciplines, including nanochemistry, chemical biology, medicinal chemistry, and computational chemistry.

Given chemistry's broad applicability to fields related to human welfare, graduates have diverse career paths. The Department seeks to cultivate professionals who can contribute widely as researchers grounded in chemistry yet capable of transcending disciplinary boundaries. Chemists with a solid foundation are in demand across nearly all applied science and technology sectors, particularly in R₩&D fields such as pharmaceuticals, polymers, petrochemicals, and catalysis. In recent years, trained chemists have also taken on increasing roles in areas such as electronics, biotechnology, and environmental science, which are closely linked to addressing pollution and sustainability challenges. As basic research becomes ever more critical to enhancing international competitiveness, the demand for advanced research personnel continues to grow.

To this end, the Department actively encourages students to pursue graduate study after completing their undergraduate education and to develop as professional researchers. Graduate students receive full scholarship support and are given exceptional opportunities to grow into independent researchers by engaging in creative, self-directed projects in advanced laboratories spanning diverse areas of chemistry.

2. Curriculum Overview

Chemistry is the science that explores the synthesis and properties of matter, investigating its composition, structure, transformations, reactions, and the accompanying energy changes. Since everything in our bodies, on Earth, and throughout the universe is made of matter, chemistry spans a vast range of disciplines. The curriculum is organized as follows:

- Physical Chemistry: Studies the fundamental principles of chemistry, including the structure and properties of atoms and molecules and theories of chemical reactions. Topics include thermodynamics, chemical equilibrium, statistical mechanics, reaction kinetics, quantum chemistry, atomic and molecular structure, molecular spectroscopy, crystal and liquid structures, photochemistry, and molecular dynamics.

- Organic Chemistry: Focuses on the structure, properties, reactions, and synthesis of organic compounds. Since most natural substances, including biomolecules, are organic, this field covers their isolation, structural determination, chemical synthesis, and development into useful materials. Topics include stereochemistry, reaction mechanisms, and spectroscopic characterization.

- Inorganic Chemistry: Explores the bonding and molecular structure of all elements in the periodic table, with particular focus on the principles governing transition metal coordination compounds. It also covers the properties, reactions, and synthesis of transition metal catalysts, organometallics, and other inorganic substances.

- Analytical Chemistry: Examines the structure, composition, and relative content of matter through analysis. This course includes quantitative analysis based on chemical equilibrium, electrochemical methods, and instrumental techniques, which address the mechanisms and applications of various instruments for analysis.

- Macromolecular Chemistry: Investigates the physical and chemical properties and synthesis of polymers, such as synthetic resins, fibers, rubber, and biopolymers, encompassing both fundamental research and industrial applications.

- Biochemistry: Examines life phenomena from a chemical perspective, providing general knowledge to understand and apply biological processes by studying biomaterial functions and structures. This field also addresses a range of issues in the life sciences effectively.

In addition to these fields, many are interrelated, and no area of chemistry can be fully understood in isolation. Furthermore, chemistry underpins other disciplines such as chemical engineering, materials science, life sciences, pharmacy, physics, and electrical and electronic engineering. Therefore, the curriculum is designed to offer sufficient flexibility to foster connections with various scientific and engineering fields.

▶ Curriculum Policy

General Chemistry I and II in the first year lay the foundation for basic chemical principles and their applications across the broader field of chemistry, serving as essential courses for science and engineering students. These courses integrate lectures and laboratory work to build conceptual understanding and train students in basic synthetic, analytical, and quantitative measurement techniques.

For smooth progress in the program, students who have not studied advanced high school chemistry (고교 화학II) are advised to take Introduction to Chemistry to strengthen their fundamentals. Beginning in the second year, students plan their course of study in consultation with their academic advisor, focusing on

areas of interest by selecting from the MR and ME courses available.

Graduation requires a minimum of 125 credits, including 30 credits in MR, 19 in ME, 15 in FE, and the remainder from General Education and basic and practical courses.

▶ Guidelines for Double Major and Minor

- Double Major: Students must complete at least 30 credits in MR and 5 credits in ME courses offered by the Department. Credits for the same courses may be applied toward both majors.

- Minor: Students must complete at least 21 credits in MR and ME offered by the Department. However, credits for the same courses cannot be double-counted toward both the major and the minor.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Physical Chemistry I (3), Organic Chemistry I/II (3/3), Chemistry Lab I: Reactions and Synthesis (3), Chemical Analysis (3), Physical Chemistry II (4), Chemistry Lab II: Physical Chemistry and Instrumental Analysis(4), Inorganic Chemistry(4), Undergraduate Thesis Research(3)	**30**	Including the STC courses (Chemical Analysis and Organic Chemistry I)
ME	ME offered by the Department, Approved ME offered by other departments Intensive AI courses offered by other departments	**19**	Including three electives from the STC courses

	All STC courses		
FE	Graduate-level courses offered by the Department or other departments are recognized as FE. (Courses at the 500 or 600 level are accepted as FE, while courses at the 700 or 800 level are not.)	15	
Subtotal		**125**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
MR	CHEM211	Physical Chemistry Ⅰ	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM221	Organic Chemistry Ⅰ (STC)	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM222	Organic Chemistry Ⅱ	3-0-3	Organic Chemistry Ⅰ
	CHEM243	Chemical Analysis (STC)	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM311	Physical Chemistry Ⅱ	4-0-4	Physical Chemistry Ⅰ
	CHEM314	Chemistry Lab II: Physical Chemistry and Instrumental Analysis	0-8-4	General Chemistry Lab Ⅰ and Ⅱ, Physical Chemistry Ⅰ, Chemical Analysis
	CHEM331	Inorganic Chemistry	4-0-4	Physical Chemistry Ⅰ, Chemical Analysis
	CHEM499	Undergraduate Thesis Research	0-9-3	Advanced Experimental Chemistry, two Research Participation courses
ME	CHEM109	Introduction to Modern Chemistry	1-0-1	
	CHEM213	Mathematics for Chemistry	3-0-3	
	CHEM224	Introduction to Organic Chemistry (for Non-Major Students)	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM231	Introduction to Nanochemistry (STC)	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM261	Chemistry for Medicine and Life (STC)	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM292	Organic Reaction Lab (for Non-Major Students)	0-4-2	General Chemistry Lab Ⅰ and Ⅱ, Organic Chemistry Ⅰ
	CHEM325	Contemporary Chemisry Lab	0-6-3	General Chemistry Lab Ⅰ and Ⅱ, Organic Chemistry, Inorganic Chemistry, Chemistry Lab Ⅰ: Reactions and Synthesis
	CHEM342	Instrumental Analysis	3-0-3	Chemical Analysis
	CHEM399	Research Participation A~D	0-4-1	
	CHEM451	Macromolecular Chemistry	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM461	Biochemistry	3-0-3	General Chemistry Ⅰ and Ⅱ
	CHEM481A-Z	Special Topics in Chemistry A-Z	Varied Credits	
	CHEM497	Advanced Experimental Chemistry	0-9-3	Take Research Participation twice
	CHEM498	Literature Review	0-6-2	

5. Recommended List of MR/BER Courses by Year and Semester

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BER	MATH101	Calculus Ⅰ	BER	MATH102	Calculus Ⅱ
	BER	PHYS101	General Physics Ⅰ or General Physics Ⅰ (H)	BER	PHYS102	General Physics Ⅱ or General Physics Ⅱ (H)
	BER	PHYS103	General Physics Lab Ⅰ	BER	LIFE103	General Life Science or General Life Science (H)
	BER	CHEM101	General Chemistry Ⅰ	BER	CHEM101	General Chemistry Ⅰ
	BER	CHEM102	General Chemistry Lab Ⅰ	BER	CHEM102	General Chemistry Lab Ⅰ
	BER	CSED101	Programming and Problem Solving	BER	CSED101	Programming and Problem Solving
	BER	CSED105	Introduction to Artificial Intelligence	BER	CSED105	Introduction to Artificial Intelligence
	BER	MSUS101	Exploring Academic Majors	BEE	CHEM103	General Chemistry Ⅱ
	BEE	CHEM100	Introduction to Chemistry	BEE	CHEM100	Introduction to Chemistry
	BEE	CHEM104	General Chemistry Lab Ⅱ	BEE	CHEM104	General Chemistry Lab Ⅱ
	BEE	CHEM199	Freshman Research Participation	BEE	CHEM199	Freshman Research Participation
Sophomore	MR	CHEM221	Organic Chemistry Ⅰ (STC)	MR	CHEM211	Physical Chemistry Ⅰ
	MR	CHEM243	Chemical Analysis (STC)	MR	CHEM222	Organic Chemistry Ⅱ
				MR	CHEM226	Chemistry Lab Ⅰ: Reactions and Synthesis
Junior	MR	CHEM311	Physical Chemistry Ⅱ	MR	CHEM314	Chemistry Lab Ⅱ: Physical Chemistry and Instrumental Analysis
	MR	CHEM331	Inorganic Chemistry			
Senior	MR	CHEM499	Undergraduate Thesis Research	MR	CHEM499	Undergraduate Thesis Research

- General Chemistry I and General Chemistry II may be taken in the same semester.
- General Chemistry Lab I and General Chemistry Lab II may also be taken in the same semester, and grades for these courses are assigned on a Pass/No Record basis.

6. Course List by Area of Specialization

Category	Course Code	Category	Course Title	Lecture-Lab/Practicum-Credit
Physical Chemistry	CHEM211	MR	Physical Chemistry Ⅰ	3-0-3
	CHEM213	ME	Mathematics for Chemistry	3-0-3
	CHEM231	ME	Introduction to Nanochemistry (STC)	3-0-3
	CHEM311	MR	Physical Chemistry Ⅱ	4-0-4
	CHEM314	MR	Chemistry Lab Ⅱ: Physical Chemistry and Instrumental Analysis	0-8-4
Organic Chemistry	CHEM221	MR	Organic Chemistry Ⅰ (STC)	3-0-3
	CHEM222	MR	Organic Chemistry Ⅱ	3-0-3
	CHEM224	ME	Introduction to Organic Chemistry (for Non-Major Students)	3-0-3
	CHEM226	MR	Chemistry Lab Ⅰ: Reactions and Synthesis	0-6-3
	CHEM292	ME	Organic Reaction Lab (for Non-Major Students)	0-4-2
	CHEM325	ME	Contemporary Chemisry Lab	0-6-3
Inorganic Chemistry	CHEM331	MR	Inorganic Chemistry	4-0-4
Analytical Chemistry	CHEM243	MR	Chemical Analysis (STC)	3-0-3
	CHEM342	ME	Instrumental Analysis	3-0-3
Macromolecular Chemistry	CHEM451	ME	Macromolecular Chemistry	3-0-3

Category	Course Code	Category	Course Title	Lecture-Lab/Practicum-Credit
Biochemistry	CHEM261	ME	Chemistry for Medicine and Life (STC)	3-0-3
	CHEM461	ME	Biochemistry	3-0-3
etc.	CHEM399 A-D	ME	Research Participation (S/U)	0-4-1
	CHEM481 A-Z	ME	Special Topics in Chemistry A-Z	Varied Credits
	CHEM497	ME	Advanced Experimental Chemistry	0-9-3
	CHEM498	ME	Literature Review (S/U)	0-6-2
	CHEM499	MR	Undergraduate Thesis Research	0-9-3

7. Curriculum Roadmap

- Spring Entry

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
CHEM221 Organic Chemistry I*	CHEM222 Organic Chemistry II	CHEM331 Inorganic Chemistry	CHEM314 Chemistry Lab II: Physical Chemistry and Instrumental Analysis	CHEM499 Undergraduate Chemical Research	CHEM499 Undergraduate Chemical Research
CHEM243 Chemical Analysis*	CHEM211 Physical Chemistry I	CHEM311 Physical Chemistry II			
	CHEM226 Chemistry Lab I: Reactions and Synthesis				
CHEM213 Mathematics for Chemistry	CHEM231 Introduction to Nanochemistry*	CHEM325 Contemporary Chemistry Lab.	CHEM481A-Z Special Topics in Chemistry A-Z	CHEM497 Advanced Experimental Chemistry	CHEM481A-Z Special Topics in Chemistry A-Z
CHEM261 Chemistry for Medicine and Life*		CHEM342 Instrumental Analysis	CHEM399A-D Research Participation A-D	CHEM399A-D Research Participation A-D	CHEM461 Biochemistry
CHEM224 Introductory to Organic Chemistry (for Non-Major Students)	CHEM292 Organic Reaction Laboratory (for Non-Major Students)	CHEM399A-D Research Participation A-D			CHEM451 Macromolecular Chemistry

※ **Major required:** Red / **Major elective:** Blue / **Others:** Black / **STC:** *

- Fall Entry

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
CHEM211 Physical Chemistry I	CHEM311 Physical Chemistry II	CHEM314 Physical Chemistry and Instrumental Analysis Laboratory	CHEM331 Inorganic Chemistry	CHEM499 Undergraduate Chemical Research	CHEM499 Undergraduate Chemical Research
CHEM226 Chemical Reaction Laboratory	CHEM221 Organic Chemistry I*	CHEM222 Organic Chemistry II	CHEM325 Synthesis Laboratory		
	CHEM243 Chemical Analytsis*				
	CHEM245 Analytical Chemistry Laboratory)				
CHEM231 Introduction to Nanochemistry*	CHEM213 Mathematics for Chemistry	CHEM481A-D Special Topics in Chemistry A-D	CHEM342 Instrumental Analysis	CHEM481A-D Special Topics in Chemistry A-D	CHEM497 Advanced Experimental Chemistry
	CHEM261 Chemistry for Medicine & Life*	CHEM399A-D Research Participation A-D	CHEM399A-D Research Participation A-D	CHEM461 Biochemistry	CHEM399A-D Research Participation A-D
CHEM292 Organic Reaction Laboratory (for Non-Major Students)	CHEM224 Introductory to Organic Chemistry (for Non-Major Students)			CHEM451 Macromolecular Chemistry	

※ **Major required:** Red / **Major elective:** Blue / **Others:** Black / **STC:** *

8. Approved ME Offered by Other Departments

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
ME	MATH200	Differential Equations (STC)	3-1-3
	MATH203	Applied Linear Algebra (STC)	3-1-3
	MATH210	Applied Complex Variables (STC)	3-1-3
	MATH230/MATH231/IMEN272	Probability and Statistics (STC)/Statistics for Experimental Research (STC)/Probability and Statistics for Engineering (STC)	3-1-3
	MATH261	Discrete Mathematics (STC)	3-1-3
	MATH311	Analysis I	3-1-3
	MATH301	Modern Algebra I	3-1-3
	MATH324	Introduction to Geometry	3-0-3
	MATH333	Computational Statistics	3-1-3
	MATH342	Engineering Mathematics	3-1-3
	MATH351	Introduction to Numerical Analysis	3-0-3
	MATH360	Principles of Software Construction	3-0-3
	MATH426	Introduction to Differential Geometry	3-1-3
	PHYS201	Introduction to Quantum Physics (STC)	3-1-3
	PHYS202	Introduction to the Theory of Relativity (STC)	3-1-3
	PHYS203	Mechanics (STC)	3-1-3
	PHYS206	Electromagnetism I	3-1-3
	PHYS209	Mathematical Methods for Physics	3-1-3
	PHYS250	Physics Laboratory I	0-6-3
	PHYS301	Quantum Physics I	3-1-3
	PHYS302	Quantum Physics II	3-1-3
	PHYS304	Thermal Physics	3-1-3
	PHYS307	Electromagnetism II	3-1-3
	PHYS351	Physics Laboratory II	0-6-3
	PHYS353	Physics Lab III (Honors)	0-6-3
	PHYS401	Solid State Physics	3-0-3
	PHYS408	Intermediate Mathematical Methods for Physics	3-1-3
	PHYS410	Optical Physics	3-0-3
	PHYS413	Biological Physics	3-0-3
	PHYS420	Special Topics in Condensed Matter Physics	3-0-3

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
	LIFE209	Modern Life Science Laboratory	1-6-4
	LIFE217	Cell Biology (STC)	3-0-3
	LIFE218	The Principles of Life Sciences (STC)	3-0-3
	LIFE219	Convergence of Biology and Engineering (STC)	3-0-3
	LIFE303	Microbiology	3-0-3
	LIFE314	Physical Biochemistry	3-0-3
	LIFE319	Biochemistry Ⅰ	3-0-3
	LIFE320	Biochemistry Ⅱ	3-0-3
	LIFE321	Molecular Biology	3-0-3
	LIFE325	Biotechnology	3-0-3
	LIFE420	Immunology	3-0-3
	AMSE201	Fundamentals of Materials Science and Engineering (STC)	3-1-3
	AMSE208	Structure of Materials (For students enrolled in 2021 or later) (STC)	3-0-3
	AMSE211	Materials Design (STC)	3-0-3
	AMSE313	Physics of Materials	3-0-3
	AMSE388	Introduction to Semiconductor Materials and Devices	3-0-3
	AMSE412	Nanoscience and Nanotechnology (For students enrolled in 2020 or before) (STC)	3-0-3
	AMSE451	Physics of Electronic Device Materials	3-0-3
	AMSE464	Polymer Properties and Applications	3-0-3
	AMSE481	Electronic Devices	3-0-3
	MECH202	Computer-Aided Drafting and Design	1-2-2
	MECH240	Solid Mechanics (STC)	3-1-3
	MECH250	Thermodynamics (STC)	3-1-3
	MECH323	System Control	3-1-3
ME	IMEN203	Financial Accounting (STC)	3-0-3
	IMEN260 or IMEN261	Operations Research Ⅰ or Introduction to Operations Research (STC)	3-0-3
	IMEN281	Information System Technology	3-1-3
	EECE211	Semiconductor Electronics Ⅰ (STC)	3-0-3
	EECE231/DISU231	Circuit Theory (STC)/Electric Circuits (STC)	3-0-3
	EECE233	Signals and Systems (STC)	3-0-3
	EECE236	Learning About Electrical Engineering Using MatLab (STC)	2-2-3
	EECE261	Introduction to Electromagnetism	3-0-3
	EECE274	Digital System Design	3-0-3
	EECE303	Physical Electronics	3-0-3
	EECE331	Electronic Circuits Ⅰ	3-0-3
	EECE411	Display Engineering Ⅰ	3-0-3
	CSED211	Introduction to Computer Software systems (STC)	2-2-3
	CSED232	Principles of Software Construction (STC)	3-0-3
	CSED233	Data Structure (STC)	3-0-3
	CHEB201	Physical Chemistry for Chemical Engineering Ⅰ (STC)	3-0-3
	CHEB206	Organic Chemistry for Chemical Engineers Ⅰ (STC)	3-0-3
	CHEB208	Fundamentals in Engineering Biology (STC)	3-0-3
	CHEB214	Energy and Environmental Engineering (STC)	3-0-3
	CHEB303	Mathematical Methods in Chemical Engineering	3-0-3
	CHEB308	Introduction to Biotechnology	3-0-3
	CITE241/MECH361 /EECE480	Introduction to Biomedical Engineering (STC)	3-0-3
	SEMI202	Physics for Semiconductors (STC)	3-0-3
	SEMI203/EECE211	Semiconductor Devices Ⅰ /Semiconductor Electronics Ⅰ (STC)	3-0-3
	SEMI206	Introduction to Semiconductor Materials (STC)	3-0-3

※ Advanced AI courses offered by other departments (starting from Spring 2021) are recognized as ME.

9. Course Description

CHEM100 – Departmental Introductory Course: Chemistry ····· (1-0-1)

This course is designed for students who lack a solid foundation in chemistry before taking General Chemistry I. It establishes basic concepts in chemistry, covering atomic structure, periodicity of elements, chemical bonding, intermolecular forces, common inorganic and organic compounds, chemical reactions, reaction rates, chemical equilibrium, acid-base reactions, and redox reactions.

CHEM101 – General Chemistry Ⅰ ····· (3-1-3)

This course provides a comprehensive and integrated understanding of basic chemistry concepts necessary for science and engineering majors. Topics include atomic structure, chemical bonding and molecular structure, intermolecular forces, chemical thermodynamics, chemical equilibrium, and reaction kinetics.

CHEM102 – General Chemistry Lab Ⅰ ····· (0-2-1)

This laboratory course reinforces theoretical concepts from CHEM101 through hands-on experiments. Exercises are selected from topics covered in CHEM101 and focus on mastering basic laboratory techniques. The course is intended to be taken concurrently with CHEM101.

CHEM103 – General ChemistryⅡ ····· (3-1-3)

This course offers tailored instruction for acquiring more advanced chemical knowledge. It introduces topics such as spectroscopy, organic chemistry, materials chemistry, macromolecular chemistry, nanochemistry, and biochemistry, with an in-depth examination of contemporary issues in modern chemistry.

CHEM104 – General Chemistry Lab Ⅱ ····· (0-2-1)

This laboratory course reinforces theoretical concepts from CHEM101 and CHEM103 through hands-on experiments. Exercises are selected from topics covered in CHEM101 and focus on mastering basic laboratory techniques. The course is intended to be taken concurrently with CHEM101 or CHEM103.

CHEM109 – Introduction to Modern Chemistry ····· (1-0-1)

This course introduces recent research trends in chemistry and the areas of interest among departmental faculty. It helps lower-year undergraduate students majoring in Chemistry or related disciplines gain broader insight into the current progress and future directions of chemistry.

CHEM199 – Freshman Research Participation ····· (0-2-1)

This course introduces recent research trends in chemistry and the areas of interest among departmental faculty. It helps lower-year undergraduate students majoring in Chemistry or related disciplines gain broader insight into the current progress and future directions of chemistry.

CHEM211 – Physical Chemistry Ⅰ ····· (3-0-3)

Recommended Prerequisites: General Chemistry I and II

This course covers the fundamentals of quantum chemistry, the structure of atoms and molecules, chemical bonding, and the theory of spectroscopy.

CHEM213 – Mathematics for Chemistry ····· (3-0-3)

For students who have completed Calculus and Linear Algebra, this course develops the ability to mathematically formulate and solve problems that future chemists will frequently encounter. It trains them to understand the nature of diverse chemical phenomena and teaches the basics of probability and statistics necessary for analyzing experimental results.

CHEM221 – Organic Chemistry Ⅰ ····· (3-0-3)

Recommended Prerequisites: General Chemistry I and II

This course examines the structure, physical properties, and chemical reactivity of fundamental organic compounds such as alkanes, alkenes, and alkynes. It also introduces methods for determining organic molecular structures.

CHEM222 – Organic ChemistryⅡ ····· (3-0-3)

Recommended Prerequisite: Organic Chemistry I

This course covers the structure, physical properties, and chemical reactivity of aromatic compounds and various functional groups. It also explores the chemical transformations of these compounds based on reaction mechanisms.

CHEM224 – Introduction to Organic Chemistry ····· (3-0-3)

Recommended Prerequisites: General Chemistry I and II /Target: Non-chemistry majors

This course reorganizes the material from Organic Chemistry I and IIinto a basic format tailored to students from other disciplines.

CHEM226 – Chemistry Lab Ⅰ: Reaction and Synthesis ····· (0-6-3)

Recommended Prerequisites: General Chemistry Lab I and II, Organic Chemistry I

This course aims to develop an understanding of chemical reactions across a wide range of substances, from small molecules to biomolecules and polymers, through hands-on synthesis experiments. Students develop basic laboratory skills essential for synthesis, including separation, purification, isolation, and analysis.

CHEM231 – Introduction to Nanochemistry ····· (3-0-3)

Recommended Prerequisites: General Chemistry I and II

This course focuses on the fundamental concepts of nanochemistry, introducing key terminology, the significance of the nanometer scale, unique quantum phenomena at the nanoscale, and the synthesis of nanomaterials through atomic or molecular manipulation and chemical bonding.

CHEM243 – Chemical Analysis ····· (3-0-3)

Recommended Prerequisites: General Chemistry I and II

This course covers the fundamentals of analytical chemistry, including statistical treatment of experimental data, principles of chemical equilibria (acid-base, metal complex, redox, solvent extraction, and ion exchange), the basics of electroanalytical methods, and an introduction to instrumental analysis. Applications of these principles are illustrated through real laboratory examples.

CHEM261 – Chemistry for Medicine and Life ····· (3-0-3)

Recommended Prerequisites: General Chemistry I and II

This course is designed for students who have completed General Chemistry and wish to broaden their knowledge toward medicinal chemistry in the Department of Life Sciences. It helps students build foundational knowledge and understand recent research trends, addressing the definition and functions of life from a chemical perspective. The course covers topics in biochemistry and chemical biology, including light and biological imaging, natural products and medicinal chemistry, stem cells, and artificial life.

CHEM292 – Organic Reaction Lab ····· (0-4-2)

Recommended Prerequisites: General Chemistry Lab I and II, Organic Chemistry I /Target: Non-chemistry majors

This course trains students in the fundamental experimental techniques of chemical synthesis through organic reaction experiments, including reaction monitoring, compound separation, purification, and structure determination. This laboratory course serves as a reduced-intensity version tailored to non-majors, offering 2 credits.

CHEM311 – Physical ChemistryⅡ ····· (4-0-4)

Recommended Prerequisite: Physical Chemistry I

This course covers thermodynamics, statistical mechanics, and chemical kinetics.

CHEM314 – Chemistry Lab.Ⅱ: Physical Chemistry and Instrumental Analysis **····· (0-8-4)**

Recommended Prerequisites: General Chemistry Lab I and II, Physical Chemistry I, Chemical Analysis

Students learn key research methods in physical chemistry and analytical chemistry using fundamental instruments. Through hands-on work in instrument setup, spectroscopy, and kinetics, they build practical skills and strengthen their understanding by connecting theory with experiment.

CHEM325 – Contemporary Chemistry Lab ····· (0-6-3)

Recommended Prerequisites: General Chemistry Lab I and II, Organic Chemistry, Chemical Analysis

Students perform advanced chemical experiments aligned with current research trends to gain experience relevant to real chemical researches in academia and industry. By working on experiments connected to recent developments in chemistry, they gain hands-on experience with advanced research facilities and instrumentation.

CHEM331 – Inorganic Chemistry ····· (4-0-4)

Recommended Prerequisites: Physical Chemistry I, Chemical Analysis

This course introduces the fundamental principles of modern inorganic chemistry. Topics include the bonding, structure, synthesis, and reactivity of inorganic compounds, with a strong focus on transition metal complexes, as well as ligand field theory, their spectroscopic and thermodynamic properties, and periodic trends of the elements.

CHEM342 – Instrumental Analysis ····· (3-0-3)

Recommended Prerequisite: Chemical Analysis

The course begins by covering the principles and structure of the modules that make up analytical chemistry instruments and the basics of optimizing coupling between modules. It then introduces various instrumental analysis techniques, including electrical measurement methods, electrical signal processing, digitization of analog signals, and signal-to-noise considerations, along with the structure and principles of optical modules in instruments. Building on this foundational knowledge, students study a range of instrumental analysis techniques, such as atomic spectroscopy, molecular spectroscopy, electroanalytical methods, and separation methods.

CHEM399 A–D – Research Participation A–D ····· (0-4-1)

This course is intended for junior and senior undergraduates and provides students with research experience and exposure to current research trends by participating directly in ongoing projects in individual laboratories.

CHEM451 – Macromolecular Chemistry ····· **(3-0-3)**

Recommended Prerequisites: General Chemistry I and II

This course covers the basic theories and phenomena of macromolecular synthesis methods, polymerization mechanisms, molecular weight and distribution, and molecular structure. It also introduces the chemical and physical properties of various macromolecules and their applications.

CHEM461 – Biochemistry ····· **(3-0-3)**

Recommended Prerequisites: General Chemistry I and II

This course introduces the fundamental principles of biochemistry and molecular biology, aiming to help students understand biological phenomena at the molecular level. Topics include the structure and function of biomolecules (proteins, DNA, and RNA), the expression and regulation of genetic information, and the mechanisms of biochemical reactions.

CHEM481 A–Z – Special Topics in Chemistry A–Z ····· **(Varied Credits)**

This course covers essential topics in modern chemistry that are not addressed in the major requirements of the undergraduate curriculum. Content varies by instructor but may include advanced physical chemistry topics such as quantum mechanics, group theory, and quantum chemical calculations, as well as contemporary organic chemistry topics.

CHEM497 – Advanced Experimental Chemistry ····· **(0-9-3)**

Prerequisite: Complete Research Participation twice

Through participation in advanced faculty-led research projects, students enhance their creativity and build essential skills for future research careers.

CHEM498 – Literature Review ····· **(0-6-2)**

Students who have not completed Advanced Experimental Chemistry carry out a literature review on a chosen topic and prepare a review article summarizing their findings.

CHEM499 – Undergraduate Thesis Research ····· **(0-9-3)**

Prerequisite: Complete Research Participation twice/Recommended Prerequisite: Advanced Experimental Chemistry

Students build foundational research skills by carrying out cutting-edge research projects in the advisor's laboratory and writing a paper based on their results. For those planning to pursue graduate studies and a career as a professional researcher, it is recommended to take Advanced Experimental Chemistry one year prior to graduation and enroll in Undergraduate Thesis Research in their final semester.

Department of Life Sciences

1. Educational Goals

The Department of Life Sciences aims to cultivate future leaders in the field by educating students through a variety of disciplines and courses in modern life science. In keeping with its philosophy of elite, small-group education, the Department supports students' academic development by balancing theoretical instruction with hands-on experimental training. The specifics are as follows:

1. The undergraduate program offers comprehensive educational opportunities in life sciences. It provides a solid foundation across a wide range of disciplines, from microscopic aspects—such as protein structure and function in biochemistry, gene regulation in molecular biology, signal transduction in cell biology, and stem cell differentiation in developmental biology—to macroscopic aspects, including genetics and ecology, microbiology and immunology, animal and plant physiology, and neuroscience.

2. The program also offers ample opportunities to gain research experience in life sciences. To ensure that theoretical knowledge acquired through coursework is reinforced by practical application, the curriculum incorporates research training at various levels.

3. By incorporating a student-centered and student-driven curriculum, the program fosters a free and creative learning environment that motivates students to engage actively and develop enthusiasm for academic inquiry.

2. Curriculum Overview

Life sciences is both a fundamental and interdisciplinary field. Depending on the subject of study, it can be categorized into zoology, botany, and microbiology; based on research methods, into biochemistry, physiology, biophysics, genetic engineering, molecular biology, and cell biology; and according to applications of research, into pharmacology, medicine, agriculture, food and nutrition, and environmental science. As the field has rapidly advanced and expanded in scope, these classifications have grown increasingly complex, with boundaries becoming less distinct.

Accordingly, the Department structures its curriculum around core subjects that form the foundation of all areas of life sciences.
-In the freshman year at MSUS, students acquire foundational knowledge and research skills through courses such as General Life Science and General Life Science Laboratory.
-In the sophomore year, students deepen their understanding of general life science before specializing, taking courses such as Cell Biology, The Principles of Life Sciences, Modern Life Science Laboratory, Introduction of Biomedical Science, and Physiology.
-In the junior and senior years, a wide variety of advanced courses in specialized areas are offered. These advanced courses are closely aligned with faculty research areas—structural biology, immunology, neuroscience, molecular medicine, and plant life sciences—providing students with unique opportunities to

pursue their majors in depth.

The Department also offers experimental courses at each grade level to ensure that theory-based lectures are reinforced through research participation.
-In the freshman year, General Life Science and General Life Science Laboratory are designed as complementary courses, integrating lectures and experiments to create synergy.
-In the sophomore year, The Principles of Life Sciences and Modern Life Science Laboratory are linked to provide students with a more advanced understanding of general life science.
-In the junior year, students can choose from a variety of experimental practices aligned with their interests through Modern Biology Laboratory, which reflects the research areas of the Department's faculty.
-In the senior year, students spend at least one semester in a laboratory through the Undergraduate Thesis Research course, conducting in-depth research on a specific topic while gaining experience in both theoretical analysis and cutting-edge experimental techniques.
-In addition, students at all grade levels may participate in research programs suited to their interests and abilities, under the guidance of a faculty advisor.

In line with the university's philosophy of educating a select group of talented students, the Department strives to provide a well-rounded education across diverse areas of modern life sciences by combining theory and practice.

The basic structure of the Major course offerings is summarized in the following tables.

MR (25 credits in 8 courses)
Modern Life Science Laboratory, The Principles of Life Sciences, Cell Biology, Convergence of Biology and Engineering, Modern Biology Laboratory, Biochemistry I, Molecular Biology, Undergraduate Thesis

▼

ME (27 credits)
Courses offered by the Department
Introduction of Biomedical Science, Physiology, Nobel Lecture, Microbiology, Physical Biochemistry, Genetics, Biochemistry II, Ecology and Field Study, Introduction to Molecular Evolution, Biotechnology, Basic Epigenetics, Stem Cells and Developmental Biology, Systems Biology, Modern Plant Biology, Developmental Biology, An Introduction to Brain and Behavior, Immunology, Research Participation I, Research Participation II, Cancer Biology, Clinical Pathology, Independent Research Program A-F, Special Topics in Life Sciences A-Z, as well as graduate-level courses offered by the Department.
STC courses and MR in other departments

▶ **Course Completion Guidelines by Category**

(1) For MR, students must complete 25 credits in eight designated courses.
(2) For ME, students must complete 27 credits in among the following: ME for undergraduates and graduate-level courses offered by the Department, as well as STC courses and MR from other

departments.

▶ Guidelines for Double Major and Minor

-Double Major

To complete a double major in Life Sciences, students must complete 25 credits in MR and an additional 10 credits in ME courses designated by the Department. The topic and scope of the undergraduate thesis research should be determined in consultation with the Chair of the Undergraduate Committee.

-Minor

To complete a minor in Life Sciences, students must complete 9 credits in the following required courses offered by the Department: LIFE217 (Cell Biology), LIFE319 (Biochemistry Ⅰ), and LIFE321 (Molecular Biology). In addition, they must earn 12 more credits in MR or ME courses offered by the Department, for a total of 21 credits.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Modern Life Science Laboratory(4), The Principles of Life Sciences (3), Cell Biology (3), Convergence of Biology and Engineering (3), Modern Biology Laboratory (3), Biochemistry I (3), Molecular Biology (3), Undergraduate Thesis (3)	**25**	
ME	ME offered by the Department, graduate-level courses offered by the Department, STC courses and MR offered by other departments	**27**	
FE		**15**	
Subtotal		**128**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite	Note
MR	LIFE209	Modern Life Science Laboratory	1-6-4		
	LIFE217	Cell Biology	3-0-3	General Life Science or General Life Science (H)	STC
	LIFE218	The Principles of Life Sciences	3-0-3		STC
	LIFE219	Convergence of Biology and Engineering	3-0-3		STC
	LIFE319	Biochemistry I	3-0-3	Cell Biology, The Principles of Life Sciences, Convergence of Biology and Engineering, Organic Chemistry I (CHEM221)	
	LIFE321	Molecular Biology	3-0-3	The Principles of Life Sciences	
	LIFE322	Modern Biology Laboratory	0-6-3	Modern Life Science Laboratory	
	LIFE402	Undergraduate Thesis	0-9-3	Modern Biology Laboratory, Research Participation	
ME	LIFE220	Introduction of Biomedical Science	3-0-3		
	LIFE216	Physiology	3-0-3		
	LIFE221	Nobel Lecture	3-0-3		
	LIFE303	Microbiology	3-0-3	General Life Science or General Life Science (H), Cell Biology	
	LIFE314	Physical Biochemistry	3-0-3		
	LIFE315	Genetics	3-0-3		
	LIFE320	Biochemistry Ⅱ	3-0-3		
	LIFE323	Ecology and Field Study	2-2-3	General Life Science or General Life Science (H)	
	LIFE324	Introduction to Molecular Evolution	3-0-3		
	LIFE325	Biotechnology	3-0-3		
	LIFE326	Basic Epigenetics	3-0-3		
	LIFE327	Stem Cells and Developmental Biology	3-0-3		
	LIFE414	Systems Biology	3-0-3		
	LIFE415	Modern Plant Biology	3-0-3	Cell Biology, Biochemistry I	
	LIFE417	Developmental Biology	3-0-3	Cell Biology	
	LIFE419	An Introduction to Brain and Behavior	3-0-3		
	LIFE420	Immunology	3-0-3		
	LIFE311	Research Participation I	0-6-3		
	LIFE411	Research Participation Ⅱ	0-6-3		
	LIFE424	Cancer Biology	3-0-3		
	LIFE412A-F	Independent Research Program A-F	0-2-1	General Life Science / General Life Science (H)	
	LIEF418	Clinical Pathology	3-0-3		
	LIFE451A-Z	Special Topics in Life Sciences A-Z	Varied Credits		

LIFE 412A~412F: Independent Research Program A~F(Spring and Fall Semester open)

5. Major Course List by Year and Semester

School Year	1st Semester		2nd Semester	
	Course Code	Course Title	Course Code	Course Title
Freshman	LIFE103	General Life Science	LIFE103	General Life Science
	LIFE103(H)	General Life Science (H)	LIFE103(H)	General Life Science (H)
	LIFE104	General Life Science Laboratory	LIFE104	General Life Science Laboratory
	LIFE100	Introduction to Life Sciences	LIFE100	Introduction to Life Sciences
	LIFE199	Freshman Research Participation	LIFE199	Freshman Research Participation
Sophomore	LIFE218	The Principles of Life Sciences	LIFE209	Modern Life Science Laboratory
	LIFE219	Convergence of Biology and Engineering	LIFE216	Physiology
	LIFE220	Introduction of Biomedical Science	LIFE217	Cell Biology
	LIFE221	Nobel Lecture		
Junior	LIFE322	Modern Biology Laboratory	LIFE322	Modern Biology Laboratory
	LIFE315	Genetics	LIFE303	Microbiology
	LIFE319	Biochemistry Ⅰ	LIFE320	Biochemistry Ⅱ
	LIFE323	Ecology and Field Study	LIFE321	Molecular Biology
	LIFE324	Introduction to Molecular Evolution	LIFE325	Biotechnology
			LIFE326	Basic Epigenetics
			LIFE327	Stem Cells and Developmental Biology
Senior	LIFE311/LIFE411	Research Participation Ⅰ/Research Participation Ⅱ	LIFE311/LIFE411	Research Participation Ⅰ/Research Participation Ⅱ
	LIFE402	Undergraduate Thesis	LIFE402	Undergraduate Thesis
	LIFE415	Modern Plant Biology	LIFE414	Systems Biology
	LIFE417	Developmental Biology	LIFE420	Immunology
	LIFE419	An Introduction to Brain and Behavior	LIFE424	Cancer Biology

6. Curriculum Roadmap

- Spring Entry

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
Cell Biology* The Principles of Life Sciences* Convergence of Biology & Engineering* Introduction of Biomedical Science Nobel Lecture	Modern Life Science Laboratory Physiology Cell Biology*	Modern Biology Laboratory Genetics BiochemistryI Ecology & Field Study Introduction to Molecular Evolution	Modern Biology Laboratory Microbiology BiochemistryII Molecular Biology Biotechnology Basic Epigenetcis Stem Cells and Developmental Biology	Research ParticipationI/ Research ParticipationII Undergraduate Thesis Modern Plant Biology Developmental Biology An Introduction to Brain & Behavior Immunology	Research ParticipationI/ Research ParticipationII Undergraduate Thesis Systems Biology Cancer Biology

*Independent Research Program: Spring & Fall Semester Open ※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

- Fall Entry

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
Modern Life Science Laboratory Physiology Cell Biology*	Cell Biology* The Principles of Life Sciences* Convergence of Biology & Engineering* Introduction of Biomedical Science Nobel Lecture	Modern Biology Laboratory Microbiology BiochemistryII Molecular Biology Biotechnology Basic Epigenetcis Stem Cells and Developmental Biology	Modern Biology Laboratory Genetics BiochemistryI Ecology & Field Study Introduction to Molecular Evolution	Research ParticipationI/ Research ParticipationII Undergraduate Thesis Systems Biology Cancer Biology	Research ParticipationI/ Research ParticipationII Undergraduate Thesis Modern Plant Biology Developmental Biology An Introduction to Brain & Behavior Immunology

*Independent Research Program: Spring & Fall Semester Open ※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

7. Course Description

LIFE103 – General Life Science ····· (3-0-3)

This is a foundational course covering the general principles of life sciences. It helps students understand plant and animal cells, their structure and function, genetics, growth, division, differentiation, and apoptosis. The course also explains the structure, physiology, mechanisms, and information processing of key organs in plants and animals. It aims to broaden students' perspectives by providing comprehensive basic knowledge of biological phenomena, which can then be applied in their respective scientific fields.

LIFE103(H) – General Life Science (H) ····· (3-0-3)

Designed for advanced students with a strong background in biology from high school, this course covers similar topics as LIFE103 but explores them in greater depth.

LIFE104 – General Life Science Laboratory ····· (0-2-1)

This course introduces first-year students to actively researched areas of modern biology. Students visit the laboratories of Department faculty to learn about the current research trends in the Department.

LIFE209 – Modern Life Science Laboratory ····· (1-6-4)

This course familiarizes students with fundamental experimental techniques used in cell biology research, focusing on the morphology, structure, and function of cells.

LIFE216 – Physiology ····· (3-0-3)

Living organisms exhibit a wide variety of functions. This course emphasizes understanding biological functions at the levels of organs, tissues, cells, and molecules.

LIFE217 – Cell Biology ····· (3-0-3)

Recommended Prerequisite: LIFE103 General Life Science or LIFE103(H) General Life Science (H)

This course ensures that life sciences majors acquire essential knowledge of the structure and function of eukaryotic cells and related fundamental concepts.

LIFE218 – The Principles of Life Sciences ····· (3-0-3)

The course aims to establish a foundation for students to begin biological research by addressing the fundamental concepts and principles of molecular biology, cell biology, and biochemistry—at an introductory level but from a professional perspective—necessary for understanding biological phenomena. In particular, the course seeks to develop students' ability to read and comprehend academic texts in English, as well as to present and discuss topics, through a flipped learning approach. This is intended to help students form a conceptual framework and deeper understanding of the complex phenomena of life.

LIFE219 – Convergence of Biology and Engineering ····· (3-0-3)

This course explores the limitless potential for academic and technological advancement achieved through the convergence of life sciences and adjacent fields such as medicine, science, and engineering. Students examine diverse case studies—such as brain-machine interfaces, tissue engineering, biological imaging, biomimetics, biomedical engineering, bio-architecture, and drug development—to develop an interdisciplinary mindset.

LIFE220 – Introduction of Biomedical Science ····· **(3-0-3)**

This course provides an in-depth introduction to cutting-edge biotechnology techniques—such as immune and gene therapy, stem cell therapy, animal cloning, and nano-biotechnology—and their applications in the prevention and treatment of intractable diseases including cancer, chronic hepatitis, and diabetes.

LIFE221 – Nobel Lecture ····· **(3-0-3)**

This course selects seminal papers from each subfield of life sciences that laid the groundwork for Nobel Prizes in Physiology or Medicine and Chemistry over the past 50 years. It lectures on the academic trends prior to each discovery, the competing hypotheses of the time, and the technological limitations that researchers faced. The course then moves on to analyzing the original papers together with students and discussing the characteristics of these milestone discoveries that have served as landmarks in the field of life sciences.

LIFE303 – Microbiology ····· **(3-0-3)**

Recommended Prerequisites: LIFE103 General Life Science or LIFE103(H) General Life Science (H), LIFE217 Cell Biology

This course teaches the general principles of the structure and function of microorganisms and examines the impacts of microorganisms on the environment and on humans.

LIFE311 – Research Participation I ····· **(0-6-3)**

For upper-level students interested in research areas of modern life sciences, the course provides opportunities to participate in ongoing research projects or related fields, enabling them to gain both understanding and hands-on experience in research.

LIFE314 – Physical Biochemistry ····· **(3-0-3)**

While physical chemistry deals with the world of inanimate matter, physical biochemistry is the study of the unique properties of biomolecules that enable an organism to sustain life. For life to be maintained by the collective action of countless molecules, each molecule's activity must be regulated and coordinated within the molecular assembly, with proteins playing a central role in this process. Accordingly, this course aims to help students understand the physical chemistry properties of biomacromolecules—primarily proteins—and the methods used to study their structure and function. Much of the lecture content relates to understanding biochemical knowledge at the molecular level.

LIFE315 – Genetics ····· **(3-0-3)**

This course explores the principles governing continuity and variation, which underlie the propagation of living organisms. Key topics include the mechanisms of biological change, such as mutation and selection; the principles of classical genetics; the physical and chemical basis of heredity; the structure and function of genetic material; and a molecular-level understanding of mutation, genetic function, and recombination. The course particularly emphasizes the role of genetics as a central tool in life science research.

LIFE319 – Biochemistry I ····· **(3-0-3)**

Recommended Prerequisites: LIFE209 Modern Life Science Laboratory, LIFE218 The Principles of Life Sciences, CHEM221 Organic Chemistry I

This course provides an integrated overview of biochemical principles and methods at the molecular level

to understand the biological structure and function of organisms, tissues, and cells. It examines the structure–function relationships of cellular components and covers the biochemical structure, properties, roles, and functions of biomacromolecules—including nucleic acids, proteins, carbohydrates, and lipids. In addition, the course explores the metabolic pathways, regulatory mechanisms, and signal transduction processes of these biomolecules, with particular emphasis on the structure–function relationships of proteins, their kinetics, and energy and signal conversion processes. Students also gain an understanding of advanced analytical techniques from biophysics, molecular biology, and biochemistry used to study these phenomena.

LIFE320 – BiochemistryⅡ ····· (3-0-3)

As a continuation of Biochemistry I, this course explains biological phenomena and problems at the molecular level. By learning the mechanisms underlying cellular and organismal phenomena not only phenomenologically but also mechanistically, students develop the ability to understand and interpret biological processes in depth.

LIFE321 – Molecular Biology ····· (3-0-3)

Recommended Prerequisite: LIFE218 The Principles of Life Sciences

This course covers the molecular biology of nucleic acids, including the mechanism of DNA replication; regulation of gene expression in both prokaryotic and eukaryotic cells; gene recombination techniques; and the structure, origin, and functions of cell membranes and their components.

LIFE322 – Modern Biology Laboratory ····· (0-6-3)

Recommended Prerequisite: LIFE209 Modern Life Science Laboratory

This course provides hands-on experience with experimental techniques widely used in modern biological research, including those from cell biology, molecular biology, genetics, and biochemistry. Students gain practical skills through a mini-project that integrates techniques such as gene cloning, restriction mapping, cell transformation, gene sequencing, gene detection, gene expression analysis, microscopic observation of cells, genetic crosses and genotyping, and phenotypic analysis. Students are divided into small groups of about six, each supervised by a faculty instructor. Students in each group conduct experiments, analyze the results, and present their findings.

LIFE323 – Ecology and Field Study ····· 2-2-3)

Recommended Prerequisite: LIFE103 General Life Science or LIFE103 (H) General Life Science (H)

This course introduces the phenomena and principles of ecosystems, and of communities and populations of flora and fauna, through lectures and field observations.

LIFE324 – Introduction to Molecular Evolution ····· (3-0-3)

This course explores the diversity of species and evidence of evolution—topics of fundamental interest to life scientists. In recent years, rapid advances in DNA sequencing techniques have revealed the genome sequences of a wide range of species. By examining genetic differences between species, the course investigates how diverse organisms have adapted to their environments and how their forms and lifestyles have changed over time. Many students may initially assume that there is little concrete evidence of the intermediate stages through which one species evolves into another. However, this course teaches students how to quantitatively analyze evolutionary traces found in DNA sequence comparisons between species and interpret how gene mutations have altered the functions and traits of organisms.

LIFE325 – Biotechnology ····· **(3-0-3)**

Modern biological engineering or biotechnology, which began with the advent of recombinant DNA technology, is now evolving into new forms as vast amounts of genetic information are generated through genome sequencing. These developments have given rise to interdisciplinary research that integrates diverse technologies, including efforts to identify high-value proteins by elucidating gene functions or isolating genes capable of altering biological traits (functional genomics, proteomics); personalized drug prescriptions based on individual genetic sequence differences (pharmacogenomics); discovery of new drug targets and acceleration of drug development (combinatorial chemistry, high-throughput screening); and methods for processing the overwhelming volume of biological data (bioinformatics). This course provides information on these rapidly changing trends and future prospects in biotechnology.

LIFE326 – Basic Epigenetics ····· **(3-0-3)**

The fate of a cell is determined by when, where, and how the genetic information stored in DNA is expressed. Among the mechanisms that regulate gene expression, the concept of epigenetics has emerged. Epigenetics refers to the regulation of gene transcription not through changes in the DNA nucleotide sequence, but via mechanisms such as histone modifications, non-coding RNAs, proteins, and chromatin structure—features that are transmitted to the next generation through cell division. This course provides a comprehensive basic epigenetics.

LIFE327 – Stem Cells and Developmental Biology ····· **(3-0-3)**

This course provides students with a solid understanding of the fundamental principles of developmental biology and the molecular and cellular mechanisms underlying stem cell proliferation, differentiation, and early embryonic development. It also introduces cutting-edge regenerative therapies utilizing stem cells, based on the latest research on embryonic stem cells, induced pluripotent stem cells, and adult stem cells.

LIFE402 – Undergraduate Thesis ····· **(0-9-3)**

Recommended Prerequisite: LIFE311 Research Participation Ⅰ or LIFE411 Research Participation Ⅱ

This course consists of research for the undergraduate thesis. The topic and scope of the research are determined through consultation between the student and the supervising professor.

LIFE411 – Research ParticipationⅡ ····· **(0-6-3)**

For upper-level students interested in research areas of modern life sciences, this course provides opportunities to participate in ongoing research projects or related fields, enabling them to gain both understanding and hands-on research experience.

LIFE412A–F – Independent Research Program A–F ····· **(0-2-1)**

Recommended Prerequisite: LIFE103 General Life Science or LIFE103(H) General Life Science (H)

This course is designed to help students develop and practice the processes of forming, proposing, conducting, and interpreting the results of independent and creative research ideas. Students wishing to enroll must submit their research idea to the department in advance and obtain approval from the supervising professor.

LIFE414 – Systems Biology ····· **(3-0-3)**

This course provides life sciences majors with a comprehensive and in-depth understanding of biological phenomena at the systems level. Through discussions of recent research papers, students explore the interactions and regulation of biological networks that govern the diversity and dynamics of life processes, as well as the genome, transcriptome, and proteome that constitute living organisms.

LIFE415 – Modern Plant Biology ····· (3-0-3)

Recommended Prerequisites:: LIFE217 Cell Biology, LIFE319 Biochemistry I

This course covers fundamental knowledge of the unique structures and functions of plants, recent advances in plant research, and the impact of such research on society and the environment.

LIFE417 – Developmental Biology ····· (3-0-3)

Recommended Prerequisite: LIFE217 Cell Biology

This course helps students understand the mechanisms of embryonic development in various model animals at the cellular and molecular levels. It also introduces the latest experimental techniques used in this field.

LIFE418 – Clinical Pathology ····· (3-0-3)

This course provides an in-depth understanding of major diseases through an interdisciplinary approach, covering the mechanisms of disease onset, analysis of diseases based on real clinical cases, and clinical and practical treatment methods from past to present, as well as future prospects.

LIFE419 – An Introduction to Brain and Behavior ····· (3-0-3)

Scientific understanding of the brain and behavior is advancing at a rapid pace. This course examines the interaction between the brain and behavior, exploring the nervous system through the lens of recent developments in neuroscience. Students will consider key questions about brain function and behavior, including: (1) Why do we have a brain? (2) How is our nervous system organized? (3) How do drugs affect our behavior? (4) How does the brain store memories and enable thought? This course provides an excellent introduction to neuroscience.

LIFE420 – Immunology ····· (3-0-3)

This course provides students with fundamental knowledge of the host's defensive immune system and its interactions with pathogens, enabling a deeper understanding of biological phenomena.

LIFE424 – Cancer Biology ····· (3-0-3)

The first part of this course introduces abnormal mechanisms at the genetic level and in protein transcription, such as oncogenes and tumor suppressor genes, and examines the resulting cellular changes to help students understand the aberrant mechanisms of cancer and the differences between cancer cells and normal cells. The second part covers biological knowledge related to tumors, including chemotherapy, radiotherapy, cancer metastasis, and the tumor microenvironment, and introduces the latest cancer treatment strategies for patients. Through this, students gain medical knowledge not easily accessible at the undergraduate level and learn how fundamental scientific knowledge is applied in practice.

LIFE451A–Z – Special Topics in Life Sciences A–Z ····· (Varied Credits)

This course is offered when there is a need to introduce additional lectures in response to the rapid advancements in life sciences beyond the existing courses.

Department of Materials Science and Engineering

1. Educational Goals

To educate students in the fundamental theories and principles governing material structure and properties.

To equip students with advanced knowledge and practical skills in materials technologies—including energy, information, biomedical convergence, and structural materials—as well as in materials analysis and simulation.

2. Curriculum Overview

Materials science and engineering focus on developing and applying materials across diverse engineering fields, grounded in an understanding of their manufacturing processes and intrinsic properties.

To meet future industrial demands, students must understand the fundamental theories and principles that determine material structure and properties. Accordingly, the Department has structured the curriculum to establish a solid foundation in the early years, enabling analytical understanding of material behavior in advanced courses. In later years, students take specialized courses in metallic, ceramic, semiconductor and quantum, and organic polymeric materials for systematic training in each subfield. The curriculum is organized into the following five areas:

Basic Materials Science:
This field forms the foundation for understanding and designing engineering materials. Introductory courses cover the background and structure of advanced materials, and students study materials chemistry, materials physics, and phase equilibria to synthesize materials and understand their properties. They also learn characterization techniques and numerical analysis methods to measure and interpret material properties.

Metallic Materials:
This field focuses on manufacturing processes and the mechanical, physical, and chemical properties of metals, based on crystal structure, microstructure, and phase transformations. Topics include alloy design and metal 3D printing to develop materials tailored for specific applications.

Ceramic Materials:
This field examines ionically bonded ceramics used in batteries, semiconductors, structural components, ferroelectrics, optics, and sensors. Emphasis is placed on structure, bonding, properties, processing, and phase transitions.

Semiconductor and Quantum Materials:
This field develops understanding of electronic materials and devices, emphasizing semiconductor physics, operating principles, device fabrication, and applications in electronic and optoelectronic systems.

Organic Polymeric Materials:
This field deepens students' understanding of polymers, focusing on synthesis, structure–property relationships, and their applications in the emerging electrical and biomedical fields.

▶ Guidelines for Double Major and Minor

- Double Major: Students must complete **19 credits** in MR and 6 credits in DME, plus additional courses approved as ME, for a total of 35 credits. Credits earned in the same course may be double-counted toward both the primary major and the double major.

- Minor: Students must complete **15 credits** in MR and two introductory courses (6 credits) in DME, excluding Undergraduate Research I and II, for a total of 21 credits. Credits earned in the same course may not be double-counted toward both the primary major and the minor.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life Ⅰ (0.5) and Ⅱ (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus Ⅰ (3) and Ⅱ (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab Ⅰ (1)	7	
	General Chemistry Ⅰ (3), General Chemistry Lab Ⅰ (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry Ⅱ (3), General Chemistry Lab Ⅱ (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Fundamentals of Materials Science and Engineering (3), Thermodynamics of Materials (3), Structure of Materials (3), Materials Chemistry (3), Physics of Materials (3): 15 credits	**25**	
	Senior Research Project Ⅰ (2) and Ⅱ (2): 4 credits		
	Choose two: Introduction to Metallic Materials (3), Introduction to Ceramic Materials (3), Introduction to Polymer Materials (3), Introduction to Semiconductor Materials and Devices (3): 6 credits		
ME	More than 16 credits in ME offered by the Department All STC courses and MR from other departments	**32**	
FE		**10**	
Subtotal		**128**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.
※ English Program: Placement in Tier 1 is required.
※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note
MR	AMSE201	Fundamentals of Materials Science and Engineering (STC)	3-1-3	STC
	AMSE205	Thermodynamics of Materials	3-0-3	
	AMSE207	Materials Chemistry	3-0-3	
	AMSE208	Structure of Materials (STC)	3-0-3	STC
	AMSE313	Physics of Materials	3-0-3	
	AMSE499I	Senior Research Project Ⅰ	0-0-2	
	AMSE499II	Senior Research Project Ⅱ	0-0-2	
DME	AMSE321	Introduction to Metallic Materials	3-0-3	Choose two
	AMSE341	Introduction to Ceramic Materials	3-0-3	
	AMSE361	Introduction to Polymer Materials	3-0-3	
	AMSE388	Introduction to Semiconductor Materials and Devices	3-0-3	
BEE	AMSE100	Introduction to Materials Science & Engineering	1-0-1	
	AMSE199	Freshman Research Participation	0-2-1	

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note
ME	AMSE211	Materials Design (STC)	3-0-3	STC
	AMSE213	Mechanical Properties of Materials	3-0-3	
	AMSE301	Materials Laboratory	1-4-3	
	AMSE315	Phase Equilibrium and Transformation	3-0-3	
	AMSE318	Numerical Analysis for Materials	3-0-3	
	AMSE344	Ceramics Design and Laboratory	0-6-3	
	AMSE399	Research Participation A-D	0-2-1	
	AMSE401	Long-term Field Training	Up to 12 credits	Up to 9 credits may be counted toward graduation (including the POSTECH approved field training courses: 3 ME credits and 6 FE credits).
	AMSE405	Integrated Design of Materials and Processes Ⅲ	0-0-2	
	AMSE406	Integrated Design of Materials and Processes Ⅳ	0-0-2	
	AMSE407	Materials Analysis and Characterization	3-0-3	
	AMSE412	Nanoscience and Nanotechnology	3-0-3	
	AMSE414	Energy Materials	3-0-3	
	AMSE416	Biomedical Materials	3-0-3	
	AMSE421	Deformation Processing	3-0-3	
	AMSE422	Advanced Technology for Steels	3-0-3	
	AMSE423	Metallic Materials Lab	0-6-3	
	AMSE441	Electroceramics: Electrical Properties of Ceramics	3-0-3	
	AMSE452	Optoelectronic Devices	3-0-3	
	AMSE463	Polymer Design and Laboratory	0-6-3	
	AMSE464	Polymer Properties and Applications	3-0-3	
	AMSE481	Electronic Devices	3-0-3	
	AMSE483	Electronic Materials Laboratory	0-6-3	
	AMSE484	Electronic Circuits for Materials Science and Engineering	3-0-3	
	AMSE490	Special Topics in Materials Science and Engineering A-Z	Varied Credits	

5. Course List by Specialized Field within the Major

Subfield	Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
Common	BEE	AMSE100	Introduction to Materials Science & Engineeringing	1-0-1
	BEE	AMSE199	Freshman Research Participation	0-2-1
	MR	AMSE201	Fundamentals of Materials Science and Engineering (STC)	3-1-3
	MR	AMSE205	Thermodynamics of Materials	3-0-3
	MR	AMSE207	Materials Chemistry	3-0-3
	MR	AMSE208	Structure of Materials (STC)	3-0-3
	ME	AMSE211	Materials Design (STC)	3-0-3
	ME	AMSE213	Mechanical Properties of Materials	3-0-3
	ME	AMSE301	Materials Laboratory	1-4-3
	MR	AMSE313	Physics of Materials	3-0-3
	ME	AMSE315	Phase Equilibrium and Transformation	3-0-3
	ME	AMSE318	Numerical Analysis for Materials	3-0-3
	ME	AMSE399	Research Participation A-D	0-2-1
	ME	AMSE401	Long-term Field Training	Up to 12 credits
	ME	AMSE405	Integrated Design of Materials and Processes Ⅲ	0-0-2
	ME	AMSE406	Integrated Design of Materials and Processes Ⅳ	0-0-2
	ME	AMSE407	Materials Analysis and Characterization	3-0-3
	ME	AMSE412	Nanoscience and Nanotechnology	3-0-3
	ME	AMSE414	Energy Materials	3-0-3
	ME	AMSE490	Special Topics in Materials Science and Engineering A-Z	Varied Credits
	MR	AMSE499Ⅰ	Senior Research Project Ⅰ	0-0-2
	MR	AMSE499Ⅱ	Senior Research Project Ⅱ	0-0-2
Metal Materials	DME	AMSE321	Introduction to Metallic Materials	3-0-3
	ME	AMSE421	Deformation Processing	3-0-3
	ME	AMSE422	Advanced Technology for Steels	3-0-3
	ME	AMSE423	Metallic Materials Lab	0-6-3
Ceramic Semiconductor Materials	DME	AMSE341	Introduction to Ceramic Materials	3-0-3
	ME	AMSE344	Ceramics Design and Laboratory	0-6-3
	DME	AMSE388	Introduction to Semiconductor Materials and Devices	3-0-3
	ME	AMSE441	Electroceramics: Electrical Properties of Ceramics	3-0-3
	ME	AMSE452	Optoelectronic Devices	3-0-3
	ME	AMSE481	Electronic Devices	3-0-3
	ME	AMSE483	Electronic Materials Laboratory	0-6-3
	ME	AMSE484	Electronic Circuits for Materials Science and Engineering	3-0-3
Polymeric Materials	DME	AMSE361	Introduction to Polymer Materials	3-0-3
	ME	AMSE416	Biomedical Materials	3-0-3
	ME	AMSE463	Polymer Design and Laboratory	0-6-3
	ME	AMSE464	Polymer Properties and Applications	3-0-3

6. [MSE] Major Curriculum Roadmap

- Spring-entry students

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
AMSE201 Fundamentals of Materials Science and Engineering* AMSE208 Structure of Materials* AMSE211 Materials Design*	AMSE205 Thermodynamics of Materials AMSE207 Materials Chemistry AMSE213 Mechanical Properties of Materials	AMSE313 Physics of Materials AMSE341 Introduction to Ceramic Materials AMSE321 Introduction to Metallic Materials AMSE315 Phase Equilibrium and Transformation AMSE399A-D Research Participation A-D	AMSE361 Introduction to Polymer Materials AMSE388 Introduction to Semiconductor Materials and Devices AMSE301 Materials Laboratory AMSE318 Numerical Analysis for Materials AMSE344 Ceramics Design and Laboratory AMSE399A-D Research Participation A-D	AMSE499I/499II Senior Research Project Ⅰ/Ⅱ AMSE412 Nanoscience and Nanotechnology AMSE414 Energy Materials AMSE423 Metallic Materials Lab AMSE452 Optoelectronic Devices AMSE481 Electronic Devices AMSE463 Polymer Design and Laboratory AMSE464 Polymer Properties and Applications AMSE401 Long-term Field Training	AMSE499I/499II Senior Research Project Ⅰ/Ⅱ AMSE407 Materials Analysis and Characterization AMSE416 Biomedical Materials AMSE441 Electroceramics: Electrical Properties of Ceramics AMSE483 Electronic Materials Laboratory AMSE484 Electronic Circuits for Materials Science and Engineering AMSE401 Long-term Field Training

※ MR(Major Requirements): red, DME(Designated Major Electives): blue, ME(Major Electives): black, STC course: * mark

- Fall-entry students

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
AMSE205 Thermodynamics of Materials AMSE207 Materials Chemistry AMSE213 Mechanical Properties of Materials	AMSE201 Fundamentals of Materials Science and Engineering* AMSE208 Structure of Materials* AMSE211 Materials Design*	AMSE361 Introduction to Polymer Materials AMSE388 Introduction to Semiconductor Materials and Devices AMSE301 Materials Laboratory AMSE318 Numerical Analysis for Materials AMSE344 Ceramics Design and Laboratory AMSE399A-D Research Participation A-D	AMSE313 Physics of Materials AMSE341 Introduction to Ceramic Materials AMSE321 Introduction to Metallic Materials AMSE315 Phase Equilibrium and Transformation AMSE399A-D Research Participation A-D	AMSE499I/499II Senior Research Project Ⅰ/Ⅱ AMSE407 Materials Analysis and Characterization AMSE416 Biomedical Materials AMSE441 Electroceramics: Electrical Properties of Ceramics AMSE483 Electronic Materials Laboratory AMSE484 Electronic Circuits for Materials Science and Engineering AMSE401 Long-term Field Training	AMSE499I/499II Senior Research Project Ⅰ/Ⅱ AMSE412 Nanoscience and Nanotechnology AMSE414 Energy Materials AMSE423 Metallic Materials Lab AMSE452 Optoelectronic Devices AMSE481 Electronic Devices AMSE463 Polymer Design and Laboratory AMSE464 Polymer Properties and Applications AMSE401 Long-term Field Training

※ MR(Major Requirements): red, DME(Designated Major Electives): blue, ME(Major Electives): black, STC course: * mark

7. Approved ME Offered by Other Departments

- Students must complete more than 16 credits in ME offered by the Department.
- All STC courses and MR from other departments are accepted.

8. Course Description

AMSE100 – Introduction to Materials Science & Engineering ····· (1-0-1)

This course introduces the role of materials science and engineering in the advancement of future science and technology. It provides an overview of key research areas, including basic materials science, ceramic materials, semiconductor and quantum materials, organic polymeric materials, and metallic materials.

AMSE199 – Freshman Research Participation ····· (0-2-1)

This course allows first-year students in the Mueunjae School of Undergraduate Studies to participate in ongoing research projects in the Department or engage in activities in laboratories of their interest. Through this experience, students gain a broader understanding of materials science and engineering and are exposed to research activities.

AMSE201 – Fundamentals of Materials Science and Engineering ····· (3-1-3)

Recommended Prerequisites: General Physics, General Chemistry

This course helps students understand the connection between advances in modern science and technology and the development of materials science. It provides an accessible introduction to the fundamental principles and applications of materials science.

AMSE205 – Thermodynamics of Materials ····· (3-0-3)

This course builds a foundation for understanding and predicting the equilibrium states of materials by deriving and understanding the fundamental thermodynamic relations. Students also learn basic concepts of statistical thermodynamics. The course applies the laws and concepts of thermodynamics to equilibrium phase diagrams, phase transformations, and the equilibria of multi-phase and multi-component systems, and introduces thermodynamic applications in material manufacturing and development.

AMSE207 – Materials Chemistry ····· (3-0-3)

This course covers chemical principles related to the structure and properties of matter, starting from atoms and molecules and extending to solid and liquid compounds. Students learn the chemical structures, synthesis, and properties of various materials, as well as their applications in fields such as electronics, energy, and biotechnology. The course also introduces chemical principles underlying materials highlighted in recent research trends.

AMSE208 – Structure of Materials ····· (3-0-3)

This course aims to establish a solid foundation on the close relationship between crystal structures and materials properties, covering core concepts such as crystal lattice, crystal symmetry (point groups/space groups), crystal stereography, and defects in materials. Furthermore, the concept of reciprocal space is introduced to develop the ability to interpret real-space crystal structures through reciprocal-space

diffraction patterns.

AMSE211 – Materials Design ····· **(3-0-3)**

Students learn key concepts in materials analysis, synthesis, and applications through lectures and hands-on exercises, working in groups of two to four under the guidance of assigned teaching assistants.

AMSE213 – Mechanical Properties of Materials ····· **(3-0-3)**

This course provides an introduction to the mechanical properties of materials, covering stress and strain states, theories of plastic deformation in single and polycrystals, and dislocation theory. Students learn how crystallographic plasticity theories and microstructural interactions underpin material strengthening and fracture. In addition, they study mechanical property testing methods—including tensile, compressive, torsion, bending, and nano-indentation tests—through digital twin virtual experiments using Finite Element Method (FEM) computer simulation.

AMSE301 – Materials Laboratory ····· **(1-4-3)**

This laboratory course helps students majoring in materials science and engineering understand the fundamental concepts learned in introductory and required courses. Experiments include studies of microstructure, tensile testing, and electron microscopy, as well as experiments related to the electronic, optical, and magnetic properties of materials, reinforcing the theoretical foundations of materials science.

AMSE313 – Physics of Materials ····· **(3-0-3)**

Understanding the electrical, optical, magnetic, and electrochemical properties of materials begins with an understanding of atomic and electronic structure. This course provides fundamental knowledge of the energy structure and distribution of electrons in solids with periodic atomic arrangements, along with an introduction to basic electron transport. It lays the foundation for understanding various physical phenomena in materials and their application in engineering devices.

AMSE315 – Phase Equilibrium and Transformation ····· **(3-0-3)**

Recommended Prerequisite: Thermodynamics of Materials

This course aims to provide an understanding of microstructural evolution and phase transformations in materials across multiple temporal and spatial scales. It examines critical phase transition processes in polycrystalline materials based on thermodynamics, solid-state diffusion theory, and the structure and properties of interfaces. Students learn to describe nucleation and growth processes during material synthesis using scientific terminology.

AMSE318 – Numerical Analysis for Materials ····· **(3-0-3)**

This course develops students' ability to solve mathematical problems encountered in theoretical materials engineering through numerical computation using computers. Students acquire the fundamental principles of numerical analysis and apply them to practical problems through hands-on exercises.

AMSE321 – Introduction to Metallic Materials ····· **(3-0-3)**

The objective of this course is to provide students with not only the fundamentals of physical metallurgy, emphasizing the structure-property relationships, but also essential concepts for the materials design of engineering alloys. This course offers a solid foundation in metallic materials, covering the basics of crystal structures, thermodynamics, defects, deformation and strengthening mechanisms, phase

equilibrium and phase transformations, along with representative case studies. Furthermore, this course introduces various metal manufacturing processes and explores the materials design principles of key engineering alloys, including hydrogen energy materials, steels and non-ferrous metals.

AMSE341 – Introduction to Ceramic Materials ····· (3-0-3)

Recommended Prerequisite: Fundamentals of Materials Science and Engineering

This course covers the fundamental science of ceramic materials. It provides a broad introduction to key concepts including crystal structures, chemical bonding, physical properties, defects, and electrical, magnetic, and optical characteristics of ceramics, as well as an overview of major application fields.

AMSE344 – Ceramics Design and Lab ····· (0-6-3)

This course covers various synthesis processes of ceramic materials and measurement of their properties. Through this, students systematically study the characteristics of diverse ceramic substances and the effects of processes on them. Through these experiments and measurements, students learn about process and plant design to realize ceramic properties. Furthermore, through experiments on ceramic materials processes, we gain practical experience with various actual ceramic materials.

AMSE361 – Introduction to Polymer Materials ····· (3-0-3)

Polymer science profoundly impacts our daily lives, with polymers being indispensable in plastics, packaging, electronics, and biotechnology. This course focuses on the fundamental principles of polymer science, covering basic polymerization methods, reaction kinetics, analytical techniques, and the physical chemistry of polymers in solution and solid states. Topics include polymer chain structure, polymer reactions, solution thermodynamics, analysis, crystalline structures, and mechanical properties.

AMSE388 – Introduction to Semiconductor Materials and Devices ····· (3-0-3)

This course introduces semiconductor properties and the fundamental operating principles of semiconductor devices. Topics include crystal structure and bonding; band structure; carrier statistics (electron and hole concentrations), doping, and concentration control; charge transport by drift and diffusion; excess-carrier generation and recombination; formation and electrostatics of p–n junctions; diode current–voltage (I–V) characteristics; and semiconductor heterojunctions.

AMSE399 A-D – Research Participation A-D ····· (0-2-1)

Through direct participation in research within individual laboratories, undergraduate students gain research experience and learn about current research trends.

AMSE401 – Long-term Field Training ····· (0-0-12)

This course provides students with an opportunity to actively explore their research interests through an extended internship during a regular semester.

※ Internship participation period: At least 16 weeks

※ Up to 9 credits may be counted toward graduation (including POSTECH-approved field training courses: 3 ME credits and 6 FE credits).

AMSE405 – Integrated Design of Materials and Processes Ⅲ ····· (0-0-2)

In this team-based course, students select research topics of interest and, under the guidance of a faculty advisor, develop creative problem-solving skills related to materials and processes.

AMSE406 – Integrated Design of Materials and Processes IV ····· (0-0-2)

In this team-based course, students select research topics of interest and, under the guidance of a faculty advisor, develop creative problem-solving skills related to materials and processes.

AMSE407 – Materials Analysis and Characterization ····· (3-0-3)

This course introduces the principles and applications of various instruments used for analyzing the composition and structure of materials, supplemented by laboratory tours. Topics include spectroscopic analyses (AAS, ICP, FT-IR, Raman, Mössbauer), mass spectrometry, X-ray techniques (XRD, XRF), electron microscopy (TEM, SEM) with compositional and structural analyses (EDS, EELS), thermal analysis, and surface analysis methods (Auger, XPS, SIMS).

AMSE412 – Nanoscience and Nanotechnology ····· (3-0-3)

This course provides a comprehensive understanding of nanomaterials and nanoscience, highlighting key challenges and emerging issues. Students learn both the general principles of materials in the macroscopic world and the novel principles that emerge at the nanometer scale. The course covers the general principles of the electrical and optical properties of nanomaterials and introduces a variety of application examples and possibilities based on these principles.

AMSE414 – Energy Materials ····· (3-0-3)

Designed for junior and senior undergraduates, this course introduces various materials used in electrochemical energy conversion and storage. Topics include electrode and electrolyte materials for energy conversion systems such as fuel cells and water electrolysis, and for energy storage systems such as secondary batteries and Power-to-Gas (P2G) systems. Students gain an understanding of current research trends in electrochemical energy conversion and storage materials.

AMSE416 – Biomedical Materials ····· (3-0-3)

This course provides a molecular-level understanding of the fundamental concepts of advanced biomedical materials—composed of organic and inorganic components—used in the biomedical and healthcare fields. Lectures approach the subject from materials engineering, chemical, physicochemical, and biomedical engineering perspectives, and introduce current trends in the research and development of cutting-edge healthcare systems utilizing biomedical materials.

AMSE421 – Deformation Processing ····· (3-0-3)

Recommended Prerequisite: Mechanical Properties of Materials

After covering the fundamental theories of plastic deformation, this course explains the phenomena that occur in various processing methods, including forging, rolling, extrusion, and drawing. Students also learn about liquid-phase and powder metallurgy processes, and gain insight into industrial applications of these processes through site visits to manufacturing facilities.

AMSE422 – Advanced Technology for Steels ····· (3-0-3)

Recommended Prerequisites: Thermodynamics, Introduction to Metallic Materials

This course provides a broad introduction to the manufacturing processes of steel materials. Topics include the thermodynamics, reaction kinetics, solidification, phase transformations, and electrochemistry relevant to these processes, as well as a comprehensive understanding of advanced steel alloys and their applications.

AMSE423 – Metallic Materials Lab ····· (0-6-3)

In this laboratory course, students apply knowledge from Introduction to Metallic Materials to gain hands-on experience with processes spanning from raw materials to final products for representative metals (steel, titanium alloys, aluminum alloys, and high-entropy alloys). Experiments cover alloy design, manufacturing, post-processing, and property evaluation, with macroscopic and microscopic observation of physical and microstructural changes at each stage. Students perform metal 3D printing (additive manufacturing) and apply analytical and inspection techniques—including OM, SEM, compositional analysis (EDS, WDS), structural analysis (XRD), and mechanical property testing (micro-indentation, tensile testing)—to fabricated materials, comparing and analyzing results against theoretical concepts.

AMSE441 – Electroceramics: Electrical Properties of Ceramics ····· (3-0-3)

Recommended Prerequisite: Introduction to Ceramic Materials

This course provides an introduction to the types, properties, and applications of electroceramics. Topics include ceramic materials for energy applications (such as secondary batteries and thermoelectric materials), dielectric capacitors, piezoelectric materials, and ferroelectric materials. Students study how material composition, manufacturing processes, and microstructures influence the properties of materials and their applications in devices.

AMSE452 - Optoelectronic Devices ····· (3-0-3)

This course covers the fundamental concepts of light as an electromagnetic wave and its interactions with materials. Through basic explanations of quantum mechanics and semiconductor theory, students learn how the optical properties of materials are applied in optoelectronic devices—such as LEDs, lasers, solar cells, and photodetectors—and how these devices are transforming modern technology.

AMSE463 – Polymer Design and Laboratory ····· (0-6-3)

In this laboratory course, students synthesize polymers and analyze their composition, molecular weight, structure, and thermal properties to deepen their understanding of organic and bio-based materials. Experiments include thin-film formation, device fabrication, and analysis of polymer light-emitting materials, as well as characterization of the nanostructures of crystalline organic materials and block copolymers using small-angle X-ray scattering and AFM.

AMSE464 – Polymer Properties and Applications ····· (3-0-3)

This course focuses on the correlations between polymer structure and properties. It examines the diverse physical behaviors of polymers in solution, solid, and liquid states through thermodynamic and molecular modeling approaches. Emphasis is placed on developing a deep understanding of the viscoelastic, mechanical, and electrical properties of polymers.

AMSE481 - Electronic Devices ····· (3-0-3)

This course covers the operating principles of silicon-based semiconductor devices, including MOS capacitors and MOSFETs, as well as the unit processes and integration techniques required for semiconductor device fabrication. Students learn the principles of logic and memory semiconductor devices using MOSFETs, as well as the operating principles of next-generation memory semiconductor devices.

AMSE483 – Electronic Materials Laboratory ····· (0-6-3)

This laboratory course provides students interested in specializing in electronic and optoelectronic materials and devices—key industries in Korea—with hands-on experience in micro- and nano-device fabrication processes. Through these experiments, students gain knowledge of various fabrication techniques, develop motivation for advanced study in the field, and acquire foundational skills to effectively adapt to industrial settings and engage in related research activities.

AMSE484 – Electronic Circuits for Materials Science and Engineering ····· (3-0-3)

This course is designed to provide students with fundamental knowledge of electronic circuits and devices essential for materials science and engineering. Students will gain hands-on experience with basic concepts in circuit design, programming, experimental design, and data analysis.

AMSE490 A–Z – Special Topics in Materials Science and Engineering A–Z ····· (Varied Credits)

This course is offered when needed to address rapidly evolving topics in materials science beyond the scope of regular courses.

AMSE499Ⅰ – Senior Research Project Ⅰ ····· (0-0-2)

Through individual or group research projects on selected topics, students apply undergraduate knowledge and develop skills and foundational competencies for their research.

AMSE499Ⅱ – Senior Research Project Ⅱ ····· (0-0-2)

Through individual or group research projects on selected topics, students apply undergraduate knowledge and develop skills and foundational competencies for their research.

Department of Mechanical Engineering

1. Educational Goals

Fostering global leaders who will drive innovation in future mechanical engineering through creative research and interdisciplinary thinking.

2. Curriculum Overview

Mechanical engineering is a creative discipline that transforms scientific discoveries into practical technologies, forming the foundation of future innovations where physics, data, and intelligence converge. It builds upon the principles of physics and mathematics to analyze complex systems and to design, fabricate, and control them in order to solve the engineering challenges faced by humanity and society.

The Department of Mechanical Engineering integrates scientific depth with engineering application to lead cutting-edge research in intelligent robotics, aerospace engineering, micro–nano systems, bio–medical engineering, sustainable energy, and AI-driven design and manufacturing. The curriculum combines rigorous core courses that cover the fundamental theories of mechanical engineering, experimental methods, numerical analysis, and data-driven design, with a diverse set of electives that allow students to deepen their expertise and develop interdisciplinary competence.

Students gain hands-on experience using state-of-the-art experimental facilities and computational infrastructure to define and solve real-world problems. Through creative capstone design, industry–academic collaboration, and international research programs, they cultivate both scientific insight and engineering creativity.
Through this education and research environment, the Department of Mechanical Engineering nurtures the next generation of innovative engineers equipped with scientific thinking and visionary imagination.

▶ Guidelines for Double Major and Minor

-Double Major: Complete at least 37 credits, including 22 credits in MR, 12 credits in DME, and at least 3 credits in ME.

-Minor: Complete at least 21 credits in MR and DME.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	At least 22 credits in MR, and 12 credits in DME	34	DME: 3 credits in a mathematics course and 9 credits in MR
ME	At least 10 credits in ME offered by the Department, Up to 15 credits in MR, Approved ME, Intensive AI courses, or STC courses offered by other departments	25	At least 10 credits in ME offered by the Department
FE		**9**	
Subtotal		**129**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category		Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
BEE		MECH100	Introduction to Mechanical Engineering	1-0-1	
		MECH199	Freshman Research Participation	0-2-1	
MR		MECH203	Computer Aided Drawing and Fabrication	2-2-3	
		MECH211	Dynamics	3-0-3	General Physics I
		MECH240	Solid Mechanics (STC)	3-1-3	General Physics I
		MECH244	Mechanical Behaviors and Processing of Materials	3-0-3	
		MECH250	Thermodynamics (STC)	3-1-3	General Physics I
		MECH370	Fluid Mechanics	3-1-3	Differential Equations
		MECH434	System Design: Capstone Design	3-2-4	Solid Mechanics
DME	Mathematics	MATH200	Differential Equations (offered by Department of Mathematics, STC)	3-1-3	
		MATH203	Applied Linear Algebra (offered by Department of Mathematics, STC)	3-1-3	
		MECH303	Engineering Mathematics	3-0-3	
	Major	MECH280	Sensors and Measurement	2-3-3	
		MECH311	Mechanical Vibrations	3-0-3	Solid Mechanics
		MECH323	System Control	3-1-3	Recommended: Mechanical Vibrations
		MECH330	Materials Processing	3-0-3	
		MECH371	Heat Transfer	3-1-3	Fluid Mechanics
		MECH381	Electronics for Mechanical Engineers	2-2-3	
ME		MECH305	Introduction to Numerical Methods in Mechanical Engineering	3-0-3	
		MECH340	Applied Solid Mechanics	3-1-3	Solid Mechanics
		MECH361	Introduction to Biomedical Engineering	3-0-3	
		MECH399A-D	Research Participation A-D	0-2-1	
		MECH401	Strength of Materials	3-0-3	Materials Processing
		MECH403	Introduction to Nanoscale Science and Engineering	3-0-3	
		MECH421	Introduction to MEMS	3-1-3	
		MECH423	Biomaterials and Biofabrication Methods	3-0-3	
		MECH424	Biomedical Device: Engineering for Diagnostics and Therapeutics	3-0-3	
		MECH427	Optics and Microscopy	3-0-3	
		MECH437	Artificial Intelligence for Mechanical Engineering	3-0-3	
		MECH439	Introduction to Robotics	3-1-3	
		MECH441	Metal Forming	3-0-3	Materials Processing
		MECH450	Applied Thermal Engineering	3-0-3	
		MECH451	Energy Systems	3-0-3	
		MECH465	Engineering of Creative Design	3-0-3	
		MECH467	Introduction to Appropriate Technology	3-0-3	
		MECH470	Applied Fluid Mechanics	3-0-3	Fluid Mechanics
		MECH471	Aerodynamics	3-0-3	
		MECH478	Introduction to Turbomachinery	3-0-3	Fluid Mechanics
		MECH490A-Z	Special Topics in Mechanical Engineering A-Z	Varied Credits	G, S/U
		MECH496	Combustion and Environment	3-0-3	Thermodynamics, Fluid Mechanics

5. Table of Major Courses by Year and Semester

○ Spring Semester

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
GER/GEE	GER/GEE	GER/GEE	GER/GEE	GER/GEE	GER/GEE
Dynamics MECH211	Differential Equations STC MATH200	Mechanical Vibrations MECH311	Mechanical Behaviors and Processing of Materials MECH244	System Design: Capstone Design MECH434	System Control MECH323
Thermo dynamics STC MECH250	Applied Linear Algebra STC MATH203	Deformation Processing MECH330	Fluid Mechanics MECH370		System Design: Capstone Design MECH434
Sensors and Measurement MECH280	Computer-Aided Drawing and Fabrication MECH203	Heat Transfer MECH371	Engineering Mathematics MECH303		
	Solid Mechanics STC MECH240		Electronics for Mechanical Engineers MECH381		

Major Electives				
	INTN300 MECH305 MECH340 MECH361 MECH399A-D MECH401	MECH403 MECH421 MECH423 MECH424 MECH427 MECH437	MECH439 MECH441 MECH450 MECH451 MECH465 MECH467	MECH470 MECH471 MECH478 MECH490 MECH496

※ MR(Major Requirements): Red, ME(Major Electives): Blue

○ Fall Semester

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
GER/GEE	GER/GEE	GER/GEE	GER/GEE	GER/GEE	GER/GEE
Differential Equations STC MATH200	Dynamics MECH211	Mechanical Behaviors and Processing of Materials MECH244	Mechanical Vibrations MECH311	System Control MECH323	System Design:Capstone Design MECH434
Applied Linear Algebra STC MATH203	Thermo dynamics STC MECH250	Fluid Mechanics MECH370	Deformation Processing MECH330	System Design:Capstone Design MECH434	
Computer-Aided Drawing and Fabrication MECH203	Sensors and Measurement MECH280	Engineering Mathematics MECH303	Heat Transfer MECH371		
Solid Mechanics STC MECH240		Electronics for Mechanical Engineers MECH381			

Major Electives				
	INTN300 MECH305 MECH340 MECH361 MECH399A-D MECH401	MECH403 MECH421 MECH423 MECH424 MECH427 MECH437	MECH439 MECH441 MECH450 MECH451 MECH465 MECH467	MECH470 MECH471 MECH478 MECH490 MECH496

※ MR(Major Requirements): Red, ME(Major Electives): Blue

6. Undergraduate Major Track Guide — Department of Mechanical Engineering

○ Spring Semester

Category		Year 2		Year 3		Year 4	
		Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
Micro-Nano Engineering	Recommended Requirements	• MATH200/MATH203 • MECH203 • MECH240	• MECH211 • MECH250 • MECH280	• MECH244 • MECH370 • MECH381	• MECH330	• MECH434	• MECH434
	Recommended Electives			• MECH303	• MECH311 • MECH371 • MECH340	• MECH323 • MECH403	• MECH421
Biomedical Engineering	Recommended Requirements	• MATH200/MATH203 • MECH203 • MECH240	• MECH211 • MECH250 • MECH280	• MECH244 • MECH370 • MECH303	• MECH330	• MECH434	• MECH434
	Recommended Electives			• MECH381 • MECH361 • MECH424	• MECH311 • MECH371	• MECH423 • MECH427	• MECH503 • MECH528
Robot, Control, Mobility	Recommended Requirements	• MATH200/MATH203 • MECH203 • MECH240	• MECH211 • MECH250 • MECH280	• MECH244 • MECH370 • MECH381	• MECH311	• MECH434 • MECH323	• MECH434
	Recommended Electives			• MECH303	• MECH330 • MECH371	• MECH437 • MECH439	• MECH528
Thermo,Fluid & Energy Engineering	Recommended Requirements	• MATH200/MATH203 • MECH203 • MECH240	• MECH211 • MECH250	• MECH244 • MECH370	• MECH371	• MECH434	• MECH434
	Recommended Electives		• MECH280	• MATH203 • MECH303 • MECH381	• MECH305 • MECH451 • PHYS304 • AMSE205	• MECH450 • MECH470 • CHEB417 • AMSE414	• MECH471 • MECH505 • MECH686 • CHEB418
Aerospace Engineering	Recommended Requirements	• MATH200 • MECH240 • MECH203	• MECH211 • MECH250	• MECH244 • MECH370	• MECH371 • MECH490Q	• MECH434	• MECH434 • MECH471
	Recommended Electives		• MECH280	• MATH203 • MECH303	• MECH305 • MECH496	• MECH323 • CHEB417 • MECH478	• MECH505 • MECH686 • CHEB418

※ MR(Major Requirements): Red, ME(Major Electives): Blue

○ Fall Semester

Category		Year 2		Year 3		Year 4	
		Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
Micro-Nano Engineering	Recommended Requirements	• MECH211 • MECH250 • MECH280	• MATH200/MATH203 • MECH203 • MECH240	• MECH330	• MECH244 • MECH370 • MECH381	• MECH434	• MECH434
	Recommended Electives			• MECH311 • MECH371 • MECH340	• MECH303	• MECH421	• MECH323 • MECH403
Biomedical Engineering	Recommended Requirements	• MECH211 • MECH250 • MECH280	• MATH200/MATH203 • MECH203 • MECH240	• MECH330	• MECH244 • MECH370 • MECH303	• MECH434	• MECH434
	Recommended Electives			• MECH311 • MECH371	• MECH381 • MECH361 • MECH424	• MECH503 • MECH528	• MECH423 • MECH427
Robot, Control, Mobility	Recommended Requirements	• MECH211 • MECH250 • MECH280	• MATH200/MATH203 • MECH203 • MECH240	• MECH311	• MECH244 • MECH370 • MECH381	• MECH434	• MECH434 • MECH323
	Recommended Electives			• MECH330 • MECH371	• MECH303	• MECH528	• MECH437 • MECH439
Thermo,Fluid & Energy Engineering	Recommended Requirements	• MECH211 • MECH250	• MATH200/MATH203 • MECH203 • MECH240	• MECH371	• MECH244 • MECH370	• MECH434	• MECH434
	Recommended Electives	• MECH280		• MECH305 • MECH451 • PHYS304 • AMSE205	• MATH203 • MECH303 • MECH381	• MECH471 • MECH505 • MECH686 • CHEB418	• MECH450 • MECH470 • CHEB417 • AMSE414
Aerospace Engineering	Recommended Requirements	• MECH211 • MECH250	• MATH200 • MECH240 • MECH203	• MECH371 • MECH490Q	• MECH244 • MECH370	• MECH434 • MECH471	• MECH434
	Recommended Electives	• MECH280		• MECH305 • MECH496	• MATH203 • MECH303	• MECH505 • MECH686 • CHEB418	• MECH323 • CHEB417 • MECH478

※ MR(Major Requirements): Red, ME(Major Electives): Blue

7. Approved ME Offered by Other Departments: Students Enrolled in 2018 or Later

Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note
MATH313	Introduction to Partial Differential Equations	3-0-3	
MATH342	Engineering Mathematics	3-1-3	
MATH443	Mathematical Modeling	3-0-3	
MATH451	Applied Numerical Analysis	3-0-3	
PHYS209	Mathematical Methods for Physics	3-1-3	
PHYS401	Solid State Physics	3-0-3	
PHYS410	Optical Physics	3-0-3	
AMSE416	Biomedical Materials	3-0-3	
AMSE463	Polymer Design and Laboratory	0-6-3	
IMEN301	Technology Management and Strategy	3-0-3	
IMEN303	Marketing	3-0-3	
EECE312	Introduction to Machine Learning Systems	3-0-3	
CHEB215	Chemical Engineering for Advanced Materials	3-0-3	
CHEB301	Programming and AI in Chemical Engineering	3-0-3	
CHEB405	Introduction to Polymer Science and Engineering	3-0-3	
CHEB418	Energy & Mass Transfer	3-0-3	

*ME: MR, approved ME courses, Intensive AI courses, and STC courses offered by other departments, and graduate-level courses offered by the Department (at least 10 credits must come from ME courses offered by the Department).

8. Course Description

MECH100 – Introduction to Mechanical Engineering ····· (1-0-1)

This course introduces the foundations of mechanical engineering, including its key problems, approaches to solutions, and research areas, providing students with a broad understanding of the field and an opportunity to explore the major.

MECH199 – Freshman Research Participation ····· (0-2-1)

This course gives freshmen an early opportunity to engage in research, helping them understand research planning and methodology while discovering the value and enjoyment of research activities.

MECH203 – Computer-Aided Drawing and Fabrication ····· (2-2-3)

This course covers the fundamentals of mechanical design, including interpreting and creating engineering drawings, and provides hands-on practice in fabricating mechanical components and devices using CAD software and 3D printers.

MECH211 – Dynamics ····· (3-0-3)

Recommended Prerequisite: General Physics I.

This course helps students to prepare for applying the mechanical principles to the mechanical problems in various machines with moving parts. The preparation processes would includes understanding on the core principles of mechanics and the modeling and analytical techniques to apply them to the dynamic behaviors of moving parts in mechanical machines, which include dynamics of a particle, systems of particles, and rigid bodies. In addition, Lagrangian dynamics would be introduced and treated in depth so that students could apply it for dynamics analyses.

MECH240 – Solid Mechanics ····· (3-1-3)

Recommended Prerequisite: General Physics I.

This course provides a fundamental understanding of solid mechanics, focusing on how structures and materials deform and sustain loads under various conditions. Topics include stress and strain analysis, constitutive relations, and energy principles, with applications to structural and mechanical systems. Through this course, students develop the ability to understand and predict the mechanical behavior of materials and structures.

MECH244 – Mechanical Behaviors and Processing of Materials ····· (3-0-3)

This course introduces the fundamental structures of metals, ceramics, and polymers, as well as their mechanical properties. Students also learn how processing affects material structure and properties, and study various failure mechanisms relevant to material design.

MECH250 – Thermodynamics ····· (3-1-3)

Recommended Prerequisite: General Physics I.

This course covers the fundamental concepts of material properties, equations of state, work, and heat, as well as the first and second laws of thermodynamics. Students also learn methods for analyzing thermodynamic systems and cycles, and explore techniques for improving the efficiency of heat engines.

MECH280 – Sensors and Measurements ····· (2-3-3)

Measurement is a critical aspect of engineering for understanding systems and phenomena. This course introduces core measurement and data analysis techniques used in engineering. Lectures cover probability and statistics for data interpretation, dynamic response modeling and analysis of sensors, and signal processing techniques. Students perform a variety of experiments in mechanics and mechatronics to gain practical experience configuring measurement systems, collecting data, and performing analyses.

MECH303 – Engineering Mathematics ····· (3-0-3)

This course introduces the concepts and applications of linear spaces and linear operators, which are essential for mathematically analyzing problems in science and engineering. Topics include N-dimensional vector spaces, function spaces, linear transformations, and linear differential operators, with applications to eigenvalue and self-adjoint problems. Building on a strong understanding of linear operator theory, students also learn methods for solving basic partial differential equations.

MECH305 – Introduction to numerical methods in Mechanical Engineering ····· (3-0-3)

This course introduces numerical techniques for obtaining approximate solutions to mechanical engineering problems that cannot be solved analytically. Topics include nonlinear equations, systems of linear algebraic equations, and differential/integral equations. Students will learn to implement numerical methods using MATLAB and develop fundamental programming skills to solve mechanical engineering problems.

MECH311 – Mechanical Vibrations ····· (3-0-3)

Recommended Prerequisite: Solid Mechanics

This course covers the fundamental principles and applications of mechanical vibrations, including general theories of free and forced vibration and the basics of vibration control. Systems studied include single-degree-of-freedom, multi-degree-of-freedom, and continuous systems. Students also learn to predict the dynamic characteristics of structures using natural frequencies and vibration modes.

MECH323 – System Control ····· (3-1-3)

Recommended Prerequisite: Mechanical Vibrations

This course introduces the fundamentals of feedback control for dynamic systems and provides hands-on experience through simulation. Upon completion of the course, students will be able to understand and design control systems for dynamic systems such as mechanical, electrical, and thermal-fluid systems. They will also acquire basic design techniques for system control, including the Laplace transform, Bode plot, Nyquist plot, lead and lag compensators, and notch filters.

MECH330 – Materials Processing ····· (3-0-3)

This course covers a variety of manufacturing processes for materials including metals and polymers. Key topics include casting, rolling, forging, extrusion, sheet-metal-forming, polymer-processing, 3D printing, machining, finishing, and advanced machining. By the end of the course, students will be able to select appropriate materials and processing methods for manufacturing specific products.

MECH340 – Applied Solid Mechanics ····· (3-1-3)

Recommended Prerequisite: Solid Mechanics

This course provides an advanced understanding of the mechanical behavior of engineering materials from

the viewpoint of continuum mechanics. Topics include three-dimensional stress and strain analysis, linear elasticity, hyper-elasticity, visco-elasticity, plasticity, fracture mechanics, and fatigue. The course emphasizes the physical mechanisms governing design-limiting properties such as stiffness, strength, toughness, and fatigue life, and develops students' ability to quantitatively analyze and predict material behavior under various loading conditions.

MECH361 – Introduction to Biomedical Engineering ····· (3-0-3)

By the end of this course, students will be able to: (1) apply knowledge of biological and physical sciences, mathematics, and engineering to solve problems at the interface of engineering and biology; (2) design biomedical engineering systems, components, or processes that meet specific needs, demonstrating an understanding of relevant technical, professional, and ethical considerations; (3) function effectively on multidisciplinary teams; (4) communicate clearly in verbal, written, and graphical formats; and (5) identify, formulate, and solve biomedical engineering problems that address contemporary issues in a global, societal, and economic context.

MECH370 – Fluid Mechanics ····· (3-1-3)

Recommended Prerequisite: Differential Equations

This course introduces fluid mechanics, including hydrostatics, the laws of motion and boundary conditions for moving fluids, and the integral analysis of conservation laws applied to control volumes of various fluid problems. Students learn to derive the governing differential equations of fluid motion and study dimensional analysis and dynamic similarity and their engineering applications. The course also covers velocity and pressure variations and their relationships in internal and external flows, with opportunities to investigate fluid phenomena experimentally.

MECH371 – Heat Transfer ····· (3-1-3)

Recommended Prerequisite: Fluid Mechanics

This course introduces heat transfer phenomena and analysis methods, covering conduction, convection, and radiation, heat transfer modes. Students learn to analyze steady-state and transient heat transfer. The course consists of theoretical lectures along with experimental and simulation sessions. Specific learning objectives include: (1) understanding the heat conduction equation and solving basic conduction problems; (2) learning internal and external forced-convection heat transfer phenomena; and (3) studying various other heat transfer mechanisms and models, including natural convection, radiation, boiling, and condensation.

MECH381 – Electronics for Mechanical Engineers ····· (2-2-3)

This course offers a comprehensive introduction to the fundamental principles of electronics, covering topics such as Thevenin and Norton theorems, energy band theory, diode and transistor characteristics, biasing methods, amplification, impedance, and feedback systems.

Through lectures and practical applications, students will learn to apply these principles to real-world engineering problems and gain a understanding of electronic circuits. The course aims to enhance students' technical proficiency and strengthen their professional competence as mechanical engineers.

MECH399 A-D – Research Participation A-D ····· (0-2-1)

This course offers students hands-on research experience by participating in ongoing academic projects.

MECH401 – Strength of Materials ····· (3-0-3)

Recommended Prerequisite: Deformation Processing

This course covers the mechanical behavior and strength of materials, introducing concepts such as elastic stress states and deformations, dislocation theory, fracture and fatigue phenomena, basic plasticity theory, strengthening mechanisms, and creep at high temperatures.

MECH403 – Introduction to Nanoscale Science and Engineering ····· (3-0-3)

This senior-level ME course provides a comprehensive introduction to nanoscale science and engineering. Students learn the fundamental principles underlying nanotechnology, including quantum mechanics, solid-state physics, and electromagnetics, and apply them to topics such as imaging, fabrication, and key nanoscale tools. The course also covers nanoscale materials, electronics, optics, photonics, and sensors, as well as current research developments in these areas.

MECH421 – Introduction to MEMS ····· (3-1-3)

Building on semiconductor integrated circuit fabrication technology, this course introduces the processes and principles of microelectromechanical systems (MEMS). Students study the design and fabrication of micro sensors and actuators and explore their applications in mechanical engineering, electronics, materials science, physics, and biotechnology.

MECH423 – Biomaterials and Biofabrication Methods ····· (3-0-3)

This course introduces widely used biomaterials in biomedical engineering and biofabrication technologies, with an emphasis on techniques for multiscale human tissue modeling and applications in translational medicine. Students examine advanced methods such as 3D bioprinting, electrospinning, soft lithography, and microfluidic-based fabrication, along with the physical and chemical properties of biocompatible materials, including metals, polymers, ceramics, and hydrogels.

MECH424 – Biomedical Device: Engineering for Diagnostics and Therapeutics ····· (3-1-3)

The primary objective of this course is to develop an understanding of the function and design of various medical instruments and devices. Upon successful completion, students will be able to explain and discuss the principles and designs of various biomedical devices. Ultimately, they will be able to envision new and improved future medical technologies and designs. While there are thousands of medical instruments and devices on the market, the application discussion will focus on commonly used devices such as electrical stimulators and blood pressure monitors in the technology reviews.

MECH427 – Optics and Microscopy ····· (3-0-3)

This course covers the fundamentals of optics and the principles of optical microscopy, a key optical imaging system. Optics is a critical technology for high-precision, high-resolution, and high-contrast imaging, as well as for non-contact sensing, measurement, fabrication, and AI-based image analysis. The course emphasizes the design, structure, and applications of optical measurement and imaging devices.

MECH434 – System Design: Capstone Design ····· (3-2-4)

Recommended Prerequisite: Solid Mechanics

This course builds students' understanding of mechanical engineering through design and analysis exercises based on concepts learned in prior coursework. Students learn the engineering system design process and related techniques and develop problem-solving skills by applying theoretical principles in a

capstone design project.

MECH437 – Artificial Intelligence for Mechanical Engineering ····· (3-0-3)

This course introduces the fundamentals of machine learning from a probabilistic perspective, emphasizing how uncertainty and inference form the foundation of intelligent systems. Building on this, students learn key concepts in optimization, MLP-based artificial intelligence models, and probabilistic regression methods such as Gaussian process regression, preparing them to apply data-driven approaches to complex problems in mechanical engineering.

MECH439 – Introduction to Robotics ····· (3-1-3)

This course introduces the concepts of degrees of freedom in robots, actuators, sensors, kinematics, dynamics, trajectory planning, and control methods, including theories for wheeled mobile robots. It covers kinematics and dynamics using Denavit–Hartenberg notation and Lie group theory, and deepens understanding of robot motion through simulator-based practice. Students also explore robot behavior through programming and a term project.

MECH441 – Metal Forming ····· (3-0-3)

Recommended Prerequisite: Deformation Processing

This course introduces the fundamentals and process analysis of metal forming, presenting approximate analytical methods for various processes. Students also learn key considerations for process design and explore computer-aided analysis and design techniques.

MECH450 – Applied Thermal Engineering ····· (3-0-3)

This course covers the fundamentals of thermal engineering systems, emphasizing the application of thermodynamics, fluid mechanics, and heat transfer principles to practical industrial problems and technology development. Students conduct case studies on energy conversion devices, refrigeration and air conditioning systems, fuel cells, electronics cooling systems, etc.

MECH451 – Energy Systems ····· (3-0-3)

This course reviews the principles of thermodynamics applied to energy system analysis and introduces power generation systems. At the beginning of the course, students review power generation cycles and components to build a solid foundation for understanding overall energy generation systems. Based on this foundation, the course explores the power generation methods and characteristics of various energy sources, including fossil fuels, hydropower, nuclear power, solar thermal, wind, geothermal, biomass, and transportation energy systems. Finally, students deepen their understanding of these diverse energy sources, compare their respective advantages and disadvantages, and discuss next-generation energy systems.

MECH465 – Engineering of Creative Design ····· (3-0-3)

This course focuses on creative problem-solving techniques for systematically analyzing and improving complex industrial systems. By learning these techniques, students develop the ability to analyze and improve real-world industrial systems. Led by invited professionals, guest lectures provide deeper insights into the Theory of Inventive Problem Solving (TRIZ) and its applications. Students also complete a semester-long project aimed at solving corporate system problems.

MECH467 – Introduction to Appropriate Tech. ····· **(3-0-3)**

This course aims to: (1) provide a foundation for understanding appropriate technology, incorporating guest lectures from experts and relevant data; (2) analyze and assess existing appropriate technology solutions from an engineering perspective, identify key concepts, and propose possible improvements; and (3) engage students in a term project where they present and share ideas for new or improved appropriate technology solutions.

MECH470 – Applied Fluid Mechanics ····· **(3-0-3)**

Recommended Prerequisite: Fluid Mechanics

This course covers the fundamental mechanics of fluid flow and teaches students to apply these principles to real-world fluid dynamics problems. Students are disciplined to understand fluid phenomena and learn to analyze real-world complex flows using fluid mechanics theory. Topics include aerodynamics, hydraulics, turbulence, fluid machinery, environmental fluid mechanics, microfluidics, and biological fluid mechanics.

MECH471 – Aerodynamics ····· **(3-0-3)**

This course introduces aerodynamic principles and shape design methods applied to aircraft wings, propellers, turbo engines, and wind turbines. It begins with two-dimensional inviscid flow theory and covers Joukowski's airfoil theory, Prandtl's thin airfoil theory, and wing theory. Topics include vortex flow theory, point vortices, vortex lines, vortex distributions, and induced drag. The course further extends to viscous flow effects, boundary layer concepts, induced drag reduction, and the fundamentals of aerodynamic optimization.x flow theory, point vortices, vortex lines, vortex distributions, and induced drag forces.

MECH478 – Introduction to Turbomachinery ····· **(3-0-3)**

Recommended Prerequisite: Fluid Mechanics

This course introduces the structure and characteristics of fluid machinery, which are key industrial components, along with related engineering analyses. Equipment covered includes pumps, blowers, and compressors, with detailed discussions of turbomachinery. The course also examines power transmission devices and hydraulic equipment driven by fluids.

MECH490 A-D – Special Topics in Mechanical Engineering A-D ····· **(Varied Credits)**

MECH496 – Combustion and Environment ····· **(3-0-3)**

Recommended Prerequisites: Thermodynamics, Fluid Mechanics

This course examines combustion as a fundamental phenomenon in energy conversion, manufacturing, and processing. Students study the thermodynamic and fluid dynamic principles of combustion and the formation of air pollutants such as NOx and soot. Applications include internal combustion engines (e.g., reciprocating engines, gas turbines) and various energy conversion devices, such as burners and furnaces, focusing on their structures and key phenomena.

Department of Industrial and Management Engineering

1. Educational Goals

The Department of Industrial and Management Engineering aims to cultivate future industry leaders who are capable of conducting scientific analysis and solving engineering problems based on a deep understanding of the principles of modern and future industries and management.

The core competency of a future industry leader lies in the ability to solve problems creatively and holistically by understanding industries from a systems perspective, conceptualizing and modeling the management challenges that businesses face, and deriving optimal solutions through scientific analysis and engineering methodologies.

2. Curriculum Overview

The Department structures its curriculum around six key educational areas to achieve the educational goals stated above.

[Operations Research]

Operations research is an academic discipline that deals with a diverse range of analytical methods and mathematical models to support optimal decision-making in organizations across industry, government, and other sectors. It is sometimes used interchangeably with terms like management science or analytics. The field develops methodologies to find optimal or near-optimal solutions to complex decision-making problems using mathematical tools such as mathematical programming, heuristic methods, simulation, stochastic processes, queuing theory, reliability theory, and statistical analysis.

As one of the core areas of industrial engineering, it is also closely related to business fields such as operations management and financial engineering, providing methodologies for solving optimization

problems such as cost minimization and profit maximization.

Since operations research deals with general-purpose methodologies, a crucial part of the discipline is the accurate formulation of mathematical models that describe the systems being analyzed. The curriculum covers major topics such as Operations Research I and II, Mathematical Programming, Simulation, and Complex Systems.

[Data Science]

In response to the rapid advancement of digitalization and globalization, there is an increasing emphasis on the strategic utilization of information technology (IT) and the effective use of the vast amounts of data it generates. Data Science is an academic field that systematically collects, manages, and analyzes data generated across industry and society for rational decision-making. Grounded in statistics, computer science, and industrial and management engineering, it integrates data processing, modeling & representation, prediction, and visualization techniques to quantitatively analyze real-world problems.

Data Science extracts meaningful patterns and structures from large-scale datasets through machine learning, data mining, process mining, and statistical analysis. It further encompasses database design and information system implementation, providing methodological foundations for data-driven business value creation. As one of the core areas of Industrial and Management Engineering, it is closely linked with Operations Research and Management Engineering. Major courses include Data Science Methodology, System Analysis and Design, Database Systems, and Business Analytics.

[Experience Engineering and Human Factors]

The field of experience engineering and human factors aims to enhance safety, efficiency, and convenience while improving user satisfaction and experiential value by designing products, tasks, and environments that reflect the physical, cognitive, emotional, and sociocultural characteristics of humans.

The curriculum covers topics such as Human Factors Engineering and Ergonomics, Introduction to Design of Experiments, Introduction to User Experience Design, Product Development Engineering, and Affective Design and Engineering. It also includes a wide range of theoretical and applied subjects essential for user-centered product development, including cognitive engineering, biomechanics, psychophysics, human-computer interaction, usability engineering, service design, user interface design, and experimental methodologies in human factors.

Recent research has focused on designing and evaluating multi-device experiences for highly connected smart products such as smartphones, wearables, and smart home appliances; modeling driver experiences in smart vehicles; and designing IoT-based residential and living environments that meet the needs of elderly and disabled users.

[Management Engineering]

Management Engineering in Industrial and Management Engineering focuses on designing better managerial decisions through data, analytical models, and engineering thinking. It examines strategy, technology, markets, information systems, and organizational operations as interconnected systems, and seeks to translate complex business challenges into structured, analyzable forms that lead to actionable strategies.

The field emphasizes the strategic use of information technology and the design and analysis of management information systems (MIS, DSS, EIS, SIS). By applying business analytics, particularly process mining along with revenue management, strategic analysis, and technology management modeling, students learn how to diagnose and optimize organizational performance in a quantitative and systematic

way. Mathematical modeling, statistics, machine learning, and optimization methods are used to support decisions in marketing, technology strategy, pricing, organizational design, and entrepreneurship.

Major courses include Management Information Systems, Management of Technology, Technology Management and Strategy, Strategic Management, Marketing, Pricing and Revenue Management, Organizational Behavior, Action Learning in Business Planning, Entrepreneurship, and Principles of Business Administration.

[Financial Engineering]

Financial engineering is a field that analyzes financial markets, institutions, and instruments using mathematical and engineering analysis tools. It can be defined as an interdisciplinary field that integrates finance, industrial engineering, mathematics, statistics, and computer science and engineering.

The field explores financial market risks stemming from changes in stock prices, exchange rates, and interest rates, examines the valuation of financial instruments, and studies methods for individuals and firms to invest their assets rationally in financial markets. The curriculum covers both theoretical and applied topics. These include the rational allocation and valuation of financial assets such as bonds and derivatives which are core themes in Investment, one of the major areas of corporate finance. It also includes courses such as Financial Accounting, Introduction to Financial Engineering, and Corporate Finance.

While early research in financial engineering was mainly limited to the valuation of complex financial instruments such as derivatives, the scope has recently expanded to include areas such as asset management and allocation strategies for individuals—including insurance and pensions—the development of various financial risk modeling and management techniques, the design of advanced financial markets, and other subfields of corporate finance.

[Manufacturing and Logistics]

Manufacturing and Logistics Engineering focuses on the planning, design, operation, and continuous control of the entire lifecycle of products and services. This field integrates system modeling and analytics to understand and optimize production systems, supply chain networks, system quality, and service operations. It particularly emphasizes modern manufacturing technologies such as smart factories, AI-driven production planning and scheduling, advanced logistics systems, and intelligent quality control. These technologies enable manufacturing and logistics systems to become more adaptive, data-driven, and ultimately autonomous in real-time decision-making and operational optimization. The field further addresses value maximization across the entire product lifecycle and global supply chain.

Students will learn how to structurize and optimize complex systems using optimization, simulation, and data-driven analytics. They will finally develop the capability to design intelligent production and supply chain systems that achieve both efficiency and flexibility. Major courses include Introduction to Smart Manufacturing, Production & Operations Management, Supply Chain Management, Product Lifecycle Engineering, Quality Management and Engineering, and Introduction to SSME.

▶ Guidelines for Double Major and Minor

1. Double Major:

Students must complete at least 35 credits, including:

27 credits of required courses (9 credits of required courses + 18 credits of required elective courses) and additional major elective courses.

Only courses offered by the Department of Industrial and Management Engineering (IMEN) are recognized as major elective courses.

2. Minor:

Students must complete at least 21 credits from required and major elective courses.

Only courses offered by the Department of Industrial and Management Engineering (IMEN) are recognized as major elective courses.

• Credits from the same course cannot be counted toward both the major and the minor.

3. Course Substitutions:

The following courses may be substituted toward the double major or minor:

-For double major or minor: IMEN272 (Probability and Statistics for Engineering) may be substituted with MATH230 (Probability and Statistics) or MATH231 (Statistics for Experimental Research).

-For minor: IMEN382 (Database System) may be substituted with CSED357 (Database Systems).

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Major Required (9)+Major Restricted Elective (18)	**27**	
ME	At least 12 credits in IME courses offered Department of Industrial and Management Engineering (IMEN)	**30**	
FE		**11**	
Subtotal		**129**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
BEE	IMEN100	Departmental Introductory Course: Industrial and Management Engineering	1-0-1	
	IMEN110	Entrepreneurship and Technology Innovation	2-0-2	
	IMEN199	Freshman Research Participation	0-2-1	
MR	IMEN272*	Probability and Statistics for Engineering	3-1-3	
	IMEN281	Computer Programming for IME	3-1-3	Programming and Problem-solving
	IMEN431	Capstone Design	3-0-3	
DME	IMEN203	Financial Accounting	3-0-3	
	IMEN260 IMEN261	Operations Research I or Introduction to Operations Research	3-0-3 3-0-3	Choose one
	IMEN266	Operations Research Ⅱ	3-0-3	
	IMEN331	Introduction to Smart Manufacturing	3-0-3	
	IMEN343	Human Factors Engineering and Ergonomics	2-2-3	
	IMEN376	Production and Operations Management	3-0-3	Operations Research I or Introduction to Operations Research
	IMEN381	Management Information Systems	3-0-3	
	IMEN387	Introduction to Financial Engineering	3-0-3	Financial Accounting
ME	IMEN242	Introduction to Design of Experiments	3-0-3	Probability and Statistics for Engineering
	IMEN301	Technology Management and Strategy	3-0-3	
	IMEN302	Principles of Business Administration	3-0-3	
	IMEN303	Marketing	3-0-3	
	IMEN304	Strategic Management	3-0-3	
	IMEN305	Organizational Behavior	3-0-3	
	IMEN346	Product Development Engineering	3-0-3	
	IMEN361	Mathematical Programming	3-0-3	Operations Research I or Introduction to Operations Research
	IMEN371	Quality Management	3-0-3	Probability and Statistics for Engineering
	IMEN382	Database System	3-1-3	Management Information Systems
	IMEN388	Investment Theory	3-0-3	
	IMEN399A-D	Research Participation A-D	0-0-1	
	IMEN400	Emerging Technology and Innovation	Varied Credits (1~3)	Programming and Problem-solving
	IMEN411	Introduction to Entrepreneurship	3-0-3	
	IMEN412	Action Learning in Business Planning	3-0-3	
	IMEN422	Supply Chain Management	3-0-3	Operations Research I or Introduction to Operations Research
	IMEN423	Product Lifecycle Engineering	3-0-3	
	IMEN443	Introduction to User Experience Design	2-2-3	Ergonomics and Human Factors
	IMEN446	Affective Design and Engineering	3-0-3	
	IMEN462	Pricing and Revenue Management	3-0-3	Operations Research I, Probability and Statistics for Engineering
	IMEN472	Data Science Methodology	3-0-3	Probability and Statistics for Engineering
	IMEN473	Business Analytics	3-0-3	Information System Technology, Database System
	IMEN474	Complex Systems	3-0-3	
	IMEN481	Simulation	3-0-3	Information System Technology
	IMEN482	Introduction to SSME (Service Science, Management, and Engineering)	3-0-3	Operations Research I or Introduction to Operations Research
	IMEN483	System Analysis and Design	3-0-3	Management Information Systems
	IMEN485	Technology Management	3-0-3	Management Information Systems
	IMEN487	Corporate Finance	3-0-3	Probability and Statistics for Engineering, Financial Accounting
	IMEN491	Special Topics in Industrial and Management Engineering	Varied Credits (1~3)	

*Alternative for IMEN272 Probability and Statistics for Engineering: MATH230 Probability and Statistics, MATH231 Statistics for Experimental Research

5. Major Course List by Year and Semester

School Year	Category	1st Semester		2nd Semester	
		Course Code	Course Title	Course Code	Course Title
Sophomore	MR	IMEN203	Financial Accounting	IMEN200	Understanding Industrial and Management Engineering
		IMEN230	Product and Process Design Ⅰ: Capstone Design	IMEN266	Operations Research Ⅱ
		IMEN260 IMEN261	Operations Research Ⅰ or Introduction to Operations Research	IMEN281	Computer Programming for IME
		IMEN272	Probability and Statistics for Engineering		
	ME			IMEN242	Introduction to Design of Experiments
Junior	MR	IMEN343	Human Factors Engineering and Ergonomics	IMEN387	Introduction to Financial Engineering
		IMEN381	Management Information Systems	IMEN431	**Capstone Design**
		IMEN376	Production and Operations Management		
		IMEN331	**Introduction to Smart Manufacturing**		
	ME	IMEN388	Investment Theory	IMEN301	Technology Management and Strategy
		IMEN399A-D	Research Participation A-D	IMEN303	Marketing
		IMEN481	Simulation	IMEN346	Product Development Engineering
		IMEN302	Principles of Business Administration	IMEN361	Mathematical Programming
				IMEN371	Quality Management
				IMEN382	Database System
				IMEN399A-D	Research Participation A-D
Senior	MR	IMEN430	Product and Process Design Ⅲ: Capstone Design	IMEN431	**Capstone Design**
	ME	IMEN400	Emerging Technology and Innovation	IMEN412	Action Learning in Business Planning
		IMEN411	Introduction to Entrepreneurship	IMEN422	Supply Chain Management
		IMEN423	Product Lifecycle Engineering	IMEN443	Introduction to User Experience Design
		IMEN446	Affective Design and Engineering	IMEN462	Pricing and Revenue Management
		IMEN472	**Data Science Methodology**	IMEN473	Business Analytics
		IMEN482	Introduction to SSME (Service Science, Management, and Engineering)	IMEN474	Complex Systems
		IMEN483	System Analysis and Design	IMEN485	Technology Management
		IMEN487	Corporate Finance		
		IMEN491	Special Topics in Industrial and Management Engineering	IMEN491	Special Topics in Industrial and Management Engineering

6. Curriculum Roadmap

- Spring Entry

Category	Year 2		Year 3		Year 4	
	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
	Probability and Statistics for Engineering (IMEN272)*	Computer Programming for IME (IMEN281)		Capstone Design (IMEN431)		Capstone Design (IMEN431)
Operations Research	Operations Research I (IMEN260)* or Introduction to Operations Research (IMEN261)*	Operations Research II (IMEN266)	Simulation (IMEN481)	Mathematical Programming (IMEN361)		Complex Systems (IMEN474)
Data Science				Database Systems (IMEN382)	Data Science Methodology (IMEN472) System Analysis and Design (IMEN483)	Business Analytics (IMEN473)
UX/Human Factors		Introduction to Design of Experiments (IMEN242)	Human Factors Engineering and Ergonomics (IMEN343)	Product Development Engineering (IMEN346)	Emerging Technology and Innovation (IMEN400) Affective Design and Engineering (IMEN446)	Introduction to User Experience Design (IMEN443)
Manufacturing & Logistics			Production and Operations Management (IMEN376) Introduction to Smart Manufacturing (IMEN331)	Quality Management (IMEN371)	Introduction to SSME (Service Science, Management, and Engineering (IMEN482) Product Lifecycle Engineering (IMEN423)	Supply Chain Management (IMEN422)
Management Engineering			Management Information Systems (IMEN381) Principles of Business Administration (IMEN302)	Technology Management and Strategy (IMEN301) Marketing (IMEN303)	Introduction to Entrepreneurship (IMEN411)	Action Learning in Business Planning (IMEN412) Pricing and Revenue Management (IMEN462) Technology Management (IMEN485)
Financial Engineering	Financial Accounting (IMEN203)*		Investment Theory (IMEN388)	Introduction to Financial Engineering (IMEN387)	Corporate Finance (IMEN487)	

※ MR(Major Requirements): red, ME(Major Electives): blue, STC course: *mark

- Fall Entry

Category	Year 2		Year 3		Year 4	
	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
	Computer Programming for IME (IMEN281)	Probability and Statistics for Engineering (IMEN272)*			Capstone Design (IMEN431)	
Operations Research	Operations Research II (IMEN266)	Operations Research I (IMEN260)* or Introduction to Operations Research (IMEN261)*	Mathematical Programming (IMEN361)	Simulation (IMEN481)	Complex Systems (IMEN474)	
Data Science			Database Systems (IMEN382)		Business Analytics (IMEN473)	Data Science Methodology (IMEN472) System Analysis and Design (IMEN483)
UX/Human Factors	Introduction to Design of Experiments (IMEN242)		Product Development Engineering (IMEN346)	Human Factors Engineering and Ergonomics (IMEN343)	Introduction to User Experience Design (IMEN443)	Emerging Technology and Innovation (IMEN400) Affective Design and Engineering (IMEN446)
Manufacturing & Logistics			Quality Management (IMEN371)	Production and Operations Management (IMEN376) Introduction to Smart Manufacturing (IMEN331)	Supply Chain Management (IMEN422)	Introduction to SSME (Service Science, Management, and Engineering (IMEN482) Product Lifecycle Engineering (IMEN423)
Management Engineering			Technology Management and Strategy (IMEN301) Marketing (IMEN303)	Management Information Systems (IMEN381) Principles of Business Administration (IMEN302)	Action Learning in Business Planning (IMEN412) Pricing and Revenue Management (IMEN462) Technology Management (IMEN485)	Introduction to Entrepreneurship (IMEN411)
Financial Engineering		Financial Accounting (IMEN203)*	Introduction to Financial Engineering (IMEN387)	Investment Theory (IMEN388)		Corporate Finance (IMEN487)

※ MR(Major Requirements): red, ME(Major Electives): blue, STC course: *mark

7. Approved ME Offered by Other Departments

-For students enrolled in or after 2011, any course that was classified as MR at any time after their admission year is recognized as ME.
-Starting from the 2018 academic year, all STC courses are recognized as ME.

8. Course Description

IMEN100 – Departmental Introductory Course: Industrial and Management Engineering ····· (1-0-1)
This course provides first-year undergraduate students at MSUS with a broad understanding of industrial and management engineering by introducing its historical background, key problems and approaches to problem-solving, and areas of application.

IMEN110 – Entrepreneurship and Technology Innovation ····· (2-0-2)
This course fosters foundational knowledge and insight into entrepreneurship and management, helping students grow into competitive engineers. It also motivates students to develop into self-directed, globally minded engineers who create social value through engineering knowledge and embrace social responsibility based on an entrepreneurial spirit.

IMEN199 – Freshman Research Participation ····· (0-2-1)
In this course, first-year undergraduate students participate in research under the guidance of a faculty advisor and submit a final report summarizing their work.

IMEN203 – Financial Accounting ····· (3-0-3)
This course helps students understand the theoretical framework of corporate financial accounting and acquire the knowledge necessary to solve real-world problems. Students learn accounting standards, specific procedures, and the theoretical rationale underlying accounting practices, as well as develop practical accounting skills.

IMEN242 – Introduction to Design of Experiments ····· (3-0-3)
Recommended Prerequisite: Probability and Statistics for Engineering
This course teaches students how to design effective experiments and analyze results when multiple factors affect a response variable, which is an essential competency for students in engineering and science disciplines.

IMEN260 – Operations Research I ····· (3-0-3)
This course builds on introductory optimization, strengthening students' theoretical foundation and introducing essential concepts in the field of optimization and the fundamentals of operations research (OR), with an emphasis on linear programming theory and its applications in practice.

IMEN261 – Introduction to Operations Research ····· (3-0-3)
This course covers quantitative and systematic approaches, modeling techniques, and solution methods for decision-making problems in industrial and management engineering, as well as in business, economics, and logistics. The course places particular emphasis on linear programming and related algorithms.

IMEN266 – Operations ResearchⅡ ····· (3-0-3)

Recommended Prerequisite: Probability and Statistics for Engineering

This course introduces students to probabilistic models, including Poisson processes, Markov chains, continuous-time Markov chains, queuing theory, and reliability theory. Students learn the fundamental concepts and theories of these stochastic processes and how to apply them to real-world problems.

IMEN272 – Probability and Statistics for Engineering ····· (3-1-3)

This course covers the fundamentals of probability theory including basic concepts, random variables, probability distributions, expected values, and variances. It then progresses to sampling theory centered on the normal distribution, sampling distributions, point and interval estimation, and hypothesis testing. Students also learn correlation analysis and introductory regression theory, with applications in engineering.

IMEN281 – Computer Programming for IME ····· (3-1-3)

Recommended Prerequisite: Programming and Problem-solving

This course introduces students to applying computational methods to practical industrial and management engineering problems. Students learn the fundamentals of object-oriented programming, data structures, and algorithms using C++ and Java, and apply these skills to problems such as shortest-path, bin packing, scheduling, and logistics systems.

IMEN301 – Technology Management and Strategy ····· (3-0-3)

This course teaches students how to effectively acquire, manage, and utilize technology as a core competency of organizations. It systematically explores strategies and methods to achieve competitive advantage in a dynamic business environment.

IMEN302 – Principles of Business Administration ····· (3-0-3)

This course provides a structured introduction to the fundamental concepts of business administration. Topics include management theories, organizational functions, and discussions on current issues and trends in modern management.

IMEN303 – Marketing ····· (3-0-3)

This course covers key topics in marketing, including the marketing environment, marketing information systems, market research, consumer behavior, market segmentation, targeting and positioning, product, pricing, promotion, distribution, and competitive analysis.

IMEN304 – Strategic Management ····· (3-0-3)

This course introduces students to strategic management practices for businesses to succeed in competitive markets. Topics include corporate objectives, market structure and strategy, strategy implementation, product differentiation, vertical integration, diversification, mergers and acquisitions, and global strategic management.

IMEN305 – Organizational Behavior ····· (3-0-3)

This course introduces the fundamental concepts of organizational behavior and explains the relationship between individual and group behavior within organizations. Topics include individual behavior, motivation, group behavior, communication, leadership, power, conflict and negotiation, organizational structure, and organizational culture.

IMEN331 – Introduction to Smart Manufacturing ····· (3-0-3)

This course focuses on the design and implementation of products and production processes in smart manufacturing environments. Students explore technical and managerial challenges that arise throughout the entire lifecycle of product and production processes and study advanced manufacturing technologies and their future directions for addressing these challenges. Major topics include CAD/CAM, manufacturing system design and simulation, automation and control systems, and AI/ML applications for smart manufacturing. The course combines lectures, exercises, and hands-on labs, requiring strong programming skills, analytical thinking, and active participation.

IMEN343 – Human Factors Engineering and Ergonomics ····· (2-2-3)

This course covers the fundamental theories and design processes for the effective design and management of human–machine–environment systems, focusing on human characteristics, performance, capabilities, and limitations. The course also introduces relevant theories from psychology, biomechanics, physiology, and statistics as approaches to measurement, analysis, and evaluation.

IMEN346 – Product Development Engineering ····· (3-0-3)

This course explores the entire product development process, including product development process, customer needs analysis, technology trend analysis, concept generation techniques, patents, industrial design, prototyping, and team project scheduling. Students work in teams to complete a product development project, gaining hands-on experience in planning, analysis, decision-making, teamwork, and idea communication.

IMEN361 – Mathematical Programming ····· (3-0-3)

Recommended Prerequisite: Operations Research I or Introduction to Operations Research

This course introduces the fundamental theories and applications of nonlinear programming, integer programming, dynamic programming, and discrete optimization.

IMEN371 – Quality Management ····· (3-0-3)

Recommended Prerequisite: Probability and Statistics for Engineering

This course covers the theories and applications of designing and operating quality systems, emphasizing statistical methodologies to ensure quality across all phases of the entire product development process, including product design, process design, and manufacturing. Topics include the philosophy of quality management, design quality assurance, measuring and improving process capability, statistical process control, and service quality.

IMEN376 – Production and Operations Management ····· (3-0-3)

Recommended Prerequisite: Operations Research I or Introduction to Operations Research

This course introduces quantitative approaches to production and inventory control, focusing on analyzing and improving systems using these methods. Topics include basic concepts of production systems, decision-making methods, demand forecasting, production scheduling, optimal lot sizing, and inventory management.

IMEN381 – Management Information Systems ····· (3-0-3)

This course covers the strategic use of information technology (IT) to effectively respond to rapid digitalization and globalization. Topics include the significance of information, the role and strategic application of IT, management innovation strategies, emerging IT trends, and various information systems

such as management information systems (MIS), decision support systems (DSS), executive information systems (EIS), and strategic information systems (SIS).

IMEN382 – Database System ····· (3-1-3)

Recommended Prerequisite: Management Information Systems

This course introduces the fundamental concepts of database system, including data models such as ER diagrams and ODL, normalization theory, and SQL based on relational algebra. Additional topics include stored procedures, embedded SQL, database APIs, object-oriented databases, triggers, transaction management, and practical exercises in database programming.

IMEN387 – Introduction to Financial Engineering ····· (3-0-3)

Recommended Prerequisite: Financial Accounting

This course explores the theory and practical application of modern financial engineering models used to manage diverse and complex financial products, such as fixed-income securities (cash flows, interest rate structures), modern portfolio theory (mean-variance, CAPM, APT), and derivatives (forwards, futures, swaps, options). Students gain practical experience implementing these models using MATLAB, taking a mathematical and engineering approach that distinguishes the course from traditional financial management in business or economics.

IMEN388 – Investment Theory ····· (3-0-3)

This course provides a theoretical framework for understanding the basic characteristics of modern financial markets and the fundamental theories used in investment decision-making. Students learn how financial institutions and corporations manage investments based on these principles. Topics include the risk–return tradeoff of investment assets, diversification methods, rational asset valuation, and investment decision-making. The course also covers financial market theory, portfolio theory, asset pricing theory, and fixed-income securities.

IMEN399 A–D – Research Participation A–D ····· (0-0-1)

Students assist in research under the supervision of a faculty advisor and submit a final report. Students may earn up to a maximum of 4 credits in this course series.

IMEN400 – Emerging Technology and Innovation ····· (Varied Credits, 1~3)

Recommended Prerequisite: Programming and Problem-solving

Through learning and practicing newly emerging innovative technologies, students develop Industrial and Management Engineering (IME) perspectives for interpreting and applying these technologies. The course includes designing and implementing a smart farm using open-source hardware and Internet of Things (IoT) technologies, and exploring business models for its commercialization from an IME perspective.

IMEN411 – Introduction to Entrepreneurship ····· (3-0-3)

This course introduces students to the principles and knowledge of entrepreneurship, emphasizing not only knowledge transfer but also student motivation. Students acquire essential skills and insights into business models, strategies, and related competencies.

IMEN412 – Action Learning in Business Planning ····· (3-0-3)

This course provides students with practical knowledge for preparing business plans, with the goal of

completing a fully developed plan. Students develop and present their plans in connection with startup competitions, fundraising activities, and related initiatives.

IMEN422 – Supply Chain Management ····· (3-0-3)

Recommended Prerequisite: Operations Research I or Introduction to Operations Research

This course covers the fundamental concepts of logistics systems in manufacturing and service industries, including facility location, facility layout, logistics management, and distribution methodologies, supported by management science models.

IMEN423 – Product Lifecycle Engineering ····· (3-0-3)

This course explores the theoretical elements of a product's lifecycle—from raw material extraction through design and development, manufacturing, use, and end-of-life (disposal/recycling). The course also introduces concepts of environmentally conscious design, manufacturing, and recycling. Students develop applied skills through case studies and site visits, learning to apply these theories at different stages of the product lifecycle. The course emphasizes optimization based on the Total Performance Index (TPI).

IMEN431 – Capstone Design ····· (3-0-3)

This project-based course integrates the theories and analytical methodologies of Industrial and Management Engineering to systematically define and solve complex, real-world problems through team collaboration. Students engage in the entire problem-solving process, including problem definition, system analysis, data-driven modeling, design and implementation, performance evaluation, and assessment of commercialization potential. Throughout the course, students apply a holistic industrial engineering perspective to evaluate not only technical feasibility but also economic viability, marketability, and operational efficiency. By conducting comparative analyses of cutting-edge technologies, students explore practical applications and emerging industry trends.

IMEN443 – Introduction to User Experience Design ····· (2-2-3)

Recommended Prerequisite: Human Factors Engineering and Ergonomics

This course introduces the concept of user experience (UX) and provides an overview of the UX design process. Students learn and practice strategies and methods for each stage of the process from user research through design, prototyping, and testing while also exploring concepts such as device/service ecosystems and Lean UX.

IMEN446 – Affective Design and Engineering ····· (3-0-3)

This course covers the processes, methods, and practical applications of affective design and engineering. The course covers the definition, history, and methodologies of affective design, and explores its applications in product design, marketing, computing, and other industries, enabling students to apply these techniques in practice.

IMEN462 – Pricing and Revenue Management ····· (3-0-3)

Recommended Prerequisites: Operations Research I, Probability and Statistics for Engineering

This course examines the fundamentals and case studies of pricing and revenue management, applying optimization and statistical knowledge from industrial and management engineering to management science and marketing. The course emphasizes shifting from a cost-minimization to a revenue-maximization perspective and explores engineering-based, quantitative approaches to marketing

strategies.

IMEN472 – Data Science Methodology ····· (3-0-3)

Recommended Prerequisite: Probability and Statistics for Engineering

This course covers specific techniques for prediction, classification, clustering, and association rules, which are the main objectives of data mining. Topics include modified regression techniques for prediction, logistic regression, discriminant analysis, and decision trees for classification, hierarchical and non-hierarchical clustering techniques, and market basket analysis with recommendation systems for association rules.

IMEN473 – Business Analytics ····· (3-0-3)

Recommended Prerequisites: Information System Technology, Database System

This course provides students with an understanding of how to apply fundamental knowledge and data analysis techniques to rational and scientific decision-making. The course introduces the basic theories of business analytics and offers practical experience with real-world data analysis.

IMEN474 – Complex Systems ····· (3-0-3)

This course introduces models used in complex systems research and examines recent research trends. Students carry out projects to implement and practice these models, focusing on applications not only in science and technology but also in management, social systems, and other fields.

IMEN481 – Simulation ····· (3-0-3)

Recommended Prerequisite: Information System Technology

This course covers simulation as a widely used technique for solving real-world problems, including system modeling, fundamental concepts of simulation, characteristics of continuous and discrete systems, simulation techniques, and statistical methods for analyzing simulation results.

IMEN482 – Introduction to SSME (Service Science, Management, and Engineering) ····· (3-0-3)

Recommended Prerequisite: Introduction to Operations Research or equivalent

This course explores the background of the global shift toward a service-based economy and covers key issues and applicable techniques for the development, operation, and improvement of services.

IMEN483 – System Analysis and Design ····· (3-0-3)

Recommended Prerequisite: Management Information Systems

This course covers frameworks and methodologies for developing information systems, including development cycles, user requirements analysis, and design techniques. The course introduces object-oriented methodologies derived from traditional structured methodologies and compares them to approaches used in business reengineering (BR).

IMEN485 – Technology Management ····· (3-0-3)

Recommended Prerequisite: Management Information Systems

This course teaches students how to effectively acquire, manage, and utilize technology as an increasingly critical core competency of businesses. Topics include technology innovation and corporate strategy, formulation and execution of technology strategies, development of organizational innovation capabilities, research management, and organizational design and operations.

IMEN487 – Corporate Finance ····· (3-0-3)

Recommended Prerequisites: Financial Accounting, Probability and Statistics for Engineering

This course covers corporate financial activities and fundamental financial decision-making. Topics include (i) capital structure, which involves determining the optimal mix of equity and debt; (ii) capital budgeting, which encompasses investment and financing decisions; and (iii) dividend policy, which concerns the timing and distribution of capital.

IMEN491 – Special Topics in Industrial and Management Engineering ····· (Varied Credits, 1~3)

This course provides students with an opportunity for in-depth study of key areas of interest in industrial and management engineering.

[Interdisciplinary Minor in Entrepreneurship - Course Descriptions]

ENTP201 – Introduction to Entrepreneurship ····· (3-0-3)

This course introduces students to the principles of entrepreneurship, emphasizing both knowledge transfer and student motivation. Students also acquire essential skills and insights into business models, strategies, and related competencies.

ENTP301 – Action Learning in Business Planning ····· (3-0-3)

This course provides students with practical knowledge for developing business plans, with the goal of producing a complete plan. Students develop and present their plans in connection with startup competitions, fundraising activities, and related initiatives.

ENTP451A–Z – Special Topics in Start-up Practice A-Z ····· (Varied Credits, 1~2)

This course allows students to explore in depth the motivations for pursuing entrepreneurship through real-world startup cases, fostering entrepreneurial thinking and practice.

-ENTP451A – Special Topics in Start-up Practice A: Technology Startup ····· (1-0-1)

Through tailored, hands-on entrepreneurship education aligned with industry demand, students learn directly from venture entrepreneurs engaged in emerging industries and promising sectors involving tech startups, and reflect deeply on their own motivations for pursuing entrepreneurship.

-ENTP451B – Special Topics in Start-up Practice B: Service Startup ····· (1-0-1)

Through tailored, hands-on entrepreneurship education aligned with industry demand, students learn directly from venture entrepreneurs engaged in emerging industries and promising sectors involving service startups, and reflect deeply on their own motivations for pursuing entrepreneurship.

ENTP491 – Entrepreneurship Seminar ····· (1-0-1)

This course is designed to help students develop an entrepreneurial mindset by learning from the real-world experiences and stories of entrepreneurs. Students gain practical insights from experts in entrepreneurship and technology.

ENTP492 – Entrepreneurial Practice and Planning ····· (2-0-2)

This course serves as a preliminary course for hands-on entrepreneurship, raising students' awareness of entrepreneurship and providing learning opportunities from indirect experience to foster a practical understanding of entrepreneurial activities.

ENTP493 – Special Topics in Entrepreneurship ····· (Varied Credits, 1~3)

This course aims to cultivate an entrepreneurial and tech startup mindset through a series of special lectures on entrepreneurship.

INTN301 – Tech+ Innovation ····· (Varied Credits)

This course provides students with hands-on experience in start-up sites by working on projects proposed by POSTECH alumni companies and promising local startups, giving them the opportunity to engage in real-world startup operations.

INTN302/801 – Tech+ Star ····· (Varied Credits)

This course offers students practical experience in the early stages of entrepreneurship, including acquiring necessary knowledge, refining ideas, designing business models, and creating prototypes, enabling them to engage in the full startup process.

Department of Electronics and Electrical Engineering

1. Educational Goals

The Department of Electronics and Electrical Engineering aims not only to pursue academic excellence but also to cultivate highly skilled engineers capable of leading Korea's advanced electronics technologies. To this end, the Department provides students with a solid foundation of broad-based knowledge and expertise spanning the entire field of electronics and electrical engineering, fostering their abilities through high-quality education.

2. Curriculum Overview

Electronics and electrical engineering encompasses a wide and diverse range of subfields, as reflected by the IEEE (Institute of Electrical and Electronics Engineers), an international professional organization comprising 39 specialized societies and publishing 191 journals and magazines.

The discipline includes all activities involved in designing and developing systems for the generation, transmission, processing, and control of electrical energy and signals. It can be broadly divided into the following sub-areas:

[Control and Power]
This area focuses on developing technologies to control various dynamic systems—such as automobiles, robots, motors, renewable power generators, and energy storage devices—to meet user needs. Research topics include system modeling based on real-time sensing data, optimal controller design, performance analysis, and practical, real-world applications.

[Information and Communications, and Signal Processing]
This area examines the theories and systems underlying information theory, signal processing for communications, speech, and images, as well as networks and big data.

[Computer]
Research in computing focuses on high-performance computer architecture, high-performance/low-power digital systems, and efficient, high-throughput algorithms and software, particularly artificial intelligence techniques for machine learning, computer vision, and speech recognition.

[Electromagnetic Fields and Microwave Engineering]
This area covers the scattering and radiation of electromagnetic waves, wave transmission, antenna design, radar, remote sensing, electromagnetic compatibility, and microwave engineering.

[Semiconductors and Quantum Electronics]
This area conducts research on all aspects of semiconductor materials, processes, devices, and sensors. To support this, the curriculum integrates theory and practice in physical electronics, nanoelectronic

devices, semiconductor fabrication processes, quantum devices and computing, optoelectronics, displays, wearable devices, and energy- and bio-applied sensors.

[Electronic Circuits and VLSI Design]

This area focuses on passive and active, analog and digital electronic circuits, which form the foundation of many other fields. However, designing a complete system requires knowledge beyond a single field. For example, designing an application processor chip involves antennas (electromagnetic fields), transceivers (circuits and systems), communication theory (information and communications), and computers (computer science and engineering). Accordingly, the Department ensures that students complete at least one required course in each of these areas to build a strong foundation, enabling them to specialize in their chosen field in graduate school or industry.

▶ Guidelines for Double Major and Minor

[Minor Requirements]

Students from other departments who wish to pursue a minor in Electronics and Electrical Engineering must complete the following three required courses: EECE231 Circuit Theory, EECE233 Signals and Systems, and EECE491 Capstone Design Ⅰ (7 credits total). In addition, they must complete three courses from one Major Track (9 credits) and at least 5 additional credits in Major Courses (defined below), for a total of 21 credits.

[Double Major Requirements]

Students from other departments who wish to pursue a double major in Electronics and Electrical Engineering must complete 28 credits in MR courses, plus at least 7 additional credit from Major Courses (defined below), for a minimum of 35 credits.

[Course Substitutions for Double Major and Minor]

CSED273 Digital System Design may be substituted for EECE274 Digital System Design; CSED241 Introduction to Computer Architecture may be substituted for EECE375 Computer Design; CSED211 Introduction to Computer Software systems may be substituted for EECE372 Microprocessor Architecture and Applications; and PHYS206 Electromagnetism Ⅰ may be substituted for EECE261 Introduction to Electromagnetism.

※ Major Courses: Includes major courses offered by the Department, as well as the approved courses, STC courses, and MR courses offered by other departments.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Common Required Courses (7 credits): EECE231 Circuit Theory (3), EECE233 Signals and Systems (3), EECE491 Capstone Design I (1) Track Required Courses (9 credits): Choose one of the following two tracks ▶ Systems Track (9 credits): EECE202 Introduction to Probability and Random Processes (3), EECE274 Digital System Design (3), EECE320 Introduction to Automatic Control (3) ▶ Devices Track (9 credits): EECE211 Semiconductor Electronics I (3), EECE261 Introduction to Electromagnetism (3), EECE331 Electronic Circuits I (3) Common Elective Required Courses (12 credits): 9 credits in major courses and 3 credits in mathematics	**28**	Major Concentration and Track Requirements

Category	Course Title	Credits	Note
ME	All STC and MR courses offered by other departments are approved as ME. However, of the 31 credits required for ME, at least 10 credits must come from major courses offered by the Department. (Note: Some STC and MR courses offered by other departments may be recognized as courses offered by the Department. For the list of such courses, refer to the **table in Section 8.2 below**.)	31	At least 10 credits must come from major courses offered by the Department.
FE		10	
Subtotal		130	***Applicable to students enrolled in 2024 or after**

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take the Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

※ Courses considered equivalent to the departmental introductory course (counted as BEE): EECE100 Introduction to Electrical Engineering and DISU101 Introduction to Electrical Engineering

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Recommended/Required Prerequisite	Note	
MR	EECE231/DISU231	Circuit Theory (STC)/Electric Circuits (STC)	3-0-3		Common Core: 7 credits required	
	EECE233	Signals and Systems (STC)	3-0-3			
	EECE491	Capstone Design Project I	0-3-1			
	EECE202	Introduction to Probability and Random Processes	3-0-3		Sys.	Major Track (Selection) : 9 credits required
	EECE274	Digital System Design	3-0-3			
	EECE320	Introduction to Automatic Control	3-0-3	Signals and Systems		
	EECE211	Semiconductor Electronics I	3-0-3		Devi.	
	EECE261	Introduction to Electromagnetism	3-0-3			
	EECE331 (SEMI205)	Electronic Circuits I (Semiconductor Electronic Circuits I)	3-0-3	~~Basic~~ Circuit Theory		
	EECE312	Introduction to Machine Learning Systems	3-0-3		Common Electives: 9 credits (3 courses) required	
	EECE336	Electronic Circuits Ⅱ	3-0-3	Electronic Circuits I		
	EECE341	Introduction to Communication Systems	3-0-3	Signals and Systems		
	EECE361/DISU361	Applied Electromagnetic Waves/Theory and Applications of Microwave Engineering	3-0-3	Introduction to Electromagnetism		
	EECE375	Computer Design	3-0-3	Digital System Design		
	MATH200	Differential Equations (STC)	3-1-3		Mathematics Electives: Complete 3 credits (1 course) out of 2 mathematics courses.	
	MATH203	Applied Linear Algebra (STC)	3-1-3			
ME	EECE201	Quantum Electronics	3-0-3			
	EECE236	Learning About Electrical Engineering Using MatLab (STC)	2-2-3			
	EECE276	Electronics and Electrical Engineering Lab I	1-3-2	~~Basic~~ Circuit Theory		
	EECE301	Introduction to Digital Signal Processing	3-0-3	Signals and Systems		
	EECE303	Physical Electronics	3-0-3	Semiconductor Electronics I		
	EECE304	Mathematics for Electronics and Electrical Engineers	3-0-3			
	EECE305	Power Electronics	3-0-3	`		
	EECE306	Introduction to radar engineering	3-0-3			
	EECE308	Introduction to Digital Communication	3-0-3	Signals and Systems or Mathematics for Electronics and Electrical Engineers A		
	EECE309	Modern Control Theory	3-0-3	Signals and Systems, Introduction to Automatic Control		
	EECE310	Introduction to Electric Power System Control and Operation	3-0-3			
	EECE338	Electronics and Electrical Engineering Lab Ⅱ	1-3-2	Circuit Theory, Signals and Systems		
	EECE372/DISU372	Microprocessor Architecture and Applications	3-0-3	Digital System Design		
	EECE376	Electronics and Electrical Engineering Lab Ⅲ	1-5-3			
	EECE392	Seminars on Electronics	1-0-1			
	EECE399A/D/ DISU399A/D	Research Participation/Undergraduate Research Internship A-D	0-2-1			

Category	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Recommended/Required Prerequisite	Note
ME	EECE401	Semiconductor Electronics Ⅱ	3-0-3	Semiconductor Electronics Ⅰ or Physical Electronics	
	EECE411	Display Engineering Ⅰ	3-0-3		
	EECE412/DISU412	Display Engineering Ⅱ / Semiconductor Device for Display Technology	3-0-3		
	EECE413	Electronic Circuit 3A: High-Speed Digital Electronics Design	3-0-3		
	EECE414	Microelectronics 3B: RF/Analog Circuits	3-0-3		
	EECE415	Biomedical Device: Engineering for Diagnostics and Therapeutics	3-0-3		
	EECE416	Microwave Device Analysis	3-0-3		
	EECE417	Introduction to Nanoscale Science and Engineering	3-0-3		
	EECE418	Basic quantum information	3-0-3		
	EECE419	**Advanced Electoronic Circuits**	3-0-3	Circuit Theory/Electronic Circuits Ⅰ	
	EECE422	Digital Control Engineering	3-0-3	Introduction to Automatic Control	
	EECE426	Embedded Control Systems	2-2-3	Digital System Design, Microprocessor Architecture and Applications	
	EECE428	Dynamic Modeling and Analysis of Power Systems	3-0-3		
	EECE434/DISU434	Introduction to VLSI Design/VLSI System Design	3-0-3	Digital System Design	
	EECE442/NGCN301	Introduction to Communications and Network	3-0-3		
	EECE443/NGCN302	Communications and Network Lab	1-4-3		
	EECE455	Embedded System-on-Chip Design	3-0-3	Computer Design	
	EECE461	Microwave Engineering Application and Lab	1-4-3	Electromagnetic Waves	
	EECE472	Introduction to Computer Security	3-0-3		
	EECE480	Introduction to Biomedical Engineering	3-0-3		
	EECE490A/Z	Special Topics in Electrical Engineering A/Z	Varied Credits		
	EECE492	Capstone Design Project Ⅱ	0-5-2	Capstone Design Project Ⅰ	
	EECE495	Semester Internship	12 Credits	*Credits counted toward graduation: up to 9 credits ○ ME: 3 credits ○ FE: 6 credits	
	EECE5**	Graduate courses offered by the Department	3-0-3		
	DISU221	Semiconductor Manufacturing Equipment Training	0-3-1	Regular courses of the Next-Generation Semiconductor Innovation Convergence University	
	DISU232	Electronic Circuits Lab	0-2-1		
	DISU402	High-Speed Semiconductor I/O Circuits	3-1-3		
	DISU403	고속반도체회로측정실습	0-2-1		
	DISU490R	전기회로 연습	0-2-1		
	DISU496A-Z	POLARIS: Capstone Design A-Z	Varied Credits		
BEE	EECE100/DISU101	Introduction to Electrical Engineering/Introduction to Electrical Engineering	1-0-1		
	EECE199	Freshman Research Participation	0-2-1		

※ The total number of credits in university-wide field-based practicum courses that can be counted toward graduation is limited to 9 credits: INTN300 Internship Program, INTN301 Tech+ Innovation, INTN302 Tech+ Star, ENTP493C CUOP Internship, EECE495 Semester Internship
(INTN300 Internship Program and ENTP493C CUOP Internship combined: up to 4 credits can be counted toward graduation)

※ Recognition of Courses from the Next-Generation Semiconductor Innovation Convergence University Offered by the Department

-Cross-listed courses: When taking a DISU cross-listed course originally offered by the Department, it is recognized under the category of the original departmental course.

-Regular (new) courses: Regular courses offered by Convergence and Open Sharing System: Next-Generation Semiconductor are fully recognized as ME courses.

5. Major Course List by Year and Semester

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BER	MSUS101	Exploring Academic Majors	BEE	EECE100/ DISU101	Introduction to Electrical Engineering/Introduction to Electrical Engineering
				BEE	EECE199	Freshman Research Participation
Sophomore	MR	MATH200	Differential Equations (STC)	MR	EECE211	Semiconductor Electronics I
		MATH203	Applied Linear Algebra (STC)			
		EECE202	Introduction to Probability and Random Processes			
		EECE211	Semiconductor Electronics I			
		EECE231 / DISU231	Circuit Theory/Electric Circuits (STC)		EECE231/ DIS231	Circuit Theory/Electric Circuits (STC)
		EECE233	Signals and Systems		EECE233	Signals and Systems (STC)
					EECE261	Introduction to Electromagnetism
	ME	EECE201	**Quantum Electronics**		EECE274	Digital System Design
		EECE236	Learning About Electrical Engineering Using MatLab (STC)	ME	EECE276	Electronics and Electrical Engineering Lab I
Junior	MR	EECE331 (SEMI205)	Electronic Circuits I (Semiconductor Electronic Circuits I)	MR	EECE312	
		EECE361/ DISU361	Applied Electromagnetic Waves /Theory and Applications of Microwave Engineering		EECE320	Introduction to Automatic Control
					EECE336	Electronic Circuits Ⅱ
					EECE341	Introduction to Communication Systems
					EECE375	Computer Design
					EECE491	Capstone Design Project I
	ME	EECE301	Introduction to Digital Signal Processing	ME	EECE303	Physical Electronics
		EECE304	Mathematics for Electronics and Electrical Engineers			
		EECE306	Introduction to radar engineering		EECE305	Power Electronics
		EECE308	Introduction to Digital Communication			
		EECE309	Modern Control Theory			
		EECE310	Introduction to Electric Power System Control and Operation		EECE376	Electronics and Electrical Engineering Lab Ⅲ
		EECE338	Electronics and Electrical Engineering Lab Ⅱ			
		EECE372	Microprocessor Architecture and Applications		EECE392	Seminars on Electronics
Senior	MR	EECE491	Capstone Design Project I	MR	EECE491	Capstone Design Project I
	ME	EECE401	Semiconductor Electronics Ⅱ	ME	EECE411	Display Engineering I
		EECE412 / DISU412	Display Engineering Ⅱ /Semiconductor Device for Display Technology		EECE425	Power Electronics
		EECE413	Electronic Circuit 3A: High-Speed Digital Electronics Design			
		EECE414	Introduction to RFand Analog Circuit Design		EECE428	Dynamic Modeling and Analysis of Power Systems
		EECE415	Biomedical Device: Engineering for Diagnostics and Therapeutics		EECE443/ NGCN302	Communications and Network Lab
		EECE416	Microwave Device Analysis			
		EECE417	Introduction to Nanoscale Science and Engineering		EECE312	Introduction to Machine Learning Systems
		EECE418	Basic quantum information			
		EECE419	**Advanced Electoronic Circuits**		EECE455	Embedded System-on-Chip Design
		EECE422	Digital Control Engineering			
		EECE426	Embedded Control Systems		EECE461	Microwave Engineering Application and Lab
		EECE434/ DISU434	Introduction to VLSI Design/ VLSI System Design			
		EECE442/ NGCN301	Introduction to Communications and Network		EECE472	Introduction to Computer Security
		EECE480	Introduction to Biomedical Engineering		EECE490 A/Z	Special Topics in Electronics Engineering A/Z
		EECE490 A/Z	Special Topics in Electrical Engineering A/Z			
		EECE492	Capstone Design Project Ⅱ		EECE492	Capstone Design Project Ⅱ
		EECE5	Graduate-level 500-series courses offered by the Department (excluding Research Credit Courses)		EECE5	Graduate-level 500-series courses offered by the Department (excluding Research Credit Courses)

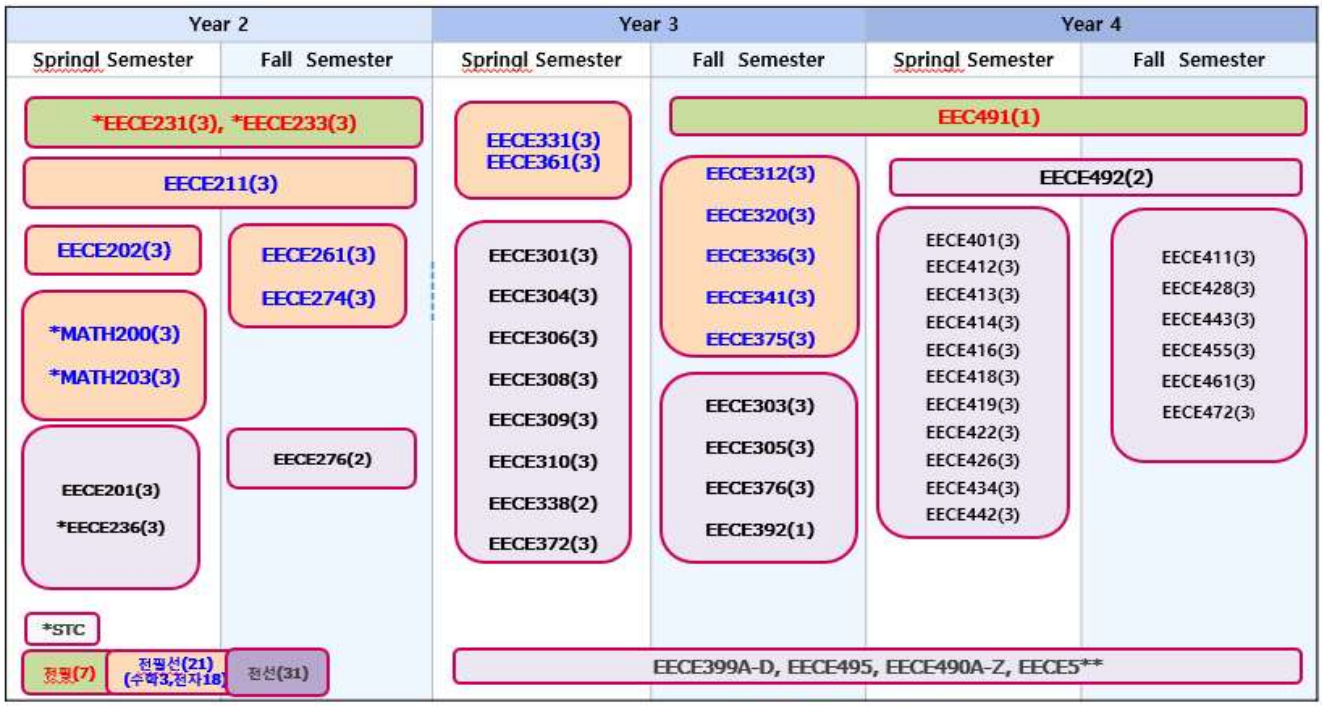
※ In the senior year, the offering semester of ME courses may vary.

6. Course List by Specialized Field within the Major

Guidelines for Course Completion: ME courses must be taken under the guidance of an academic advisor.

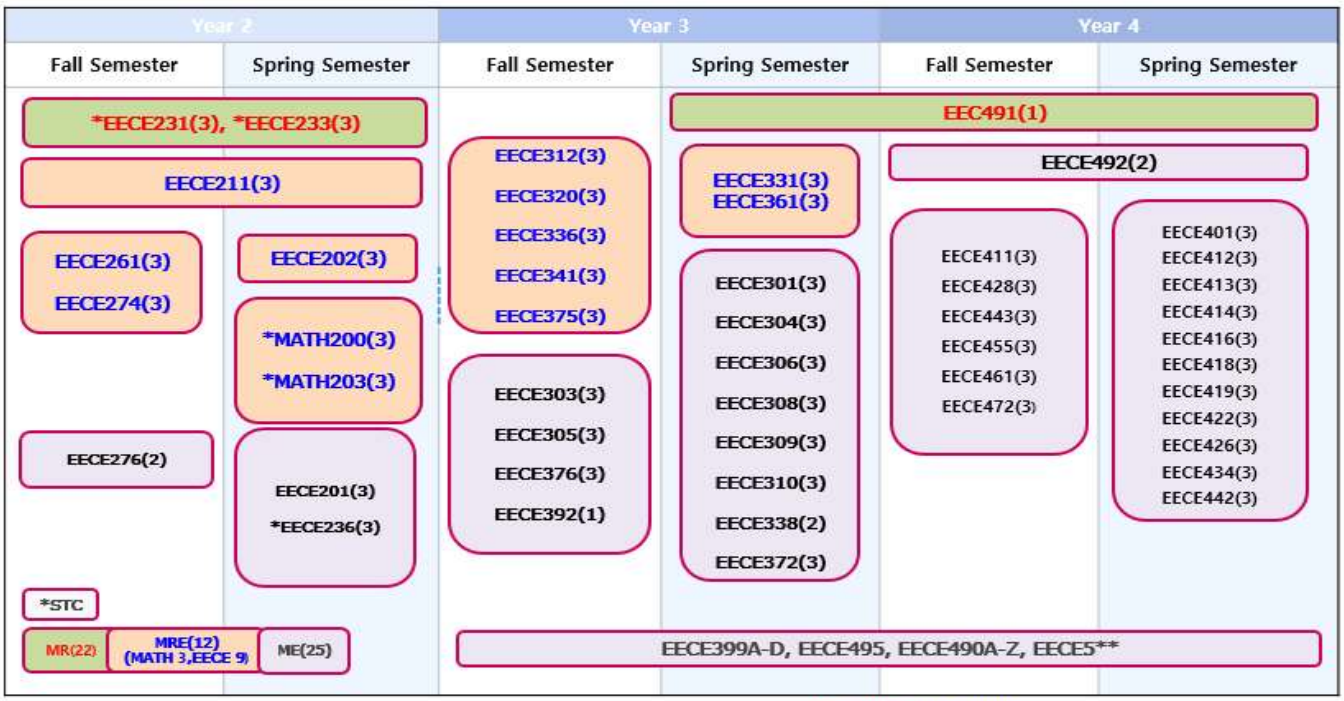
7. Curriculum Roadmap

- Spring Entry



※ MR: RED, ME: BLUE, STC COURSE:*MARK

- Fall Entry



※ MR: RED, ME: BLUE, STC COURSE: *MARK

8. Approved ME/MR Courses Offered by Other Departments

8-1. Approved MR/DME courses offered by other departments

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
MR	MATH200	Differential Equations (STC)	3-1-3
MR	MATH203	Applied Linear Algebra (STC)	3-1-3

8-2. Approved ME courses offered by other departments (Applicable to students enrolled in 2018 or after)

Include it as a major course offered by the Department of Electrical Engineering.

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
ME	CSED232	Principles of Software Construction (STC)	3-0-3
	CSED233	Data Structure (STC)	3-0-3
	CSED312	Operating Systems	3-2-4
	CSED331	Algorithms	3-0-3
	CSED353	Computer Networks	3-0-3
	CSED357	Database Systems	3-2-4
	CSED423	Design of Compilers	3-1-3
	PHYS201	Introduction to Quantum Physics(STC)	3-1-3
	PHYS209	Mathematical Methods for Physics	3-1-3
	PHYS301	Quantum Physics I	3-1-3
	PHYS304	Thermal Physics	3-1-3
	PHYS401	Solid State Physics	3-0-3
	PHYS410	Optical Physics	3-0-3
	MATH210	Applied Complex Variables (STC)	3-1-3
	MATH261	Discrete Mathematics (STC)	3-1-3
	MATH301	Modern Algebra I	3-1-3
	MATH311	Analytics I	3-1-3
	INTN300	Internship Program	1 to 4 Credits
	INTN301	Tech+ Innovation	Varied Credits
	INTN302	Tech+ Star	Varied Credits
	ENTP451A	Technology Startup	1-0-1
	ENTP451B	Service Startup	1-0-1
	CITE215	Introduction to Makers	2-2-3

9. Course Description

EECE100/DISU101 – Introduction to Electrical Engineering ····· (1-0-1)

This introductory course is designed for first-year undergraduate students with an interest in electrical engineering. It offers an overview of the current landscape and future developments of the field, emphasizes rapidly advancing research areas, and delineates faculty-led research initiatives within electrical engineering. No prerequisites are required.

EECE199 – Freshman Research Participation ····· (0-2-1)

Under the supervision of a faculty advisor, freshmen participate in research projects in various areas of electrical engineering and gain practical experience.

EECE201 - Quantum Electronics ····· (3-0-3)

This course is a foundational, interdisciplinary subject in electronic engineering that provides a step-by-step learning path from the basic concepts of quantum mechanics to advanced applications such as solid-state physics, semiconductor devices, quantum computing, and AI hardware. It is designed for second-year students majoring in related fields such as electronic engineering, physics, and materials science. Building on fundamental knowledge of general physics and calculus, the course aims to help students intuitively and easily grasp core concepts without relying on complex mathematics.

EECE202 – Introduction to Probability and Random Processes ····· (3-0-3)

This course covers mathematical tools essential for modeling, analyzing, and designing signals and systems in electronics and electrical engineering, with a focus on probability theory and random processes.

EECE211 – Semiconductor Electronics I ····· (3-0-3)

This course covers the fundamental principles of semiconductor devices, including current conduction by electrons and holes, tunneling, P–N junctions, bipolar transistors, JFETs (Junction Field Effect Transistors), MOSFETs (Metal Oxide Semiconductor Field Effect Transistors), and other advanced devices. It also examines applications of these devices in integrated circuits.

EECE231/DISU231 – Circuit Theory/Electric Circuits ····· (3-0-3)

This course develops students' ability to analyze electrical circuits. Topics include charge, current, voltage, resistance, capacitance, inductance, power and energy, Kirchhoff's laws, impedance, maximum power transfer, Thevenin's theorem, Norton's theorem, and computer-aided circuit analysis.

EECE233 – Signals and Systems ····· (3-0-3)

This course introduces the concepts of sampling, modulation, and filtering of signals by studying continuous and discrete-time functions. Emphasis is placed on the input–output relationships of linear time-invariant systems, including the convolution theorem, Fourier transform, Laplace transform, Z-transform, and Discrete Fourier Transform (DFT).

EECE236 – Learning About Electrical Engineering Using MatLab ····· (2-2-3)

This course introduces undergraduates to the fundamentals of electronics through engaging, cutting-edge engineering technologies using MATLAB. Students identify target applications inspired by advanced

engineering topics, develop high-level software programs with MATLAB tools, and assemble hardware components like building blocks to complete engaging projects. Through these projects, students are exposed to a variety of electronics techniques, learn the underlying mathematical and scientific theories of engineering, and explore how these theories are applied to state-of-the-art devices and software.

EECE261 – Introduction to Electromagnetism ····· (3-0-3)

Prerequisites: Calculus, General Physics II, General Physics II (H)

This course covers Coulomb's law, Faraday's law, the divergence theorem, Stokes' theorem, Poisson's equation, Laplace's equation, Ampère's law, vector potential, the Biot–Savart law, and Maxwell's equations. Students also study image analysis techniques, boundary-value problems, the properties of dielectrics, magnetic materials and magnetization, and methods for analyzing magnetic circuits.

EECE274 – Digital System Design ····· (3-0-3)

This course provides students with the knowledge and skills to understand and design systems that process digital information. It covers implementation techniques for combinational logic circuits, methodologies for designing sequential systems, and the use of hardware description languages (HDLs) for digital system design.

EECE276 – Electronics and Electrical Engineering Lab I ····· (1-3-2)

Prerequisite: Circuit Theory

This is the first undergraduate laboratory course in electronics engineering. Students learn to use electronic measurement instruments, read RLC component values, and work with operational amplifiers, digital circuits, and FPGAs to build simple electronic circuits. Programming techniques using microcontrollers such as Arduino and Raspberry Pi are also introduced.

EECE301 – Introduction to Digital Signal Processing ····· (3-0-3)

Prerequisite: Signals and Systems

This course explores signal processing techniques and their applications using digital systems such as computers. Students review the relationships between continuous and discrete signals, Z-transforms, and the Discrete Fourier Transform (DFT), and then study the Fast Fourier Transform (FFT) and state-space equations of discrete-time systems. The course also covers the design of digital filters using FIR and IIR methods.

EECE303 – Physical Electronics ····· (3-0-3)

Prerequisite: Semiconductor Electronics I

This course examines the physical properties of semiconductors, including crystal structures, quantum mechanics, quantum confinement, energy bands, electrons and holes, statistical distributions, density of states, Fermi level, carrier concentration, carrier transport and current, carrier generation and recombination, and the Hall effect.

EECE304 – Mathematics for Electronics and Electrical Engineers ····· (3-0-3)

In electronics engineering, areas such as semiconductors, optoelectronics, and electromagnetics—rooted in physics—require a solid understanding of advanced mathematical techniques. This course introduces these techniques to undergraduate students in electronics and related fields and demonstrates their applications to real-world problems.

Major topics include: 1) Dirac Delta Function; 2) Vector and Tensor Analyses; 3) Complex Variables; 4) Integral Transforms; 5) Ordinary and Partial Differential Equations; 6) Special Functions; and 7) Green's Functions.

EECE305 – Power Electronics ····· (3-0-3)

This course focuses on the principles of AC-to-DC and AC-to-AC power conversion. Topics include switching matrices, existence functions, current source converters, voltage source converters, pulse-width modulation (PWM), and uninterruptible frequency chargers (UFC).

EECE306 - Introduction to radar engineering ····· (3-0-3)

Prerequisite: EECE233 Signals and Systems

Here's a smoother and more polished version of your paragraph — ideal for a course catalog or syllabus description: This course introduces the principles and fundamental engineering concepts of radar systems. Topics include a review of electromagnetism, signals, systems, and digital signal processing (DSP), followed by the radar equation, propagation effects, and signal detection in noise. The course also covers radar cross section, antenna fundamentals, radar clutter, and various waveform design and pulse compression techniques.

EECE308 – Introduction to Digital Communication ····· (3-0-3)

Prerequisite: Signals and Systems or Mathematics for Electronics and Electrical Engineers A

This course provides a comprehensive introduction to the processes involved in digital communications, including sampling, quantization, multiplexing, coding, modulation, transmission links, switching, and reception of signals from analog sources or computers.

EECE309 – Modern Control Theory ····· (3-0-3)

Prerequisites: Signals and Systems, Introduction to Automatic Control

This course focuses on system analysis and design using state variables. It introduces computer control systems, modern techniques widely used in practice, linearization methods for analyzing nonlinear systems, optimization techniques for linear systems, input-output identification methods for unknown systems, and self-tuning control techniques.

EECE310 – Introduction to Electric Power System Control and Operation ····· (3-0-3)

Prerequisite: Introduction to Automatic Control

This course teaches optimal operation and real-time control techniques for large-scale power systems, including both AC and DC generators. Students develop economic dispatch algorithms that ensure the stability and reliability of power system operations and derive optimal solutions. The course also examines the frequency and node voltage characteristics of AC synchronous generators and designs feedback controllers to regulate them. Students verify controller performance using MATLAB/Simulink and explore output forecasting, control strategies, and impact analysis for large-scale renewable power plants.

EECE312 – Introduction to Machine Learning Systems ····· (3-0-3)

With recent advancements in artificial intelligence, there is active, bidirectional research and development in both AI-based electronics and the application of AI to electronics engineering. As a result, foundational knowledge of AI and machine learning has become essential for electronics engineering students.

This course, designed for students who have completed the Department curriculum, covers a wide range

of topics, from classical machine learning theories and their applications to solving data-driven engineering problems, to cutting-edge deep learning techniques.

EECE320 – Introduction to Automatic Control ····· (3-0-3)

Prerequisite: Signals and Systems

This course covers the principles of mathematical modeling, transfer functions, and feedback control and its applications, with emphasis on the analysis and synthesis of feedback systems in the time and frequency domains. Topics include the root-locus method, Bode diagrams, Nyquist method, and state-space methods, as well as analysis and synthesis of control systems using computers.

EECE331(SEMI205) – Electronic Circuits Ⅰ ····· (3-0-3)

Prerequisite: Circuit Theory

This course covers the fundamental operation of semiconductor devices such as diodes and BJTs, and their use in circuits including rectifiers, single-transistor amplifiers, cascode amplifiers, and differential amplifiers. Students learn techniques for analyzing large-signal transient behavior and small-signal frequency characteristics of linear amplifier circuits.

EECE336 – Electronic CircuitsⅡ ····· (3-0-3)

Prerequisite: Electronic Circuits Ⅰ

This course covers differential amplifiers and multistage amplifier circuits, frequency response, feedback analysis, stability issues, output stages and power amplifiers, analog integrated circuits, filters, tuned amplifiers, oscillators, and signal generators. Students analyze these circuits and verify their operation through laboratory experiments.

EECE338 – Electronics and Electrical Engineering LabⅡ ····· (1-3-2)

Prerequisites: Circuit Theory, Signals and Systems

This is the second undergraduate laboratory course in electronics engineering. It prepares students to work with advanced technologies by experimenting with semiconductor device characterization, analog circuits such as amplifiers, embedded systems that integrate hardware and software components, various digital signal processing techniques, and control algorithms.

EECE341 –Introduction to Communication Systems ····· (3-0-3)

Prerequisite: Signals and Systems

This course develops students' ability to design and analyze communication systems in both the time and frequency domains by applying Fourier transforms to communication channel models, signal design, and signal processing. The course focuses on analog communication systems, covering the fundamentals of modulation and demodulation techniques.

EECE361/DISU361 – Applied Electromagnetic Waves ····· (3-0-3)

Prerequisite: Introduction to Electromagnetism

This course covers Faraday's law, Maxwell's equations for time-varying electromagnetic waves, the wave equation, reflection and refraction of plane waves at dielectric boundaries, transmission line theory, the Smith chart, and impedance matching. It also includes theories related to waveguides, cavities, and the basic properties of antennas.

EECE372 – Microprocessor Architecture and Applications ····· (3-0-3)

Prerequisite: Digital System Design

This course covers the hardware, software, and interfacing of microprocessors and microcomputer systems. Topics include addressing modes in microcomputer systems, instruction set architecture, utilization of I/O devices, memory management, I/O interfacing, interrupts, DMA, and inter-processor communication. Students learn to apply and optimize microprocessor systems through software.

EECE375 – Computer Design ····· (3-0-3)

Prerequisite: Digital System Design

This course teaches techniques for designing complex digital systems using hardware description languages (VHDL or Verilog) and methods for implementing, building, and testing computer systems on FPGAs.

EECE376 – Electronics and Electrical Engineering LabⅢ ····· (1-5-3)

This is the third undergraduate laboratory course in electronics engineering. Students apply advanced technologies to build electronic devices such as ultrasonic wireless communication systems, drone control systems, and machine learning devices, and assess their performance.

EECE392 – Seminars on Electronics ····· (1-0-1)

This course provides an overview of electronics and electrical engineering by introducing research activities and future directions in various areas, including control and power electronics, information and communication systems, computer engineering, electromagnetic fields and microwaves, semiconductors and quantum electronics, and electronic circuits and VLSI design. It helps students gain a broad understanding of the field and make informed decisions about their area of specialization.

EECE399A/D – Research Participation ····· (0-2-1)

Under the supervision of a research advisor, students participate in research projects and gain direct, hands-on experience.

EECE401 – Semiconductor ElectronicsⅡ ····· (3-0-3)

Prerequisite: Semiconductor ElectronicsⅠ or Physical Electronics

Building on the knowledge gained in Semiconductor ElectronicsⅠ, this course explores advanced semiconductor devices, including P/N junctions, heterojunctions, bipolar transistors, MOSFETs, HBTs, and HEMTs.

EECE411 – Display EngineeringⅠ ····· (3-0-3)

This course provides students with a foundation in fundamental theories and knowledge of display technologies, as well as an understanding of emerging display technologies used in new devices, including AR/VR, to help them adapt quickly to advancements in the field.

Upon completing this course, students can expect to:

1) Understand the principles, structures, and the advantages and disadvantages of nearly all existing display technologies.
2) Gain in-depth knowledge of LCD and OLED, which dominate the current display market.
3) Understand the various factors and real-world examples that determine the competitiveness of display technologies.

4) Learn the operating mechanisms, advantages, remaining challenges, and potential of major future display technologies.
5) Apply and systematize the knowledge gained by conceptualizing new display technologies, identifying potential technical issues, and conducting a team-based term project (in groups of 1–3 students).

EECE412/DISU412 – Display EngineeringⅡ ····· (3-0-3)

Building on Display EngineeringⅠ, this course is designed for juniors and seniors who have completed foundational courses in electronics and related fields. It focuses on deepening students' understanding of key device engineering concepts essential for display technologies, including display modes, semiconductors, thin-film transistors (TFTs), touch technology, and quantum dot (QD) emitters. Students also explore updated topics such as OLED and flexible displays, fostering an integrated perspective on the convergence of display technologies with semiconductors, sensors, vision systems, and materials science.

The course combines lectures and discussions on topics including TFT devices and fabrication processes, LCD device and mode technologies, the principles of OLEDs used in TVs, flexible displays, touch-based user interfaces for displays, quantum dot technologies, and post-OLED innovations, encouraging students to develop creative and integrative thinking in display engineering.

EECE413 – Electronic Circuit 3A: High-Speed Digital Electronics Design ····· (3-0-3)

This course teaches the theories, design techniques, and methodologies required to custom-design high-speed digital circuits at the transistor level.

EECE414 – Introduction to RFand Analog Circuit Design ····· (3-0-3)

This course helps students understand the principles of wireless communication and radar systems and analyze system architectures from an RF-analog circuit perspective. It covers fundamental concepts and design theories of RF-analog circuits—an important area of analog integrated circuits—including transmission line theory, impedance matching, S-parameters, and circuit design using the Smith chart. Students learn to define performance metrics for RF/Analog circuits and analyze circuits such as high-power amplifiers, low-noise amplifiers, frequency converters, and signal generators. The course also includes hands-on practice in designing and analyzing simple RF circuits using commercial design simulators.

EECE415 – Biomedical Device: Engineering for Diagnostics and Therapeutics ····· (3-0-3)

With growing interest in biomedical engineering driven by advancements in the bio-health field, this course provides engineering knowledge essential for developing medical devices. Students are introduced to devices for disease treatment at the physiological level, such as neural electronics, and learn the principles underlying therapeutic applications.

EECE416 – Microwave Device Analysis ····· (3-0-3)

This course reviews the fundamental operating principles of semiconductor devices used in mircrowave device analysis and explores the theoretical behavior of various high-frequency devices, including diodes, BJTs, HBTs, and HEMTs. It covers two-port analysis and scattering parameters, which are essential for microwave device analysis, and teaches equivalent circuit modeling for interpreting frequency characteristics. Students learn to predict high-frequency operating characteristics using equivalent circuit models and to extract equivalent circuit parameters from measured device data.

EECE417 – Introduction to Nanoscale Science and Engineering ····· (3-0-3)

This senior-level ME course offers a comprehensive introduction to nanoscience and nanoengineering. Students learn the fundamental principles underpinning nanotechnology, such as quantum mechanics, solid-state physics, and electromagnetics, and study imaging techniques, fabrication processes, and key tools used at the nanoscale. The course also examines theories and recent research findings on nanoscale materials, electronics, optics, photonics, and sensors.

EECE418 – Basic quantum information ····· (3-0-3)

This course reviews fundamental quantum mechanics necessary for understanding quantum information processing. Topics include the Schrödinger formalism for describing quantum systems, the quantum harmonic oscillator, and density matrices for characterizing quantum states. The course also examines dissipation processes that cause loss of coherence in quantum states, provides an overview of quantum optics, and introduces mathematical descriptions of advanced quantum processors such as ion traps and superconducting qubits.

EECE419/DISU404 – Advanced Electoronic Circuits ····· (3-0-3)

Prerequisites: Circuit Theory, Electronic Circuits I

This course goes beyond analytical circuit evaluation to emphasize a design-oriented approach for advanced electronic systems. Students explore the structure and operating principles of complex circuits in depth, focusing on key technologies required in both industry and research. Topics include semiconductor device modeling, high-speed signal processing, power conversion, and mixed analog–digital circuit design. The course also introduces advanced analysis techniques and design optimization methods that enable intuitive and efficient understanding of complex circuit systems.

EECE422 – Digital Control Engineering ····· (3-0-3)

Prerequisite: Introduction to Automatic Control

This course covers the Z-transforms and state-variable methods for analyzing sampled-data control systems. Students learn to design control systems using computers, particularly microcomputers, and study stability criteria for digital systems and time-domain analysis techniques.

EECE426 – Embedded Control Systems ····· (2-2-3)

Prerequisites: Digital System Design, Microprocessor Architecture and Applications

This course covers the architecture and design methods of embedded systems, with particular emphasis on memory (DRAM and cache) and storage (SSD: solid-state disks) access control in embedded systems. As a laboratory-centered course, students work on projects such as SystemC-based modeling through SSD design tasks, embedded software development on actual SSDs using the OpenSSD platform, qualitative operation and quantitative performance analysis of memory subsystems with DRAM/cache, and embedded programming using ARM Cortex-A8 boards.

EECE428 – Dynamic Modeling and Analysis of Power Systems ····· (3-0-3)

Prerequisite: Circuit Theory

This course introduces the fundamental operating principles of electric energy systems and explores modeling and analysis methods for power systems. Students study AC power generation, transmission, consumption, and protection in both steady-state and fault conditions, and perform exercises using MATLAB. The course also covers the basic concepts and the impacts of emerging technologies such as

microgrids, wind and solar renewable energy sources, energy storage systems, demand response, and HVDC transmission.

EECE434/DISU434 – Introduction to VLSI Design ····· (3-0-3)

Prerequisite: Digital System Design

This course covers the overall knowledge and design methodologies required for system semiconductor design. Students learn digital design techniques using HDL for combinational and sequential logic circuits and practice logic synthesis and physical design processes using commercial EDA software.

EECE442/NGCN301 – Introduction to Communications and Network ····· (3-0-3)

This course covers the standards of various communication networks, the modulation techniques they employ, and the structures and functions of networks.

EECE443/NGCN302 – Communications and Network Lab ····· (1-4-3)

This laboratory course teaches students how to operate essential measurement equipment for understanding and researching communications and networks, and to conduct a variety of experiments using these tools.

EECE455 – Embedded System-on-Chip Design ····· (3-0-3)

Prerequisite: Computer Design

This course builds foundational knowledge in computer architecture, embedded programming, digital circuits, and accelerator system design, while teaching optimization techniques that integrate these disciplines. Students design system-on-chip (SoC) architectures that integrate embedded processors and accelerators using Verilog, and develop and test their designs on commercial FPGA systems. The course adopts a project-based learning (PBL) approach, enabling students to optimize and implement their own SoC designs.

EECE461 – Microwave Engineering Application and Lab ····· (1-4-3)

Prerequisite: Electromagnetic Waves

This laboratory course provides hands-on experiments with passive components used in microwave engineering. Topics include rectangular waveguides, Gunn oscillators, frequency and power measurement methods, precision attenuators, matching tuners, standing waves, waveguide wavelength, resonators, couplers, dividers, horn antennas, and microwave lenses.

EECE472 – Introduction to Computer Security ····· (3-0-3)

This course provides a broad overview of various information security issues encountered in the information society, such as passwords, access control, encryption, biometrics, e-commerce, intellectual property, nuclear weapons management, and information warfare. It also aims to raise awareness of the importance of protecting personal data.

EECE480 – Introduction to Biomedical Engineering ····· (3-0-3)

By the end of this course, students will be able to: (1) Apply knowledge of biological and physical sciences, mathematics, and engineering to solve problems at the interface of engineering and biology; (2) Design biomedical engineering systems, components, or processes that meet specific needs, demonstrating an understanding of relevant technical, professional, and ethical issues; (3) Function effectively on

multidisciplinary teams; (4) Communicate clearly in verbal, written, and graphical formats; and (5) Identify, formulate, and solve biomedical engineering problems that address contemporary issues in a global, societal, and economic context.

EECE490A/Z – Special Topics in Electrical Engineering A/Z ····· (Varied Credits, up to 3 credits)

Prerequisite: Varies depending on the nature of the lecture

This course offers lectures on topics not explicitly covered in the existing curriculum. Visiting professors or full-time faculty members teach specialized subjects of current interest based on the latest trends.

EECE491 – Capstone Design Project Ⅰ ····· (0-3-1)

The Capstone Design Project Ⅰ is designed to provide practical research experience through the design and implementation of an independent system. In Capstone Design Project Ⅰ, students select a topic, draft and submit a research proposal. The project should be an original work that synthesizes knowledge from the four-year electronics engineering curriculum, demonstrates creativity, can be independently implemented, and is feasible for a team of 2–3 students. Theoretical topics that cannot be demonstrated are presented as posters and must be accepted at domestic or international conferences or submitted to journals. The first half of the research plan is carried out, including a demonstration and submission of the first report.

EECE492 – Capstone Design Project Ⅱ ····· (0-5-2)

Prerequisite: Capstone Design Project Ⅰ

In this course, students carry out the research plan drafted in Capstone Design Project Ⅰ, perform demonstrations, and submit the final report.

EECE495 – Semester Internship ····· (12 credits)

Semester Internship is a semester-long (at least 16 weeks) internship program that provides students with expanded opportunities for hands-on experience and enables them to actively explore their research interests.

※ However, the total number of graduation credits recognized from field training courses is limited to a maximum of 9 credits.

10. Interdisciplinary Minor in Next-Generation Communications and Networks

With the rapid advancement of 5G, 6G mobile communications, and network technologies—the foundation of the Fourth Industrial Revolution—there is an increasing need to cultivate interdisciplinary talent equipped with both hardware and software knowledge and competencies.

Supported by Samsung Electronics (IM/CE Division: Network Business, Samsung Research, Mobile Communications Business), this program builds on courses offered by the Department of Electronics and Electrical Engineering and the Department of Computer Science and Engineering. It introduces tailored introductory core courses and elective laboratory courses, establishing and operating a successful industry–academia collaborative education model that achieves academic excellence and meets corporate demands.

[Comprehensive List of Major Courses]

<table>
<tr><th>Category</th><th>Course Code</th><th>Course Title</th><th>Lecture-Lab/Practicum-Credit</th><th colspan="2">Minimum Requirements</th></tr>
<tr><td>MR</td><td>NGCN301
/EECE442</td><td>Introduction to Communications and Network</td><td>3-0-3</td><td colspan="2">More than 3 credits</td></tr>
<tr><td rowspan="6">DME</td><td>CSED331</td><td>Algorithms</td><td rowspan="6">3-0-3</td><td rowspan="3">More than 3 credits</td><td rowspan="6">More than 9 credits</td></tr>
<tr><td>CSED332</td><td>Software Design Methods</td></tr>
<tr><td>CSED353</td><td>Computer Networks</td></tr>
<tr><td>EECE202</td><td>Introduction to Probability and RandomProcesses</td><td rowspan="3">More than 3 credits</td></tr>
<tr><td>EECE341</td><td>Introduction to Communication Systems</td></tr>
<tr><td>EECE308</td><td>Introduction to Digital Communication</td></tr>
<tr><td rowspan="29">ME</td><td>NGCN302
/EECE443</td><td>Communications and Network Lab</td><td>1-4-3</td><td colspan="2" rowspan="29">More than 9 credits</td></tr>
<tr><td>CSED342</td><td>Artificial Intelligence</td><td rowspan="28">3-0-3</td></tr>
<tr><td>CSED352</td><td>Computer Security</td></tr>
<tr><td>CSED415</td><td>Peer-to-peer Networking</td></tr>
<tr><td>CSED416</td><td>Internet of Things</td></tr>
<tr><td>CSED417</td><td>Software Verification</td></tr>
<tr><td>CSED500</td><td>Advanced Linear Algebra for CSE</td></tr>
<tr><td>CSED505</td><td>Network Performance Analysis</td></tr>
<tr><td>CSED530</td><td>Advanced Probability Theory for CSE</td></tr>
<tr><td>EECE361</td><td>Applied Electromagnetic Waves</td></tr>
<tr><td>EECE414</td><td>Microelectronics 3B: RF/Analog Circuits</td></tr>
<tr><td>EECE451</td><td>Introduction to Digital Signal Processing</td></tr>
<tr><td>EECE574</td><td>Probability and Stochastic Process</td></tr>
<tr><td>EECE575</td><td>Communication and Sensing Systems</td></tr>
<tr><td>EECE576</td><td>Statistical Communication Theory</td></tr>
<tr><td>EECE577</td><td>Information and Coding Theory</td></tr>
<tr><td>EECE578</td><td>Digital Communications</td></tr>
<tr><td>EECE579</td><td>Information and Communication Security</td></tr>
<tr><td>EECE581</td><td>Digital Signal Processing</td></tr>
<tr><td>EECE582</td><td>Error-Correcting Codes</td></tr>
<tr><td>EECE583</td><td>Advanced Linear Algebra</td></tr>
<tr><td>EECE589</td><td>Modern Coding Theory</td></tr>
<tr><td>MATH430</td><td>Introduction to Mathematical Statistics</td></tr>
<tr><td>MATH448</td><td>Introduction to Coding Theory</td></tr>
<tr><td>MATH449</td><td>Introduction to Cryptography</td></tr>
<tr><td>MATH565</td><td>Coding Theory</td></tr>
<tr><td>MATH567</td><td>Algebraic cryptography</td></tr>
<tr><td>IMEN561</td><td>Network Theory</td></tr>
<tr><td>CSED343</td><td>Mathematics for Machine Learning</td></tr>
<tr><td>MATH442</td><td>Mathematics for AI</td></tr>
</table>

Discipline	Dobule Major	Minor
Interdisciplinary Minor in Next-Generation Communications and Networks	-	**21 credits (MR 12 credits + ME 9 credits)** **A. MR: 12 credits** -Students must take Introduction to Communications and Network (3-0-3) as a required core course. -Students must complete at least three DME courses (9 credits), including at least one from Algorithms, Software Design Methods, or Computer Networks, and at least one from Mathematics for Electronics and Electrical Engineers A, Introduction to Communication Systems, or Introduction to Digital Communication. -Eligible MR courses: NGCN301 Introduction to Communications and Network, CSED331 Algorithms, CSED332 Software Design Methods, CSED353 Computer Networks, EECE202 Introduction to Probability and Random Processes, EECE341 Introduction to Communication Systems, EECE308 Introduction to Digital Communication **B. ME: 9 credits** -Eligible ME courses: NGCN302 Communications and Network Lab, CSED342 Artificial Intelligence, CSED352 Data Communications, CSED415 Computer Security, CSED416 Peer-to-peer Networking, CSED417 Internet of Things, CSED500 Advanced Linear Algebra for CSE, CSED505 Network Performance Analysis, CSED530 Advanced Probability Theory for CSE, EECE361 Applied Electromagnetic Waves, EECE414 Microelectronics 3B: RF/Analog Circuits, EECE451 Introduction to Digital Signal Processing, EECE574 Probability and Stochastic Process, EECE575 Communication and Sensing Systems, EECE576 Statistical Communication Theory, EECE577 Information and Coding Theory, EECE578 Digital Communications, EECE579 Information and Communication Security, EECE581 Digital Signal Processing, EECE582 Error-Correcting Codes, EECE583 Advanced Linear Algebra, EECE589 Modern Coding Theory, MATH430 Introduction to Mathematical Statistics, MATH448 Introduction to Coding Theory, MATH449 Introduction to Cryptography, MATH565 Coding Theory, MATH567 Algebraic cryptography, IMEN561 Network Theory, CSED343 Mathematics for Machine Learning, MATH442 Mathematics for AI **C. Note: Up to 9 credits (three courses) may be double-counted if they are both: (1) included in this Interdisciplinary Minor course list and (2) major courses offered by the Department of Computer Science and Engineering or the Department of Electronics and Electrical Engineering.** "Mathematics for Machine Learning" **and** "Mathematics for AI" **are considered equivalent courses, and only one of them can be recognized for credit.**

[Course Description]

NGCN301/EECE442 – Introduction to Communications and Network ····· (3-0-3)

This course serves as the required MR introductory course for the Next-Generation Communications and Networks Interdisciplinary Minor, covering both the communications and networking fields.

NGCN302/EECE443 – Communications and Network Lab ····· (1-4-3)

This course serves as the ME laboratory course for the Next-Generation Communications and Networks Interdisciplinary Minor.

Department of Computer Science and Engineering

1. Educational Goals

(1) To build a strong foundation in computer science and engineering and cultivate creative, globally-minded talent capable of leading R&D in cutting-edge IT fields.
(2) To nurture individuals who combine theoretical expertise with practical skills and who can independently set and achieve their own goals.

2. Curriculum Overview

Computer science and engineering is a relatively young discipline, but it has advanced at a remarkable pace to become one of the core technologies not only in the IT field but also all areas of science and industry. It is founded on the logic of computation and mathematical principles, further developed through knowledge from electronic and systems engineering, and has continued to evolve through integration with diverse fields such as linguistics, cognition, medicine, business, mechanical, and industrial engineering. Although research in this field includes computer applications, its primary focus is on the computer itself—both hardware and software. The discipline addresses scientific and engineering challenges that span from fundamental principles of computation to the design and construction of new or higher-performance computers, as well as the development and implementation of related algorithms.

In recent years, growing attention has been directed toward the theories and technologies of computer science and engineering that enable artificial intelligence (AI) systems capable of learning and reasoning. In particular, technologies for the rapid exchange and processing of large-scale data have become a crucial foundation for AI advancement, whose importance has expanded with the widespread use of computers and mobile IT devices. As the focus of the IT industry shifts from hardware to software, software has become more than a tool—it now serves as the key technology for designing and automating intelligent systems. Amid these changes, computer science and engineering remains both the foundational discipline that enables advanced technologies and the core driver of future innovation.

In response, the Department of Computer Science and Engineering has strengthened its foundational curriculum to provide students with a solid grounding in the discipline bridging theory and practice. To offer both breadth and depth, the curriculum includes an expanded set of foundational and core MR courses common to the subfields of computer science and engineering, while allowing students to choose subfield-specific foundational courses as DME courses. For more advanced studies, students can freely select from ME courses. The curriculum also emphasizes both theoretical knowledge and practical experience to foster the self-directed problem-solving skills required of R&D leaders in graduate school or industry. To this end, the Department aims to foster graduates who possess a solid theoretical foundation and strong practical capabilities, prepared to lead in a rapidly changing technological world.

▶Guidelines for Double Major and Minor

1) Double Major
-Students pursuing a double major in Computer Science and Engineering must complete all MR courses, at least 6 credits in DME courses, and a minimum of 35 total credits including ME courses. Credits for

the same course may be counted toward both the primary major and the double major.

2) Minor

-Students pursuing a minor in Computer Science and Engineering must complete at least 15 credits in MR courses and at least 6 credits in DME courses, for a total of at least 21 credits.

-Credits for the same course may not be double-counted toward both the primary major and the minor.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5 credit requirement will count as FE.
MR	MR: 28 credits DME: 6 credits	**34**	
ME	18 credits in major courses offered by the Department STC courses and MR offered by other departments	**27**	
FE		**9**	
Subtotal		**131**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended Prerequisite
BER	CSED101	Programming and Problem Solving	3-1-3	
	CSED105	Introduction to Artificial Intelligence	2-0-2	
BEE	CSED100	Introduction to Computer Science & Engineering	1-0-1	
	CSED103	Introduction to Programming	3-0-3	
	CSED199	Freshman Research Participation	0-2-1	
MR	MATH230*	Probability and Statistics	3-1-3	
	CSED211	Introduction to Computer Software Systems (STC)	2-2-3	Programming and Problem Solving
	CSED232	Principles of Software Construction (STC)	3-0-3	Programming and Problem Solving
	CSED233	Data Structure (STC)	3-0-3	Programming and Problem Solving
	CSED241	Introduction to Computer Architecture	3-2-4	Introduction to Computer Systems
	CSED261	Discrete Mathematics for Computer Science	3-0-3	
	CSED312	Operating Systems	3-2-4	Principles of Software Construction, Data Structures
	CSED331	Algorithms	3-0-3	Data Structures
	CSED499 Ⅰ	Research Project Ⅰ	0-2-1	
	CSED499 Ⅱ	Research Project Ⅱ	0-2-1	
DME	CSED321	Programming Languages	3-0-3	Data Structures
	CSED341	Automata and Formal Languages	3-0-3	
	CSED342	Artificial Intelligence	3-0-3	Data Structures
	CSED343	Mathematics for Machine Learning	3-0-3	Applied Linear Algebra, Probability and Statistics, Introduction to Operations Research
	CSED353	Computer Networks	3-0-3	Introduction to Computer Systems
	CSED356	Human-Computer Interaction	3-0-3	
	CSED357	Database Systems	3-2-4	Data Structures
ME	CSED212	Programming Studio	2-2-3	Introduction to Programming
	CSED213	Problem Solving Practice and Applications	0-2-1	Programming and Problem Solving
	CSED226	Introduction to Data Analysis	3-0-3	Data Structures
	CSED273	Digital System Design	3-3-4	
	CSED332	Software Design Methods	3-0-3	Principles of Software Construction
	CSED352	Data Communications	3-0-3	Introduction to Computer Systems
	CSED354	Introduction to Topics in Computer Science and Engineering	0-2-1	
	CSED355	Computational Signal Processing	3-0-3	Calculus
	CSED399	Research Participation	0-2-1	

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended Prerequisite
ME	CSED401	Computers and Society	3-0-3	Programming and Problem Solving
	CSED403	Blockchain & Cryptocurrency	3-0-3	Data Structures, Computer Networks
	CSED404	Mobile and Ubiquitous Computing	3-0-3	
	CSED405	GPU and Accelerated Computing	3-0-3	Introduction to Computer Architecture
	CSED415	Computer Security	3-0-3	
	CSED416	Peer-to-peer Networking	3-0-3	Computer Networks
	CSED417	Internet of Things	3-0-3	Computer Networks
	CSED420	Software Verification	3-0-3	Automata and Formal Languages
	CSED423	Design of Compilers	3-1-3	Data Structures, Automata and Formal Languages
	CSED425	Embedded System Programming	2-2-3	Introduction to Computer Architecture, Operating Systems
	CSED426	Big Data	3-0-3	Data Structures, Algorithms
	CSED433	Logic in Computer Science	3-0-3	Programming Languages
	CSED434	Advanced Programming in Scala	3-0-3	Programming Languages
	CSED441	Introduction to Computer Vision	3-0-3	Applied Linear Algebra
	CSED451	Computer Graphics	3-0-3	Data Structures, Applied Linear Algebra
	CSED490	Special Topics in Computer Science A-Z	Varied Credits	

* Students must complete one of the following courses: Probability and Statistics (MATH230), Statistics for Experimental Research (MATH231), or Probability and Statistics for Engineering (IMEN272).

5. Major Course List by Year and Semester

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BER	CSED101	Programming and Problem Solving	BER	CSED101	Programming and Problem Solving
		CSED105	Introduction to Artificial Intelligence		CSED105	Introduction to Artificial Intelligence
	BEE	CSED103	Introduction to Programming	BEE	CSED100	Introduction to Computer Science & Engineering
					CSED103	Introduction to Programming
					CSED199	Freshman Research Participation
Sophomore	MR	MATH230*	Probability and Statistics	MR	MATH230*	Probability and Statistics
		CSED232	Principles of Software Construction		CSED211	Introduction to Computer Software Systems
		CSED233	Data Structure		CSED233	Data Structure
		CSED241	Introduction to Computer Architecture			
		CSED261	Discrete Mathematics for Computer Science			
	ME	CSED226	Introduction to Data Analysis	ME	CSED212	Programming Studio
		CSED273	Digital System Design		CSED213	Problem Solving Practice and `Applications
Junior	MR	CSED331	Algorithms	MR	CSED312	Operating Systems
					CSED331	Algorithms
	DME	CSED321	Programming Languages	DME	CSED341	Automata and Formal Languages
		CSED342	Artificial Intelligence		CSED342	Artificial Intelligence
		CSED343	Mathematics for Machine Learning		CSED356	Human-Computer Interaction
		CSED353	Computer Networks			
		CSED357	Database Systems			
	ME	CSED352	Data Communications	ME	CSED332	Software Design Methods
		CSED399	Research Participation		CSED354	Introduction to Topics in Computer Science and Engineering
					CSED355	Computational Signal Processing
					CSED399	Research Participation
Senior	MR	CSED499 Ⅰ/Ⅱ	Research Project Ⅰ/Ⅱ	MR	CSED499I/II	Research Project Ⅰ/Ⅱ
	ME	CSED401	Computers and Society	ME	CSED405	GPU and Accelerated Computing
		CSED403	Blockchain & Cryptocurrency		CSED416	Peer-to-peer Networking
		CSED404	Mobile and Ubiquitous Computing		CSED417	Internet of Things
		CSED415	Computer Security		CSED425	Embedded System Programming
		CSED420	Software Verification		CSED426	Big Data
		CSED423	Design of Compilers		CSED433	Logic in Computer Science
		CSED451	Computer Graphics		CSED434	Advanced Programming in Scala
		CSED490	Special Topics in Computer Science A-Z		CSED441	Introduction to Computer Vision
					CSED490	Special Topics in Computer Science A-Z

* Students must complete one of the following courses: Probability and Statistics (MATH230), Statistics for Experimental Research (MATH231), or Probability and Statistics for Engineering (IMEN272).

6. Curriculum Roadmap

- Spring Entry

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
Probability and Statistics(3) (MATH230)	Probability and Statistics(3) (MATH230)	Programming Languages(3) (CSED321)	Operating Systems(4) (CSED312)	Research Project Ⅰ(1)/Ⅱ(1) (CSED499I,II)	Research Project Ⅰ(1)/Ⅱ(1) (CSED499I,II)
*Principles of Software Construction(3) (CSED232)	*Introduction to Computer Software Systems(3) (CSED211)	Algorithms(3) (CSED331)	Algorithms(3) (CSED331)	Computers and Society(3) (CSED401)	GPU and Accelerated Computing(3) (CSED405)
*Data Structure(3) (CSED233)	*Data Structure(3) (CSED233)	Artificial Intelligence(3) (CSED342)	Automata and Formal Languages(3) (CSED341)	Blockchain & Cryptocurrency(3) (CSED403)	Peer-to-peer Networking(3) (CSED416)
Introduction to Computer Architecture(4) (CSED241)	Programming Studio (3) (CSED212)	Mathematics for Machine Learning(3) (CSED343)	Artificial Intelligence(3) (CSED342)	Mobile and Ubiquitous Computing (3) (CSED404)	Internet of Things(3) (CSED417)
Discrete Mathematics for Computer Science (3) (CSED261)	Problem Solving Practice and Applications (1) (CSED213)	Computer Networks(3) (CSED353)	Human-Computer Interaction(3) (CSED356)	Computer Security(3) (CSED415)	Embedded System Programming(3) (CSED425)
Introduction to Data Analysis(3) (CSED226)		Database Systems(4) (CSED357)	Software Design Methods(3) (CSED332)	Software Verification(3) (CSED420)	Big Data(3) (CSED426)
Digital System Design (4) (CSED273)		Data Communications (3) (CSED352)	Introduction to Topics in Computer Science and Engineering(1) (CSED354)	Design of Compilers (3) (CSED423)	Logic in Computer Science(3) (CSED433)
		Research Participation (CSED399)	Research Participation (CSED399)	Computer Graphics(3) (CSED451)	Advanced Programming in Scala (3) (CSED434)
				Special Topics in Computer Science A-Z (CSED490)	Introduction to Computer Vision(3) (CSED441)
					Special Topics in Computer Science A-Z (CSED490)

※ Major required:Red, Major eletcive:Blue,Others:Black, STC:*

- Fall Entry

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
Probability and Statistics(3) (MATH230)	Probability and Statistics(3) (MATH230)	Operating Systems(4) (CSED312)	Programming Languages(3) (CSED321)	Research Project Ⅰ(1)/Ⅱ(1) (CSED499I,II)	Research Project Ⅰ(1)/Ⅱ(1) (CSED499I,II)
*Introduction to Computer Software Systems(3) (CSED211)	*Principles of Software Construction (3) (CSED232)	Algorithms(3) (CSED331)	Algorithms(3) (CSED331)	GPU and Accelerated Computing(3) (CSED405)	Computers and Society(3) (CSED401)
*Data Structure(3) (CSED233)	*Data Structure(3) (CSED233)	Automata and Formal Languages(3) (CSED341)	Artificial Intelligence(3) (CSED342)	Peer-to-peer Networking(3) (CSED416)	Blockchain & Cryptocurrency(3) (CSED403)
Programming Studio(3) (CSED212)	Introduction to Computer Architecture (4) (CSED241)	Artificial Intelligence(3) (CSED342)	Mathematics for Machine Learning(3) (CSED343)	Internet of Things(3) (CSED417)	Mobile and Ubiquitous Computing (3) (CSED404)
Problem Solving Practice and Applications (1) (CSED213)	Discrete Mathematics for Computer Science (3) (CSED261)	Human-Computer Interaction(3) (CSED356)	Computer Networks(3) (CSED353)	Embedded System Programming(3) (CSED425)	Computer Security(3) (CSED415)
	Introduction to Data Analysis(3) (CSED226)	Software Design Methods(3) (CSED332)	Database Systems(4) (CSED357)	Big Data(3) (CSED426)	Software Verification(3) (CSED420)
	Digital System Design (4) (CSED273)	Introduction to Topics in Computer Science and Engineering(1) (CSED354)	Data Communications (3) (CSED352)	Logic in Computer Science(3) (CSED433)	Design of Compilers(3) (CSED423)
		Research Participation (CSED399)	Research Participation (CSED399)	Advanced Programming in Scala (3) (CSED434)	Computer Graphics(3) (CSED451)
				Introduction to Computer Vision(3) (CSED441)	Special Topics in Computer Science A-Z (CSED490)
				Special Topics in Computer Science A-Z (CSED490)	

※ Major required:Red, Major eletcive:Blue,Others:Black, STC:*

7. Approved Major Courses Offered by Other Departments

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
MR	MATH230	Probability and Statistics	3-1-3
	MATH231	Statistics for Experimental Research	3-1-3
	IMEN272	Probability and Statistics for Engineering	3-1-3
	MATH261	Discrete Mathematics	3-1-3
ME	All STC courses and MR offered by other departments		

* Students must complete one of the following courses: Probability and Statistics (MATH230), Statistics for Experimental Research (MATH231), or Probability and Statistics for Engineering (IMEN272).
※ Discrete Mathematics (MATH261) and Computational Mathematics (CSED261) are considered equivalent. When a student takes Discrete Mathematics, it is recognized as a MR course in the Department.
※ Recognition of Computational Mathematics as an STC course is limited to students in the Department and those pursuing a double major or minor in the Department.

8. Course Description

CSED100 – Introduction to Computer Science & Engineering ····· (1-0-1)

This course is designed for freshmen interested in computer science and engineering. It offers an engaging and accessible introduction to the field's current state and future prospects, highlighting its diverse areas, cutting-edge research directions, faculty laboratory activities, and the overall curriculum structure.

CSED101 – Programming and Problem Solving ····· (3-1-3)

This course introduces the fundamental principles of computation and the computational thinking essential for problem-solving. Through hands-on programming exercises, students learn how to express computational thinking effectively in computer programs using the Python language.

CSED103 – Introduction to Programming ····· (3-0-3)

This course provides an introduction to programming concepts and techniques using the C and C++ languages. C, as a procedural language, helps students understand fundamental programming principles and structures, while C++, which extends C with object-oriented features, equips students with more advanced programming skills. By the end of the course, students will be able to develop practical and efficient programs in both C and C++.

CSED105 – Introduction to Artificial Intelligence ····· (2-0-2)

This course introduces the background and key concepts of artificial intelligence, aiming to cultivate AI-based problem-solving skills and prepare students to thrive in an AI-driven society.

CSED199 – Freshman Research Participation ····· (0-2-1)

Under the guidance of a faculty advisor, freshmen participate in research projects to gain firsthand experience in research activities.

CSED211 – Introduction to Computer Software Systems ····· (2-2-3)

Recommended Prerequisite: CSED101 (Programming and Problem Solving)

This course introduces how computer systems execute programs, store information, and communicate, equipping students to develop highly compatible, efficient, and reliable software. It covers foundational knowledge of computer systems, including compilers, networks, operating systems, and computer

architecture. Specific topics include machine code generation and optimization, performance measurement and tuning, computer operations, memory structure and management, networking technologies and protocols, and parallel processing.

CSED212 – Programming Studio ····· (2-2-3)

Recommended Prerequisite: CSED103 (Introduction to Programming)

This course focuses on enhancing students' programming skills, which are essential in computer science and engineering. Through a studio-format class combining hands-on assignments, self-directed projects, and detailed code reviews with group discussions, students gain practical experience and improve their coding proficiency.

CSED213 – Problem Solving Practice and Applications ····· (0-2-1)

Recommended Prerequisite: CSED101 (Programming and Problem Solving)

This course helps students develop the ability to analyze real-world problems and efficiently implement appropriate algorithms. Students are challenged with various algorithmic tasks, select/implement suitable solutions, and validate their results through practice. The course fosters critical skills in problem analysis, algorithm selection, and precise implementation.

CSED226 – Introduction to Data Analysis ····· (3-0-3)

Recommended Prerequisite: CSED233 (Data Structure)

This course introduces fundamental concepts and widely used methods in data analysis. Students practice applying these techniques using Python and relevant data analysis libraries, and gain hands-on experience by participating in data analysis competitions.

CSED232 – Principles of Software Construction ····· (3-0-3)

Recommended Prerequisite: CSED101 (Programming and Problem Solving)

This course introduces the fundamental principles and techniques for software construction and programming, including object-oriented design, programming language semantics, software testing, and program reasoning and verification. These principles are essential for understanding the structure and meaning of software and for reasoning about its correctness. They form the foundation for building reliable and efficient software—principles that remain unchanged even in the era of generative AI.

CSED233 – Data Structure ····· (3-0-3)

Recommended Prerequisite: CSED101 (Programming and Problem Solving)

This course introduces fundamental data structures and provides techniques for designing and analyzing efficient algorithms, laying the groundwork for advanced programming and algorithm development.

CSED241 – Introduction to Computer Architecture ····· (3-2-4)

Recommended Prerequisite: CSED211 (Introduction to Computer Software Systems)

Computer architecture is the science and art of selecting and interconnecting hardware components to create a computer that meets functional, performance, cost, and reliability goals. This course introduces the basic principles and hardware structures of modern general-purpose computers. Topics include the basics of digital system design, instruction set architecture (ISA), the design of control and datapaths for pipelined CPUs, efficient memory hierarchy design, I/O devices, and modern architectures for parallel computing. The principles presented in the lectures are reinforced in the laboratory through the design and implementation of a RISC processor at the register-transfer level

(RTL) using Verilog HDL, as well as through simulation.

CSED261 – Discrete Mathematics for Computer Science ····· (3-0-3)

This course explores the fundamentals of discrete mathematics, essential to computer science and engineering. Topics include sets, logic and propositions, basic computational concepts, fundamental discrete structures, and introductory algebraic concepts.

CSED273 – Digital System Design ····· (3-3-4)

This course focuses on the design principles of combinational and sequential circuits, which are essential to digital system design and serve as the foundation for understanding computer architecture. Students gain practical experience through laboratory assignments involving real digital circuit design.

CSED312 – Operating Systems ····· (3-2-4)

Recommended Prerequisite: CSED232 (Principles of Software Construction), CSED233 (Data Structure)

This course covers core concepts of operating systems, including process, memory, and I/O device management, file system services, and security. Students reinforce their understanding by designing and implementing a small-scale operating system through a practical project.

CSED321 – Programming Languages ····· (3-0-3)

Recommended Prerequisite: CSED233 (Data Structure)

This course introduces the theoretical foundations of programming languages. Students examine the mathematical underpinnings, including abstract syntax, type systems, and semantics, and explore key principles and implementation strategies essential to language design.

CSED331 – Algorithms ····· (3-0-3)

Recommended Prerequisite: CSED233 (Data Structure)

This course examines general strategies for algorithm design, associated data structures, and techniques for analyzing efficiency. Students gain insight into how widely used algorithms are developed and assessed, enhancing their ability to design and evaluate algorithms effectively.

CSED332 – Software Design Methods ····· (3-0-3)

Recommended Prerequisite: CSED232 (Principles of Software Construction)

This course explores software design principles, notations, and methodologies. Students apply these concepts through hands-on design projects to build practical skills.

CSED341 – Automata and Formal Languages ····· (3-0-3)

This course introduces the fundamental theories and models of computation, focusing on formal languages, automata, and computability. Topics include deterministic and nondeterministic finite automata, regular languages, grammars and expressions, context-free languages and grammars, pushdown automata, Turing machines, and computational complexity.

CSED342 – Artificial Intelligence ····· (3-0-3)

Recommended Prerequisite: CSED233 (Data Structure)

This course introduces the characteristics and fundamental principles of artificial intelligence (AI) problems, as well as the basic theories and methodologies required to solve them. Specific topics include machine learning theory, search algorithms, Markov decision process, reinforcement learning, games,

constraint satisfaction problem, Bayesian network, and logic. Through practical AI implementation exercises, students develop the ability to tackle real-world AI problems.

CSED343 – Mathematics for Machine Learning ····· (3-0-3)

Recommended Prerequisite: MATH203 (Applied Linear Algebra), MATH230 (Probability and Statistics), IMEN261 (Introduction to Optimization)

This course covers the essential mathematical foundations needed to understand the algorithms used in machine learning, a discipline that identifies patterns in data and performs predictions on unseen data. The first half of the course reviews core mathematics topics such as linear algebra, analytic geometry, matrix decomposition, vector calculus, probability and distributions, and optimization. The second half introduces classical machine learning algorithms, including linear regression, logistic regression, support vector machines, principal component analysis, and artificial neural networks. Students gain the foundational knowledge necessary for more advanced machine learning algorithms and develop the ability to apply simple algorithms to real-world datasets.

CSED352 – Data Communications ····· (3-0-3)

Recommended Prerequisite: CSED211 (Introduction to Computer Software Systems)

This course introduces the protocols and layered architecture that form the basis of computer networks, along with the ISO reference model. Building on these concepts, it focuses on the technologies underlying today's Internet, particularly those in the physical and data link layers, including signaling, Ethernet, and wireless LANs. Students gain a solid understanding of the key technologies that support the Internet.

CSED353 – Computer Networks ····· (3-0-3)

Recommended Prerequisite: CSED211 (Introduction to Computer Software Systems)

Today, nearly every computers and mobile devices are connected over the network. As we hardly see a computer without networks, computer networks are fundamental technologies in modern computing. This course introduces basic principles and topics of fundamental concepts concerning the technology and architecture of the Internet, including TCP/IP and various Internet applications. This course also features programming assignments guiding students to develop hand-crafted TCP/IP that is compatible with regular TCP/IP, eventually achieving successful communication with external computers.

CSED354 – Introduction to Topics in Computer Science and Engineering ····· (0-2-1)

This course introduces the specialized research areas and current research activities of the Department of Computer Science and Engineering graduate program. Each week, a faculty member presents and explains their research field within computer science and engineering.

CSED355 – Computational Signal Processing ····· (3-0-3)

Recommended Prerequisite: Math103 (Calculus)

This is an introductory course for fundamentals of signal processing and its analysis methods. It covers representations of discrete-time and continuous-time signals, signal transforms (e.g., Fourier, Wavelet, Laplace transform), representations of linear, time-invariant system. It extends these core ideas to not only 1D but to other images defined in higher-dimensional spaces or graphs that contain irregularity in its domain. This course requires background knowledge on calculus, experience on manipulating complex numbers, and exposure to differential equations.

CSED356 – Human-Computer Interaction ····· (3-0-3)

This course explores the theories, knowledge, and design principles necessary to create effective interactions between users and computers, including desktops and other modern electronic devices. Students gain practical experience in designing, implementing, and evaluating human–computer interactions.

CSED357 – Database Systems ····· (3-2-4)

Recommended Prerequisite: CSED233 (Data Structure)

This course covers file structures and access methods, as well as techniques for performance analysis and storage management. Students learn about database models, implementation methods and techniques, as well as data reliability, protection, and integrity. The course also addresses design and management issues and includes a hands-on project to design and implement an actual database.

CSED399A–D – Research Participation A–D ····· (0-2-1)

Under the supervision of a research advisor, students participate in research projects and learn research methods. Open only to juniors and seniors.

CSED401 – Computers and Society ····· (3-0-3)

Recommended Prerequisites: CSED101 (Programming and Problem Solving)

This course examines the contributions of IT technologies to societal progress, explores the harm caused by misuse or abuse of IT and crimes committed using IT, and discusses ways to prevent such issues. It also addresses the restoration of ethical values needed to establish a healthy information society.

CSED403 – Blockchain & Cryptocurrency ····· (3-0-3)

Recommended Prerequisites: CSED233 (Data Structure), CSED353 (Computer Networks)

This course introduces the general concepts of blockchain technology as applied in platforms like Bitcoin and Ethereum. Topics include distributed consensus algorithms, mining, smart contracts, ICOs, and token economies. The course also covers blockchain platforms such as Loopchain and Cosmos Chain, and introduces the development of decentralized applications (DApps).

CSED404 – Mobile and Ubiquitous Computing ····· (3-0-3)

Today, computers are no longer confined to specific locations but exist throughout our daily lives, recognizing, predicting, and empowering humans anytime, anywhere. This course broadly covers real-world applications and fundamental system technologies of mobile and ubiquitous computing. It aims to expand students' perspectives on computer science and engineering to encompass everyday life and to foster interdisciplinary awareness between the department and other fields.

CSED405 – GPU and Accelerated Computing ····· (3-0-3)

Recommended Prerequisite: CSED241 (Introduction to Computer Architecture)

Beyond traditional CPU-based computing, highly parallel GPUs and domain-specific accelerators are now widely used for large-scale computation, including supercomputing and AI training and inference. This course introduces the microarchitecture of GPUs and domain-specific accelerators, CUDA programming, and key aspects of system design such as memory systems, interconnection networks, and scheduling to support high parallelism.

CSED415 – Computer Security ····· (3-0-3)

As the processing and exchange of information over the Internet have become increasingly active, the importance of information security has grown. This course covers a variety of techniques related to information security, including cryptographic systems, authentication methods, software protection, email security, secure electronic commerce, intrusion detection systems, and firewalls.

CSED416 – Peer-to-peer Networking ····· (3-0-3)

Recommended Prerequisite: CSED353 (Computer Networks)

This course introduces the concepts of P2P networking, the technical challenges of implementing P2P networks effectively, and the networking technologies developed to overcome these challenges. It also explores the development trends and potential of P2P-based applications currently in use.

CSED417 – Internet of Things ····· (3-0-3)

Recommended Prerequisite: CSED353 (Computer Networks)

Since most Internet of Things (IoT) implementations rely on wireless networks, this course has been redesigned from a wireless mobile networks course to cover a variety of IoT topics while also including foundational concepts of wireless networking.

CSED420 – Software Verification ····· (3-0-3)

Recommended Prerequisite: CSED341 (Automata and Formal Languages)

This course introduces the theories and techniques of software analysis and verification, organized into three parts. First, it covers logical theories and automated reasoning techniques essential for automating software analysis. Next, it introduces formal methods for rigorously defining and analyzing the semantics of various software systems and programming languages. Finally, it presents model-checking algorithms for performing rigorous software verification.

CSED423 – Design of Compilers ····· (3-1-3)

Recommended Prerequisite: CSED233 (Data Structure), CSED341 (Automata and Formal Languages)

This course introduces the fundamental principles of compiler design and implementation. Topics include execution environments for high-level languages, the relationship between compiler design and runtime data structures, lexical, syntactic, and semantic analysis, intermediate and executable code generation, and code optimization. Students also develop a simple compiler for the C language.

CSED425 – Embedded System Programming ····· (2-2-3)

Recommended Prerequisite: CSED241 (Introduction to Computer Architecture), CSED312 (Operating Systems)

This course focuses on real-time POSIX programming and kernel programming environments in embedded Linux. Through hands-on practice, students learn embedded system boot processes, device driver development for input/output devices, and application software development in various environments.

CSED426 – Big Data ····· (3-0-3)

Recommended Prerequisite: CSED233 (Data Structure), CSED331 (Algorithms)

This course covers big data analysis theories and includes hands-on practice using various languages and tools. It is divided into two parts: (1) big data from a systems perspective, focusing on methods for storing, retrieving, and analyzing large datasets using solutions such as SQL, MapReduce, Hadoop, and Spark; and (2) big data from a methodological perspective, focusing on building models from data

through techniques like machine learning, clustering, recommendation systems, link analysis, and frequent pattern mining.

CSED433 – Logic in Computer Science ····· (3-0-3)

Recommended Prerequisite: CSED321 (Programming Languages)

This course focuses on intuitionistic logic and proof-theoretic logical systems used in computer science. Students study the relationship between proof-theoretic logic systems and type theory in programming language theory. The course also teaches how to represent mathematical proofs as logical expressions and automatically verify them using automated theorem provers.

CSED434 – Advanced Programming in Scala ····· (3-0-3)

Recommended Prerequisite: CSED321 (Programming Languages)

This course covers key programming techniques in object-oriented, functional, and concurrent programming paradigms, using a language that supports all three paradigms. In addition to advanced programming techniques, students learn practices useful for software development, such as testing, code reviews, and version control.

CSED441 – Introduction to Computer Vision ····· (3-0-3)

Recommended Prerequisite: MATH120 (Applied Linear Algebra)

This course introduces techniques for automatically interpreting visual data, such as images and videos, without human intervention. Students learn to mathematically model and analyze visual data in various ways to extract meaningful information. Closely related to machine learning, algorithms, and graphics, this course equips undergraduates with both foundational concepts and practical implementation skills, preparing them for graduate-level study in computer vision.

CSED451 – Computer Graphics ····· (3-0-3)

Recommended Prerequisite: CSED233 (Data Structure), MATH120 (Applied Linear Algebra)

This course covers the fundamental principles of two-dimensional and three-dimensional computer graphics. It introduces the hardware and software components of graphics systems and explores topics such as geometric transformations and interactive techniques. Students learn methods for representing 3D objects, projection techniques, viewing transformations, hidden surface removal, and rendering. Through programming assignments, students implement basic concepts in simple applications.

CSED490A–Z – Special Topics in Computer Science A–Z ····· (Varied Credits)

This course covers topics not explicitly included in the standard curriculum. It introduces new courses or focuses on areas of interest reflecting the latest trends in the field.

CSED499I – Research Project Ⅰ ····· (0-2-1)

Under the guidance of a research advisor, students select a research topic, conduct research, write a report, and present their findings in a poster session.

CSED499II – Research ProjectⅡ ····· (0-2-1)

Under the guidance of a research advisor, students select a research topic, conduct research, write a report, and present their findings in a poster session.

Department of Chemical Engineering

1. Educational Goals

Through its diverse curriculum grounded in physics, chemistry, and biology, the Department of Chemical Engineering aims to cultivate creative, forward-thinking engineers capable of addressing challenges facing both nature and humanity, and developing solutions that benefit society.

2. Curriculum Overview

Chemical engineering is a comprehensive discipline that addresses all areas of knowledge and technology involving chemical transformations of matter to improve human welfare. Traditionally, it has focused on petrochemicals, energy, and polymers, but its scope has expanded to include biotechnology, environmental engineering, semiconductors, and advanced materials.

The undergraduate curriculum reflects the field's diversity, offering a flexible array of courses that encompass areas often covered by industrial chemistry, applied chemistry, chemical and biological engineering, energy engineering, and environmental engineering programs at other universities.

In the freshman year, students develop a strong foundation in the fundamental sciences, including mathematics, physics, chemistry, and life sciences. In the sophomore year, they focus on acquiring the basic knowledge that underpins all areas of chemical engineering, such as physical chemistry and organic chemistry. In the upper years, students are introduced to a range of applied fields—such as materials for the IT industry (IT), biotechnology (BT), energy and environmental technology (EET), and computation and systems (Computation & Systems)—preparing them as well-rounded engineers and helping them explore potential career paths.

To provide students with hands-on experience, the program includes the Chemical Engineering Lab courses that combine theory and practice. The Chemical Engineering Capstone Design course gives students a complete research experience—covering idea development, experimental planning and execution, organizing data, drawing conclusions, and writing a senior thesis.

▶ Guidelines for Double Major and Minor

- Double Major (students from other departments)

Students must complete all MR courses in the Department (30 credits) as well as at least 5 additional credits in the Department's ME courses.

- Minor (students from other departments)

Students must complete CHEB204 Chemical Engineering Thermodynamics, CHEB305 Reaction Engineering, and CHEB417 Transport Phenomena (9 credits total), plus at least 12 additional credits in 300-level or higher courses offered by the Department.

▶ Graduation Thesis

1) For students enrolled in 2024 and later

- Take the Capstone Design course, which is part of the MR curriculum for seniors, and submit a senior thesis.

2) For students enrolled in and before 2023:

- In the senior year, students may register for Undergraduate Research Ⅰ and Ⅱ (4 credits total).
- Students majoring in Chemical Engineering who pursue a double major or minor in another department are still required to submit a Chemical Engineering senior thesis.
- Students from another department who pursue a double major or minor in Chemical Engineering are exempt from the thesis requirement.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.
MR	Physical Chemistry for Chemical Engineering I (3)/II (3), Chemical Engineering Thermodynamics (3), Organic Chemistry for Chemical Engineers I (3), Chemical Engineering Lab (3), Fundamentals in Engineering Biology (3), Programming and AI in Chemical Engineering (3), Reaction Engineering (3), Transport Phenomena (3), Chemical Engineering Capstone Design (3)	**30**	
ME		**25**	
FE		**15**	
Subtotal		**131**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.
※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
MR	CHEB201	Physical Chemistry for Chemical Engineering I (STC)	3-0-3	
	CHEB202	Physical Chemistry for Chemical Engineering Ⅱ	3-0-3	Physical Chemistry for Chemical Engineering Ⅰ (recommended)
	CHEB204	Chemical Engineering Thermodynamics	3-0-3	Physical Chemistry for Chemical Engineering Ⅰ (recommended)
	CHEB206	Organic Chemistry for Chemical Engineers I (STC)	3-0-3	
	CHEB208	Fundamentals in Engineering Biology (STC)	3-0-3	
	CHEB216	Chemical Engineering Lab	0-6-3	
	CHEB301	Programming and AI in Chemical Engineering	3-0-3	Introduction to Artificial Intelligence (required) Programming and Problem-solving (required) Mathematical Methods in Chemical Engineering (recommended)
	CHEB305	Reaction Engineering	3-0-3	
	CHEB417	Transport Phenomena	3-0-3	
	CHEB427	Chemical Engineering Capstone Design	0-6-3	
ME	CHEB207	Organic Chemistry for Chemical Engineers Ⅱ	3-0-3	Organic Chemistry I (required)
	CHEB214	Energy and Environmental Engineering (STC)	3-0-3	
	CHEB215	Chemical Engineering for Advanced Materials	3-0-3	
	CHEB303	Mathematical Methods in Chemical Engineering	3-0-3	
	CHEB306	Catalytic Reaction Engineering	3-0-3	
	CHEB307	Introduction to Molecular Biotechnology	3-0-3	
	CHEB308	Introduction to Biotechnology	3-0-3	
	CHEB309A/B	On-the-job Training at Chemical Plants A/B	0-2-1	
	CHEB313	Introduction to Colloid and Interface Phenomena	3-0-3	
	CHEB314	Introduction to Intermolecular and Surface Forces	3-0-3	
	CHEB315	Smart Soft Material Engineering	3-0-3	
	CHEB316	Introduction to Electronic Materials for Chemical Engineers	3-0-3	
	CHEB360	Solid State Chemical Engineering	3-0-3	
	CHEB399A/D	Research Participation A-D	0-2-1	
	CHEB401	Chemical Process Control	3-0-3	
	CHEB402	Process Analysis and Design	3-0-3	
	CHEB403	Separation Processes	3-0-3	
	CHEB404	Environmental Engineering	3-0-3	
	CHEB405	Introduction to Polymer Science and Engineering	3-0-3	
	CHEB407	New and Renewable Energy	3-0-3	
	CHEB408	Biochemical Engineering	3-0-3	
	CHEB409	Introduction to Synthetic Biology	3-0-3	
	CHEB410	Chemical Substances Analysis for Engineers	3-0-3	
	CHEB411	Chemical Engineering Applied Inorganic Chemistry	3-0-3	
	CHEB412	Chemical Engineering Process for Rechargeable Battery	3-0-3	
	CHEB413	Introduction to Characterization of Energy and Environmental Materials	3-0-3	
	CHEB418	Energy & Mass Transfer	3-0-3	Transport Phenomena (recommended)
	CHEB421	Clean Process Engineering	3-0-3	
	CHEB422	Chemical Product Design	3-0-3	
	CHEB423	Introduction to Systems Bioengineering	3-0-3	
	CHEB424	Phase and Reaction Equilibria	3-0-3	
	CHEB425	Undergraduate Research I	0-4-2	
	CHEB426	Undergraduate Research Ⅱ	0-4-2	Undergraduate Research I (recommended)
	CHEB460	Energy and Electronic Device Engineering	3-0-3	
	CHEB461	Nano Chemical Engineering	3-0-3	
	CHEB462	Modern Electrochemistry Ⅰ : Ionics	3-0-3	
	CHEB463	Introduction to Nanotechnology	3-0-3	
	CHEB465	Structure and Properties of Polymers	3-0-3	
	CHEB469A/Z	Special Topics A/Z	Varied Credits	
	CHEB471	Chemical Engineering Seminar I	1-0-1	

5. Major Course List by Year and Semester

1) For Students Enrolled in 2024 and Later

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BEE	CHEB199	Freshman Research Participation	BEE	CHEB100	Introduction to Chemical Engineering
				BEE	CHEB199	Freshman Research Participation
Sophomore	MR	CHEB201	Physical Chemistry for Chemical Engineering Ⅰ	MR	CHEB204	Chemical Engineering Thermodynamics
	MR	CHEB206	Organic Chemistry for Chemical Engineers Ⅰ	MR	CHEB216	Chemical Engineering Lab
	MR	CHEB208	Fundamentals in Engineering Biology			
Junior	MR	CHEB202	Physical Chemistry for Chemical EngineeringⅡ	MR	CHEB301	Programming and AI in Chemical Engineering
	MR	CHEB305	Reaction Engineering			
	MR	CHEB417	Transport Phenomena			
Senior	MR	CHEB427	Chemical Engineering Capstone Design	MR	CHEB427	Chemical Engineering Capstone Design

*Chemical Engineering Capstone Design only needs to be taken once

2) For Students Enrolled before 2023

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BEE	CHEB199	Freshman Research Participation	BEE	CHEB100	Introduction to Chemical Engineering
				BEE	CHEB199	Freshman Research Participation
Sophomore	MR	CHEB201	Physical Chemistry for Chemical Engineering Ⅰ	MR	CHEB204	Chemical Engineering Thermodynamics
	MR	CHEB206	Organic Chemistry for Chemical Engineers Ⅰ	MR	CHEB207	Organic Chemistry for Chemical EngineersⅡ
	MR	CHEB208	Fundamentals in Engineering Biology	MR	CHEB211	Organic Chemistry Lab
	MR	CHEB213	Engineering Biology Laboratory			
Junior	MR	CHEB202	Physical Chemistry for Chemical EngineeringⅡ	MR	CHEB212	Physical Chemical Lab
	MR	CHEB305	Reaction Engineering			
	MR	CHEB417	Transport Phenomena			
Senior	ME	CHEB425	Undergraduate Research Ⅰ	ME	CHEB426	Undergraduate ResearchⅡ

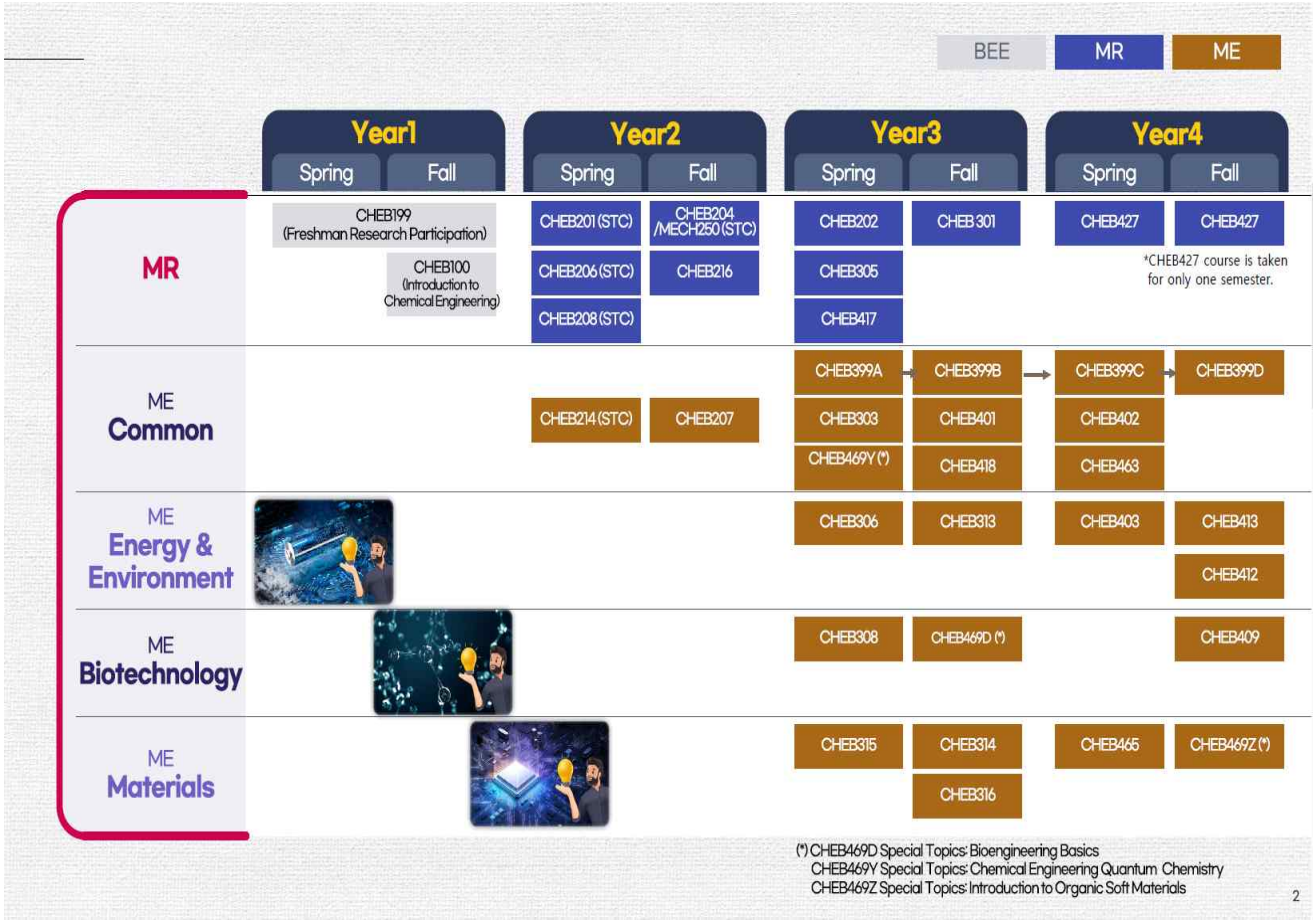
6. List of the Courses Offered for Each Area of Specialization

Area of Specialization	Courses Offered by the Department		Courses Offered by Others	
Materials for the IT Industry (IT)	CHEB207	Organic Chemistry for Chemical EngineersⅡ	PHYS201	Introduction to Quantum Physics
	CHEB360	Solid State Chemical Engineering	PHYS304	Thermal Physics
	CHEB405	Introduction to Polymer Science and Engineering	PHYS401	Solid State Physics
	CHEB424	Phase and Reaction Equilibria	EECE211	Semiconductor ElectronicsⅠ
	CHEB460	Energy and Electronic Device Engineering	EECE231	Circuit Theory
	CHEB461	Nano Chemical Engineering	EECE401	SemiconductorElectronicsⅡ
	CHEB462	Modern ElectrochemistryⅠ: Ionics	AMSE201	Fundamentals of Materials Science and Engineering
	CHEB463	Introduction to Nanotechnology	AMSE313	Physics of Materials
	CHEB465	Structure and Properties of Polymers	AMSE361	Introduction to Polymer Materials
			AMSE388	Introduction to Semiconductor Materials and Devices
Biotechnology (BT)	CHEB307	Introduction to Molecular Biotechnology	LIFE217	Cell Biology
	CHEB308	Introduction to Biotechnology	LIFE319	BiochemistryⅠ
	CHEB408	Biochemical Engineering	LIFE321	Molecular Biology
	CHEB409	Introduction to Synthetic Biology	LIFE420	Immunology
	CHEB423	Introduction to Systems Bioengineering	CHEM461	Biochemistry
			PHYS413	Biological Physics
Energy & Environment Technology (EET)	CHEB214	Energy and Environmental Engineering (STC)	CHEM331	Inorganic Chemistry
	CHEB306	Catalytic Reaction Engineering	CHEM342	Instrumental Analysis
	CHEB403	Separation Processes	EVSE520	Air Pollution
	CHEB404	Environmental Engineering	EVSE525	Water Pollution
	CHEB407	New and Renewable Energy		
	CHEB410	Chemical Substances Analysis for Engineers		
	CHEB411	Chemical Engineering Applied Inorganic Chemistry		
	CHEB422	Chemical Product Design		
Computation & Systems	CHEB215	Chemical Engineering for Advanced Materials	IMEN472	Data Science Methodology
	CHEB303	Mathematical Methods in Chemical Engineering		
	CHEB401	Chemical Process Control		
	CHEB402	Process Analysis and Design		
	CHEB418	Energy & Mass Transfer		
	CHEB421	Clean Process Engineering		

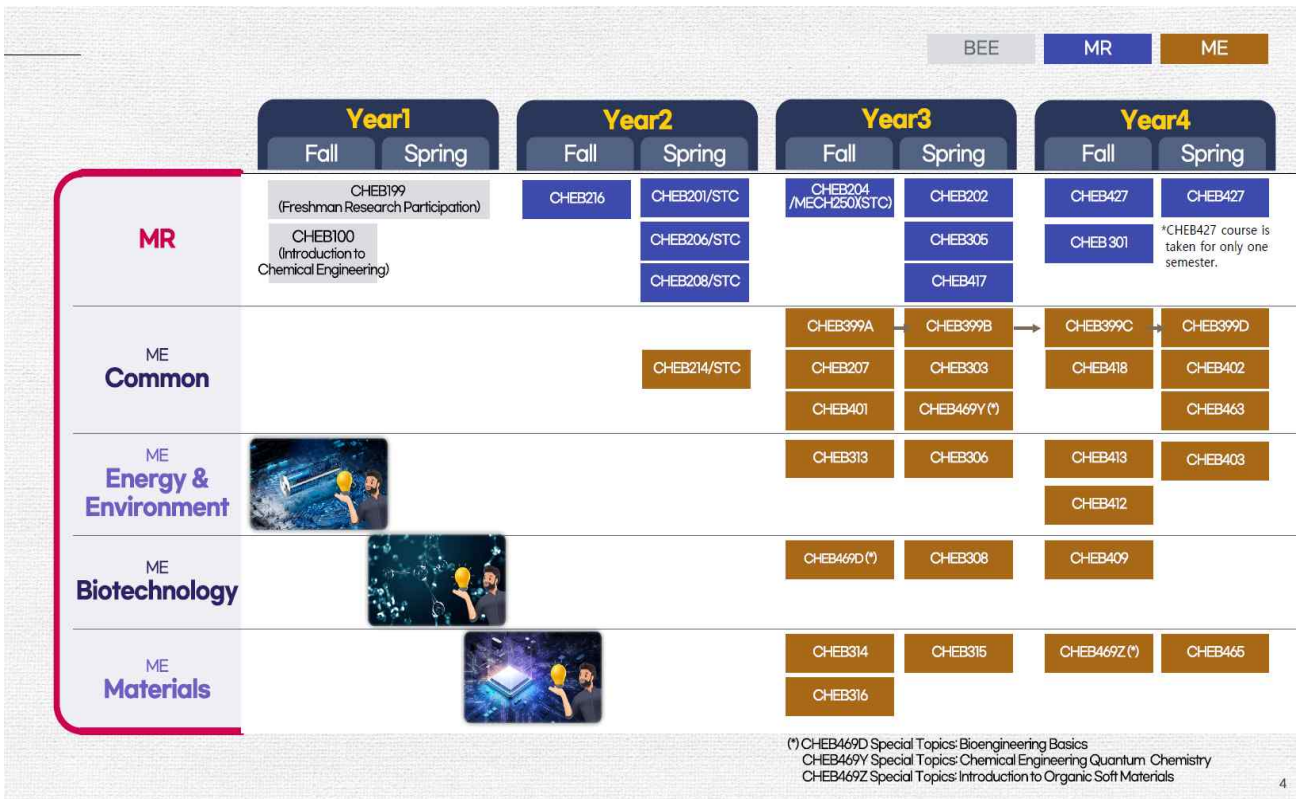
※ Students are to take courses under the guidance of their academic advisor, referring to the enlisted courses for each specialization.

7. Curriculum Roadmap

- Spring Entry



- Fall Entry



8. Approved Major Courses Offered by Other Departments

-In addition to the courses listed below that count as ME but are offered by other departments, MR courses offered by other departments are also recognized as ME courses. (Effective as of the 2017 Fall semester)

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit
MR	CHEM211(CHEB202)	Physical ChemistryⅠ (Physical Chemistry for Chemical EngineeringⅡ)	3-0-3
	CHEM221(CHEB206)	Organic ChemistryⅠ (Organic Chemistry for Chemical EngineersⅠ)	3-0-3
	CHEM311(CHEB201)	Physical ChemistryⅡ (Physical Chemistry for Chemical EngineeringⅠ)	3-0-3
	MECH250(CHEB204)	Thermodynamics (Chemical Engineering Thermodynamics)	3-0-3
ME	AMSE201	Fundamentals of Materials Science and Engineering	3-1-3
	AMSE313	Physics of Materials	3-1-3
	AMSE361(CHEB405)	Introduction to Polymer Materials (Introduction to Polymer Science and Engineering)	3-0-3
	AMSE388	Introduction to Semiconductor Materials and Devices	3-0-3
	CHEM331	Inorganic Chemistry	4-0-4
	CHEM342	Instrumental Analysis	3-0-3
	CHEM461	Biochemistry	3-0-3
	EECE211	Semiconductor ElectronicsⅠ	3-0-3
	EECE231	Circuit Theory	3-0-3
	EECE401	Semiconductor ElectronicsⅡ	3-0-3
	EVSE520	Air Pollution	3-0-3
	EVSE525	Water Pollution	3-0-3
	IMEN472	Data Science Methodology	3-0-3
	LIFE217	Cell Biology	3-0-3
	LIFE319	BiochemistryⅠ	3-0-3
	LIFE321	Molecular Biology	3-0-3
	LIFE420	Immunology	3-0-3
	PHYS201	Introduction to Quantum Physics	3-1-3
	PHYS304	Thermal Physics	3-1-3
	PHYS401	Solid State Physics	3-0-3
	PHYS413	Biological Physics	3-0-3

9. Course Description

CHEB100 – Introduction to Chemical Engineering ····· (1-0-1)

This course, designed for freshmen interested in chemical engineering, provides a clear and engaging introduction to the field's present and future. It covers the discipline's diverse areas, current research trends, faculty laboratory activities, and curriculum structure.

CHEB199 – Freshman Research Participation ····· (0-2-1)

This course offers freshmen in the Mueunjae School of Undergraduate Studies the opportunity to deepen their understanding of chemical engineering and gain hands-on research experience by participating in departmental projects or activities in research labs of their choice.

CHEB201 – Physical Chemistry for Chemical Engineering Ⅰ ····· (3-0-3)

This course introduces the fundamentals of classical thermodynamics, focusing on key concepts such as first law of thermodynamics (energy conservation), the second law of thermodynamics (entropy), phase equilibria, and electrochemistry.

CHEB202 – Physical Chemistry for Chemical EngineeringⅡ ····· (3-0-3)

This course explores the concept of quantum mechanics to understand the physical and chemical properties of atoms and molecules. Topics include basic quantum theory, atomic structure and spectra, and molecular structures.

CHEB204 – Chemical Engineering Thermodynamics ····· (3-0-3)

Building on concepts from Physical Chemistry I, this course emphasizes the engineering applications of thermodynamics. Topics include the first and second laws of thermodynamics, thermodynamic properties of substances, gas equations of state, enthalpy, entropy, internal energy, heats of reaction, and related principles.

CHEB206 – Organic Chemistry for Chemical Engineers Ⅰ ····· (3-0-3)

This course introduces the structure, reactions, structural determination methods, and synthesis of organic compounds. It focuses on the reactions of fundamental molecules such as alkanes, alkenes, alkynes, alcohols, and their derivatives.

CHEB207 – Organic Chemistry for Chemical EngineersⅡ ····· (3-0-3)

A continuation of Organic Chemistry I, this course examines the synthesis, properties, and reactions of key organic compounds. Topics include aromatic compounds like benzene and its derivatives, aldehydes and ketones, organic acids and their derivatives, and general carbonyl compound synthesis and reactions.

CHEB208 – Fundamentals in Engineering Biology ····· (3-0-3)

This course provides essential foundational knowledge in biochemistry, molecular biology, cell biology, and immunology, which are vital for biotechnology research. It also introduces the principles, techniques, and applications of genetic engineering as a central field within biotechnology.

CHEB211 – Organic Chemistry Lab ····· (0-4-2)

Through laboratory experiments, students develop practical skills in performing various organic reactions.

CHEB212 – Physical Chemical Lab ····· **(0-4-2)**
Through laboratory experiments, students gain hands-on experience in analyzing the physical and chemical properties of substances.

CHEB213 – Engineering Biology Laboratory ····· **(0-4-2)**
This course offers foundational laboratory training in biochemistry, molecular biology, and related fields to prepare students for biotechnology research.

CHEB214 – Energy and Environmental Engineering ····· **(3-0-3)**
This course introduces renewable energy and environmental technologies as studied in the Department of Chemical Engineering. It covers fundamental engineering principles and applied research examples in renewable energy, energy production and storage, air pollution control, and water treatment, helping students develop a deeper understanding of chemical engineering.

CHEB215 – Chemical Engineering for Advanced Materials ····· **(3-0-3)**
This course examines chemical engineering technologies for materials and processes related to information technology (IT) and biotechnology (BT), which are core elements of the Fourth Industrial Revolution and the intelligent information society.

CHEB216 – Chemical Engineering Lab ····· **(0-6-3)**
As a fundamental laboratory course for chemical engineering students, this course provides hands-on training in the physical properties of materials, organic reactions, biochemistry, and molecular biology, laying the groundwork for research skills.

CHEB301 – Programming and AI in Chemical Engineering ····· **(3-0-3)**
This course introduces the fundamentals of numerical analysis, data analysis, and artificial intelligence, all widely applied in chemical engineering. Students develop proficiency in Python programming and learn to apply these techniques to key chemical engineering applications.

CHEB303 – Mathematical Methods in Chemical Engineering ····· **(3-0-3)**
This course provides fundamental mathematical tools essential for chemical engineering. Topics include linear spaces, linear and self-adjoint operators, eigenvalue problems, Fourier series, special functions, and partial differential equations, with a focus on their application to chemical engineering problems.

CHEB305 – Reaction Engineering ····· **(3-0-3)**
This course introduces the fundamental principles of chemical reactions and reactor design. Students learn to analyze reaction rates, mass and heat transfer in reaction systems, and the performance of ideal reactors.

CHEB306 – Catalytic Reaction Engineering ····· **(3-0-3)**
This course explores catalyst theory—including structure, electronic properties, adsorption, and desorption—as well as the analysis, design, and industrial applications of catalytic reactors.

CHEB307 – Introduction to Molecular Biotechnology ····· **(3-0-3)**
This course introduces molecular biotechnology, focusing on redesigning and engineering biomolecules such as DNA, proteins, and carbohydrates at the molecular level for a variety of real-world applications.

CHEB308 – Introduction to Biotechnology ····· (3-0-3)

This course covers the fundamental principles and industrial applications of biotechnology, highlighting its connections to chemical engineering, life sciences, and chemistry. It also introduces emerging bioprocessing technologies and current research trends in the field.

CHEB309A/B – On-the-job Training at Chemical Plants A/B ····· (0-2-1)

This course gives students the opportunity to experience how classroom knowledge is applied in real chemical plants by engaging in process analysis, equipment operation, and plant management. Students enhance their presentation skills by discussing their field experiences and challenges and submitting written reports.

CHEB313 – Introduction to Colloid and Interface Phenomena ····· (3-0-3)

This course examines colloid and interface phenomena, which play a vital role in industrial, environmental, biomedical, and advanced technology applications such as cleaning, emulsification, and wetting. Topics include enhanced oil recovery, petrochemical processes, personal care products, drug delivery systems, thin films, and microfabrication of electronic and optoelectronic devices. The course integrates theoretical, experimental, and applied perspectives.

CHEB314 – Introduction to Intermolecular and Surface Forces ····· (3-0-3)

This course presents the fundamental principles of molecular–molecular, surface–surface, and molecular–surface interactions, based on the framework of Jacob N. Israelachvili's *Intermolecular and Surface Forces*.

CHEB315 – Smart Soft Material Engineering ····· (3-0-3)

This course explores the chemical and physical properties of soft materials such as polymers, colloids, droplets, and liquid crystals, with particular emphasis on the unique anisotropic properties of liquid crystalline materials and their applications in both fundamental science and various practical fields.

CHEB316 – Introduction to Electronic Materials for Chemical Engineers ····· (3-0-3)

This course examines the relationship between material microstructure and electronic states, introducing the basics of crystallography and the free electron model. It explains how electronic band structures determine electrical and optical properties and covers the characteristics of semiconductor materials, ranging from silicon crystals to single-molecule organic materials.

CHEB360 – Solid State Chemical Engineering ····· (3-0-3)

This course covers atomic structure, chemical bonding, solid-state materials chemistry, and the structure and properties of solid materials. It discusses the electrical, optical, thermal, mechanical, and magnetic properties of solids in relation to chemical bonding and provides a foundation in chemical processes for material synthesis and treatment.

CHEB399A/D – Research Participation A-D ····· (0-2-1)

This course allows students to participate in departmental research projects and develop research skills through hands-on laboratory experience.

CHEB401 – Chemical Process Control ····· (3-0-3)

This course introduces the principles for analyzing and controlling the dynamics of chemical process systems. Topics include system stability, control theory and its applications, optimal control, and the

analysis and control of multivariable systems.

CHEB402 – Process Analysis and Design ····· (3-0-3)
This course presents methods for designing complete chemical processes. Students learn flowsheet analysis, process optimization, economic evaluation, and numerical analysis techniques applied to process design.

CHEB403 – Separation Processes ····· (3-0-3)
This course examines the fundamental principles of separation methods in chemical processes, including material and energy balances, thermodynamic efficiency, optimization calculations, and the design of separation equipment.

CHEB404 – Environmental Engineering ····· (3-0-3)
This course examines the causes and effects of environmental pollution, including air and water pollution, and explores mitigation strategies. It covers the properties, sampling, analysis, and treatment of pollutants emitted from industrial facilities.

CHEB405 – Introduction to Polymer Science and Engineering ····· (3-0-3)
This introductory course covers the fundamentals of polymer science, including polymer thermodynamics, properties, and synthesis, providing a comprehensive understanding of polymers from synthesis to properties and processing.

CHEB407 – New and Renewable Energy ····· (3-0-3)
This course provides an in-depth overview of renewable energy conversion technologies, including solar, wind, biomass, hydrogen, and fuel cells. It reviews the characteristics, economic feasibility, supply dynamics, and the fundamental scientific and engineering principles of each energy source.

CHEB408 – Biochemical Engineering ····· (3-0-3)
This course addresses applied topics in biochemical engineering by integrating core chemical engineering principles. Topics include unit operations for synthesizing and processing biochemical substances, optimal design, bioreactors, bioprocess control, bioseparation processes, and economic analysis of bioprocesses.

CHEB409 – Introduction to Synthetic Biology ····· (3-0-3)
This course introduces the principles and applications of synthetic biology, a key enabling technology for biotechnology that promotes a sustainable and safe future. It covers bio-based chemical industries aimed at carbon neutrality, advanced diagnostics and therapeutics for public health, and innovations in biomedical engineering.

CHEB410 – Chemical Substances Analysis for Engineers ····· (3-0-3)
This course explains the principles of instruments used to analyze molecular structure, surface chemistry, chromatographic separation, and thermal properties of organic and polymer materials, as well as techniques for interpreting the resulting spectra.

CHEB411 – Chemical Engineering Applied Inorganic Chemistry ····· (3-0-3)
This course explores the bonding, structure, and fundamental electrical, magnetic, and optical properties of materials, along with their analytical methods, synthesis techniques, and applications.

CHEB412 – Chemical Engineering Process for Rechargeable Battery ····· (3-0-3)

This course offers an in-depth understanding of the operating principles and manufacturing processes of secondary batteries. Students conduct experiments on electrode and cell fabrication to reinforce their learning and attend lectures by industry experts on strategies for performance improvement and current challenges in the field.

CHEB413 – Introduction to Characterization of Energy and Environmental Materials ····· (3-0-3)

As the development of eco-friendly energy materials becomes increasingly important, this course aims to provide an integrated understanding of characterization techniques for elucidating material properties and identifying performance-enhancing factors. With the growing complexity of modern materials, in-depth comprehension through the application of diverse analytical methods is essential. The course covers recent advances in energy and environmental materials, practical case studies of analytical techniques, and the fundamental principles and application scope of major characterization methods.

CHEB417 – Transport Phenomena ····· (3-0-3)

This course presents the fundamental principles that govern fluid flow and their engineering applications. Students study force and stress, momentum conservation equations, Newtonian fluid behavior, dimensional analysis, laminar and turbulent flows, boundary layer theory, and friction factors.

CHEB418 – Energy & Mass Transfer ····· (3-0-3)

This course examines energy and mass transfer through the lens of transport phenomena. Topics include convective and diffusive fluxes, Fourier's and Fick's laws, conservation of energy and mass, heat conduction, forced and natural convection, dimensional analysis, boundary layer theory, and heat and mass transfer coefficients.

CHEB421 – Clean Process Engineering ····· (3-0-3)

This course introduces the design, synthesis, and economic evaluation of clean processes. It also examines clean process systems designed to minimize pollution in industrial plants and explores the concept of eco-industrial parks.

CHEB422 – Chemical Product Design ····· (3-0-3)

This course presents methodologies for designing chemical products and the equipment required for their production, based on chemical engineering principles. It also covers the production of fine chemicals.

CHEB423 – Introduction to Systems Bioengineering ····· (3-0-3)

This course introduces systems bioengineering technologies essential for the industrialization of biotechnology. It provides undergraduate-level instruction in advanced biochemistry and the foundational principles of systems bioengineering.

CHEB424 – Phase and Reaction Equilibria ····· (3-0-3)

This course examines the fundamental thermodynamic principles and their applications for understanding and analyzing material separations and chemical reactions in multiphase systems.

CHEB425 – Undergraduate Research Ⅰ ····· (0-4-2)

In this course, students work individually or in groups to select a research topic and conduct research for a thesis, applying their undergraduate education and developing essential research and development skills.

CHEB426 – Undergraduate ResearchⅡ ····· (0-4-2)
This course continues the thesis research process, with students conducting research, developing a thesis, and further strengthening the foundational skills required for research and development.

CHEB427 – Chemical Engineering Capstone Design ····· (0-6-3)
This course guides students through planning and conducting experiments on a chosen research topic and writing a thesis, allowing them to apply their undergraduate knowledge and build critical research and development competencies.

CHEB460 – Energy and Electronic Device Engineering ····· (3-0-3)
This course covers the principles and materials that form the basis of silicon devices, sensors, nanoscale devices, and energy devices. Students learn to evaluate the properties of semiconductors, conductors, insulators, and dielectrics, and explore integrated circuits, sensors, batteries, solar cells, and devices utilizing various nanomaterials.

CHEB461 – Nano Chemical Engineering ····· (3-0-3)
This course examines the synthesis of nanostructured solid materials and associated chemical processes. Topics include gas-phase, liquid-phase, and solid-phase reactions, physical chemistry principles, surface and interface phenomena, complex systems, and molecular-level processes. The course also discusses emerging trends in nano-chemical processes and their applications in information electronics and industry.

CHEB462 – Modern Electrochemistry Ⅰ: Ionics ····· (3-0-3)
This course offers an in-depth study of ionics, the branch of electrochemistry that focuses on electrolytes. It covers the physical chemistry fundamentals and applications of ionics, providing a strong academic foundation for research on batteries and fuel cells.

CHEB463 – Introduction to Nanoscale Science and Engineering ····· (3-0-3)
This senior-level elective provides a comprehensive introduction to nanoscience and nanoengineering. Students learn fundamental principles of quantum mechanics, solid-state physics, and electromagnetism, and apply them to nanoscale imaging, fabrication processes, and tools. The course also explores applications in materials, electronics, optics, photonics, and sensors, as well as recent research developments.

CHEB465 – Structure and Properties of Polymers ····· (3-0-3)
This course examines the relationship between the chemical and physical structure of polymers and their properties. Topics include polymer chain structure, solution behavior, phase transitions, rubber elasticity, viscoelasticity, mechanical properties, crystallinity, and morphology.

CHEB469 – Special Topics A/Z ····· (Varied Credits)
This course explores advanced topics in chemical engineering systems that are not covered in regular coursework.

CHEB471 – Chemical Engineering Seminar Ⅰ ····· (1-0-1)
This seminar-based course introduces students to current research trends and recent developments in chemical engineering.

Department of Convergence IT Engineering

1. Educational Goals

The Department of Convergence IT Engineering aims to cultivate self-directed future leaders who drive ICT-based interdisciplinary research that connects the values of humanity, technology, and society, through engineering education grounded in creative imagination, convergent inquiry, and transformative innovation. To this end, the Department provides an education that not only equips students with expertise in IT convergence technologies and problem-solving skills, but also fosters ethical and moral values, nurturing them into well-rounded professionals in the field.

2. Curriculum Overview

The undergraduate curriculum of the Department offers a diverse range of educational and training opportunities in IT convergence technology, creativity, the humanities, and technology management and entrepreneurship. It is delivered through self-directed theoretical and practical learning, the sharing of advanced knowledge and experience, and an environment optimized for creative immersion. Through the Personal Growth Design (PGD) course, students are guided to create personalized, self-directed learning roadmaps by choosing tracks that align with their individual aptitudes and career goals. In addition, the Department provides Creative Studio courses to help students build their IT convergence research capabilities.

The Department integrates education and research throughout its programs. To support this integrated, practice-based approach, it offers the newly launched Convergence IT Design program, which combines theoretical and practical coursework. Through a structured, four-level process, students carry out projects and produce tangible outcomes as part of their education.

※ 2023 Curriculum Revision

① Changes to Major Requirement (MR) Course Titles and Categories

Course Code	~ 2022		1st Semester of 2023		2nd Semester of 2023		Lecture-Lab/ Practicum-Credit	Grade Type
	Category	Course Title	Category	Course Title	Category	Course Title		
CITE201	MR	Creative IT Design Ⅰ:Fundamentals	MR	Convergence IT Design: Fundamentals	MR	Convergence IT Design Ⅰ: Fundamentals	1-4-3	G
CITE202	MR	Creative IT Design Ⅱ:Basic Design	MR	Convergence IT Design Ⅰ	MR	Convergence IT DesignⅡ: Basic Design	2-8-6	G
CITE301	MR	Creative IT Design Ⅲ:Advanced Design	MR	Convergence IT Design Ⅱ	MR	Convergence IT DesignⅢ: Advanced Design	2-8-6	G
CITE302	MR	Creative IT Design Ⅳ:System Integration	**ME**	Convergence IT Design:System Integration	ME	Convergence IT DesignⅣ: System Integration	2-8-6	G

- Effective Term: Effective from Spring semester of 2023; applicable to students admitted in 2023 and thereafter.

- Note: Students admitted in 2022 or earlier who have not yet completed, or need to retake 'Creative IT Design IV: System Integration (CITE302)' -which is a MR course- must take 'Convergence IT Design: System Integration (CITE302)' in Spring 2023 or 'Convergence IT Design IV: System Integration (CITE302)' in Fall 2023.

② Requirements for Double Majors, Minors, and Graduation Thesis Review

Types		For Students Admitted in 2022 or Earlier	For Students Admitted in 2023 or Later
Double Major/Minor	Double Major	Complete all MR courses (32 credits) and additional Major Electives(ME) to reach a total of at least 35 credits.	Complete all MR courses **(23 credits)** and additional ME courses to reach a total of at least 35 credits.
	Minor	-Creative IT Design Ⅰ-Ⅳ: 21 credits -At least 3 credits from Creative Studio courses ※A minimum total of 24 credits is required	- Convergence IT Design Ⅰ, Ⅱ, and Ⅲ: 15 credits -At least 3 credits from Creative Studio courses ※ A minimum total of 24 credits, including ME courses, is required
Graduation Thesis Requirements	Type	Lab Reports (Project Presentations)	Same as left
	Details	CITE201 Creative IT Design Ⅰ: Fundamentals(MR) CITE202 Creative IT Design Ⅱ: Basic Design(MR) CITE301 Creative IT Design Ⅲ: Advanced Design(MR) CITE302 Creative IT DesignⅣ: System Integration(MR)	CITE201 Convergence IT Design Ⅰ: Fundamentals(MR) CITE202 Convergence IT Design Ⅱ: Basic Design(MR) CITE301 Convergence IT Design Ⅲ: Advanced Design(MR)
		※The undergraduate thesis requirement is fulfilled by completing Creative IT Design Ⅰ-Ⅳ. The final grade is determined based on the advisor's evaluation and the final poster presentation	※ The undergraduate thesis requirement is satisfied by completing Convergence IT Design I-III. The final grade is determined based on the advisor's evaluation and other assessment components

▶ Undergraduate Thesis

The undergraduate thesis requirement is satisfied by completing Convergence IT Design I-III. The final grade is determined based on the advisor's evaluation and other assessment components.

▶ Guidelines for Double Major and Minor

-Double Major: Students who choose Convergence IT Engineering as their double major must complete 23 credits of major-required courses and additional major-elective courses to earn a total of at least 35 credits.

- Minor: Students pursuing a minor in Convergence IT Engineering must earn a minimum of 24 credits, including 15 credits from **CITE201 Convergence IT Design Ⅰ, CITE202 Convergence IT DesignⅡ, and CITE301 Convergence IT Design Ⅲ**; at least 3 credits in the Creative Studio course group (CITE203, CITE303, CITE304, CITE306, CITE405); and additional additional ME credits as required.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	Exploring Academic Major (1)	1	
	Subtotal	**26**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to Environmental Science (3)	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will be counted toward FE.
MR	Personal Growth Design I (2), Convergence IT Design I (3), Convergence IT Design II (6), Convergence IT Design III (6), and at least 6 credits in the Creative Studio courses	23	For students admitted up to 2022, **Convergence IT Design IV (6 credits)**is a required course. Students admitted in 2021-2022 must complete **at least 9 credits of STUDIO (Creative Studio) courses**, for a total of **32 credits**

Category	Course Title	Credits	Note
ME	Complete 6 credits from the Engineering Division and 3 credits from the Humanities-Technology Convergence Division among the list of major courses recognized by the department as satisfying divisional requirements (including cross-listed courses) *For the list of available courses, refer to **8. List of Major Courses Recognized as Satisfying Divisional Requirements**	35	Students admitted in 2021-2022 must complete a total of at least 26 credits.
FE	Up to 9 credits may be recognized from internship- and start-up-related courses. Eligible courses include CITE495 Long-Term Field Training; INTN300 Internship Program; INTN301 Tech+ Innovation and INTN302 Tech+ Star; INTN400A Special Topics in Practical Start-ups A, INTN400B Special Topics in Practical Start-ups B, and INTN400C Special Topics in Practical Start-ups C; and CITE215 Introduction to Makers.	9	
Subtotal		**128**	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ STC Courses: Students must complete 15 credits, regardless of department or discipline.

※ English Program: Placement in Tier 1 is required.

※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

※ Up to 9 credits in Long-Term Field Training can be counted toward graduation, subject to the following limits:

-For students admitted in 2020 or earlier: maximum of 7 credits as ME

-For students admitted in 2021 or later: maximum of 3 credits as ME and 6 credits as FE

※ **Introduction to Makers:** counted as ME for students admitted in 2020 or earlier, and FE admitted in 2021 or later

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
MR	CITE201	Convergence IT Design Ⅰ: Fundamentals	1-4-3	
	CITE202	Convergence IT DesignⅡ: Basic Design	2-8-6	CITE201
	CITE203	Interaction Design Studio	2-2-3	CITE205
	CITE204	Personal Growth Design Ⅰ(PGD Ⅰ)	2-0-2	
	CITE301	Convergence IT DesignⅢ: Advanced Design	2-8-6	CITE202
	CITE303	Life Sensibility and Transhuman Studio	2-2-3	CITE205
	CITE304	Play and Game Design Studio	2-2-3	CITE205
	CITE306	Business Model Studio	2-2-3	CITE205
	CITE405	Human-Centered Design Studio	2-2-3	CITE205
ME	CITE205	Interplays of Humanities and Technology	2-0-2	
	CITE211	Human Resource and Organization Theory	2-0-2	
	CITE212	Technology Financing	2-0-2	
	CITE213	Technology Marketing	2-0-2	
	CITE214	Economics of Technological Innovation	3-0-3	
	CITE221	Introduction to Digital Systems and Microprocessor Design	3-2-4	
	CITE222	Data Structure and Algorithm	3-2-4	
	CITE241/MECH361	Introduction to Biomedical Engineering	3-0-3	
	CITE242	Principles of Medical Imaging	3-0-3	
	CITE302	Convergence IT DesignIV: System Integration	2-8-6	CITE301
	CITE311	Technology Innovation and Commercialization	3-0-3	
	CITE312	Entrepreneurship	2-0-2	
	CITE341	Control Systems Theory and Lab	3-3-4	
	CITE451/MECH423	Biomaterials and Biofabrication Methods	3-0-3	CITE241
	CITE411/IMEN412/ ENTP301	Applied Creative Entrepreneurship	3-0-3	
	CITE421/CSED357	Database Systems	3-2-4	CSED331
	CITE441/EECE423	Modern Control Theory	3-0-3	
	CITE390A/Z	Special Topics in IT Convergence Engineering A-Z	Varied Credits	
	CITE399A/D	Research Participation A-D	0-2-1	
	CITE399M	Special Research Participation	0-6-3	
	CITE452	Biomedical Device: Engineering for Diagnostics and Therapeutics	3-0-3	
	CITE453	Biomedical Systems and Signal Processing	3-0-3	
	CITE490A/Z	Advanced Special Topics in IT Convergence Engineering A-Z	Varied Credits	
	CITE495	Long-Term Field Training	0-0-12	Up to 9 credits recognized toward graduation

5. Major Course List by Year and Semester

School Year	Spring Semester			Fall Semester		
	Category	Course Code	Course Title	Category	Course Code	Course Title
Freshman	BER	MSUS101	Exploring Academic Majors	BEE BEE BEE	CITE100 CITE199 CITE103	Introduction to Convergence IT Engineering Freshman Research Participation Creative Value Design Studio
Sophomore				MR MR	CITE201 CITE204	Convergence IT Design Ⅰ Personal Growth Design Ⅰ Course offered by the Department
Junior	MR ME	CITE202 CITE390A	Convergence IT Design Ⅱ Special Topics: Personal Growth Design Ⅱ Course offered by the Department	MR ME	CITE301 CITE390(-)	Convergence IT Design Ⅲ Special Topics: Personal Growth Design Ⅲ Course offered by the Department
Senior	ME ME	CITE302	Convergence IT Design Ⅳ Course offered by the Department	ME		Course offered by the Department
Sophomore/Junior	MR	Complete at least three out of the five Creative Studio courses (minimum of two courses for students enrolled in 2023 or later) CITE203 Interaction Design Studio CITE304 Play and Game Design Studio CITE306 Business Model Studio CITE303 Life Sensibility and Transhuman Studio CITE405 Human-Centered Design Studio				

6. Curriculum Roadmap

- Spring Entry

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester
	·(CITE201)Convergence IT Design Ⅰ: Fundamentals ·(CITE204) Personal Growth Design Ⅰ ·Course offered by the Department	·(CITE202) Convergence IT Design Ⅱ: Basic Design ·(CITE390A)Special Topics: Personal Growth Design Ⅱ ·Course offered by the Department	·(CITE301)Convergence IT Design Ⅲ: Advanced Design ·(CITE390(-)Special Topics: Personal Growth Design Ⅲ ·Course offered by the Department	·(CITE302)Convergence IT Design Ⅳ: System Integration ·Course offered by the Department	·Course offered by the Department
Complete at least three out of the five Creative Studio courses (minimum of two courses for students enrolled in 2023 or later) CITE203 Interaction Design Studio CITE303 Life Sensibility & Transhuman Contents Studio CITE304 Play and game Design Studio CITE306 Business Model Studio CITE405 Human-Centered Design Studio					

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

- Fall Entry

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester	Fall Semester	Spring Semester	Fall Semester	Spring Semester
	·(CITE201) Convergence IT Design Ⅰ: Fundamentals ·Course offered by the Department	·(CITE202) Convergence IT Design Ⅱ: Basic Design ·(CITE204)Personal Growth Design Ⅰ ·Course offered by the Department	·(CITE301)Convergence IT Design Ⅲ: Advanced Design ·(CITE390A)Special Topics: Personal Growth Design Ⅱ ·Course offered by the Department	·(CITE302)Convergence IT Design Ⅳ: System Integration ·(CITE390(-)Special Topics: Personal Growth Design Ⅲ ·Course offered by the Department	·Course offered by the Department
Complete at least three out of the five Creative Studio courses (minimum of two courses for students enrolled in 2023 or later) CITE203 Interaction Design Studio CITE303 Life Sensibility & Transhuman Contents Studio CITE304 Play and game Design Studio CITE306 Business Model Studio CITE405 Human-Centered Design Studio					

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

7. Approved Graduate and Other Department Courses for Major Credits

-To encourage students to deepen their interdisciplinary knowledge, courses offered by other departments, as well as graduate-level courses offered by other departments or the Department itself, may be counted as ME credits.

-Research courses (including seminars) are not eligible for graduation credit.

8. List of Major Courses Recognized as Satisfying Divisional Requirements

Types	Course Code	Course Title
Engineering	CITE221	Introduction to Digital Systems and Microprocessor Design
	CITE241	Introduction to Biomedical Engineering
	CITE341	Control Systems Theory and Lab
	CITE421	Database Systems
	CITE451	Biomaterials and Biofabrication Methods
	CITE452	Biomedical Device: Engineering for Diagnostics and Therapeutics
	CITE453	Biomedical Systems and Signal Processing
	CITE390B	Special Topics: Clinical Anatomy and Physiology for Science and Engineering
	CITE490Q	Advanced Special Topics: Theory and Practice of Mobile Robotics
	CITE490I	Advanced Special Topics: Introduction to Electronic Devices and Circuits
	CITE490H	Advanced Special Topics: Business Plan Development in Biomedicine
	CITE490C	Advanced Special Topics: Introduction to Medicine
	CITE490J	Advanced Special Topics: Basic Clinical Pathology
	CITE490N	Advanced Special Topics: Fundamental of Robotics and ROS Training
Humanities-technology Convergence	CITE205	Interplays of Humanities and Technology
	CITE411	Applied Creative Entrepreneurship
	CITE490B	Advanced Special Topics: Sustainable Design Studio
	CITE490K	Advanced Special Topics: AR/VR Design & Fabrication Studio
	CITE490D	Advanced Special Topics: Future City Design Studio
	CITE490M	Advanced Special Topics: Meditech and Society
	CITE203	Interaction Design Studio
	CITE303	Life Sensibility and Transhuman Studio
	CITE304	Play and Game Design Studio
	CITE405	Human-Centered Design Studio

***** If a student completes three or more STUDIO courses, which are required major courses, all of them shall count toward the required major credits, and the student will be deemed to have fulfilled the Humanities–Technology Convergence Division requirement. In addition, the student must complete a total of 35 credits of elective major courses, including 6 credits from the Engineering Division.

*** Course Codes of CITE390A/Z and CITE490A/Z may be subject to change.**

*** The list above may be subject to change.**

9. Course Description

CITE103 – Creative Value Design Studio ····· (1-2-2)

This course is part of the department's Creative Studio program, tailored specifically for freshmen in the undeclared major track to meet their educational needs. Conducted as a project-based learning class rooted in design thinking, it fosters both creativity and practical design skills of students by aligning content with their initial interests, perspectives, and abilities. The course encourages students to freely develop their imagination while cultivating the ability to design and create tangible products and service concepts.

CITE201 – Convergence IT Design Ⅰ: Fundamentals ····· (1-4-3)

This course introduces the basic tools and components essential for embarking on the capstone design

journey in IT convergence. Through simple projects, students gain foundational knowledge of hardware and software experimentation that supports their Personal Growth Design (PGD).

CITE202 – Convergence IT DesignⅡ: Basic Design ····· (2-8-6)

This course focuses on the block-building stage of the capstone design journey. Students define their final research target system, design and test the necessary hardware and software blocks.

CITE203 – Interaction Design Studio ····· (2-2-3)

Interaction design Studio involves defining and creating the behavior of products, integrating usability and aesthetics across objects, services, and environments. In this course, students learn interaction design methodologies and apply them to design product interactions effectively.

CITE204 – Personal Growth DesignⅠ ····· (2-0-2)

This course develops the knowledge and skills necessary to create and implement a Personal Growth Design (PGD). Through in-depth interactions with faculty advisors and external mentors, self-reflection and exploration, future-oriented insights, and special lectures on self-development, students complete their PGD and continue to refine and implement it throughout their studies until graduation.

CITE205 – Interplays of Humanities and Technology ····· (2-0-2)

This course introduces students to a new paradigm of knowledge in which the values and imagination of the humanities and arts converge with engineering knowledge. Students explore the intricate connections between science and technology and fields such as philosophy, the humanities, the arts, and sociology, while considering how to forge new interdisciplinary career paths. The course encourages students to reflect on the imagination and knowledge needed to become future-oriented, convergence-driven leaders.

CITE211 – Human Resource and Organization Theory ····· (2-0-2)

This course explores human resource and performance management strategies for technology-oriented organizations operating in dynamic environments, including R&D centers, technology transfer entities, and technology trading firms. Students learn to compare the strengths and weaknesses of technology-focused versus function-focused organizations and develop both theoretical understanding and practical skills for managing human resources to accelerate technology commercialization.

CITE212 – Technology Financing ····· (2-0-2)

This course introduces the fundamental principles and concepts of accounting procedures essential for engineers transitioning into managerial roles, along with the use of accounting information for decision-making. Topics include preparing and analyzing financial statements, assessing corporate financial performance, making financial decisions, funding business activities, capital structure theory, and related aspects of financial management.

CITE213 – Technology Marketing ····· (2-0-2)

This course provides an overview of techniques for managing marketing resources and activities, as well as theories and practical applications of marketing tools (the marketing mix). Students learn to develop strategies and tactics for technology-based firms, create markets and attract customers, and analyze and address challenges that affect the marketing of new products.

CITE214 – Economics of Technological Innovation ····· (3-0-3)
This course aims to strengthen students' capacity for innovation by exploring technological advancements from a socio-economic perspective, with particular emphasis on the "IT Revolution."

CITE215 – Introduction to Makers ····· (2-2-3)
This course offers students opportunities to engage in evidence-based design and independent digital fabrication projects. It fosters their ability to develop design skills and translate discoveries into concrete, scientifically grounded products. *Recommended for lower-level undergraduates prior to enrolling in Creative Studio courses.*

CITE221 – Introduction to Digital Systems and Microprocessor Design ····· (3-2-4)
This course introduces the fundamental concepts of circuits, logic, and architecture required for microprocessor design, reinforced through laboratory experiments. It provides a foundation for students' creative IT design projects.

CITE222 – Data Structure and Algorithm ····· (3-2-4)
This course combines two essential subjects—data structures and algorithms—that are critical for smart computing. It equips students with foundational skills that enable interdisciplinary research and integration with other fields.

CITE241/MECH361 – Introduction to Biomedical Engineering ····· (3-0-3)
By the end of this course, students will be able to: (1) apply knowledge of biological and physical sciences, mathematics, and engineering to solve problems at the interface of engineering and biology; (2) design biomedical engineering systems, components, or processes that meet specific needs, demonstrating an understanding of relevant technical, professional, and ethical issues; (3) function effectively on multidisciplinary teams; (4) communicate clearly in verbal, written, and graphical formats; and (5) identify, formulate, and solve biomedical engineering problems that address contemporary issues in a global, societal, and economic context.

CITE242 – Principles of Medical Imaging ····· (3-0-3)
The medical imaging track is one of the essential majors in the Department of Biomedical Engineering. Because medical imaging plays a critical role in the diagnosis and treatment of diseases, it is crucial for biomedical engineers to understand the fundamental concepts of standard medical imaging modalities.

CITE301 – Convergence IT DesignⅢ: Advanced Design ····· (2-8-6)
This course focuses on designing prototypes and verifying errors to ensure functionality and performance.

CITE302 – Convergence IT DesignⅣ: System Integration ····· (2-8-6)
In this course, students present a final product that integrates all planned functions into a complete system.

CITE303 – Life Sensibility and Transhuman Studio ····· (2-2-3)
In the future, IT-based humanities–arts convergence technologies must address evolving concepts of life and humanity while shaping cultural trends. This studio expands students' imagination about life and

sensibility through transdisciplinary thinking and fosters a bold understanding of transhumanism in this transformative era. It serves as a creative space for developing innovative ideas that explore new markets and set forward-looking agendas.

CITE304 – Play and Game Design Studio ····· (2-2-3)

Fun and immersive experiences are key values in the cultural technology era, and games represent one of the most influential products of humanities–industry convergence. This course covers foundational concepts of virtuality, ludology, and the cultural industry underpinning modern gaming culture, and includes practical exercises in game design.

CITE306 – Business Model Studio ····· (2-2-3)

To develop the "i-shaped" talent envisioned by the Department, students must cultivate not only engineering knowledge and skills but also fundamental management expertise, a mindset for social entrepreneurship, and the ability to launch ventures based on their intellectual assets. For engineering students in particular, preparing to transform engineering value into societal value is essential.

The goal of this course is to deepen students' understanding of entrepreneurship through management theories, case studies, and a business simulation game, guiding them in the development of a practical business plan. This experience equips students with the insights and skills needed to design and deliver value propositions as future researchers or entrepreneurs. They apply various business methodologies to independently create innovative business models and identify new opportunities.

CITE311 – Technology Innovation and Commercialization ····· (3-0-3)

Identifying new growth engines through strategic management of technological innovation and commercialization is both a critical challenge and a cornerstone of competitiveness for 21st-century enterprises. This course introduces models, techniques, and case studies of technology-driven and business model innovations that secure competitive advantage. Students acquire both theoretical knowledge and practical expertise through team projects, group discussions, and lectures from external industry experts.

CITE312 – Entrepreneurship ····· (2-0-2)

This course equips students with practical skills and knowledge covering the entire process of founding and managing a technology-driven company or launching a new business initiative within an existing firm. Topics include strategy development, market analysis, executive team formation and organizational development, technology and product development, business plan preparation, fundraising, and IPO planning. Students gain hands-on experience through expert lectures, discussions, and entrepreneurial projects.

CITE341 – Control Systems Theory and Lab ····· (3-3-4)

This course introduces a broad range of control theory to help students build a solid foundation in control systems at the undergraduate level. It integrates core concepts—often scattered across multiple courses in other departments—into a single, comprehensive class.

CITE405 – Human-Centered Design Studio ····· (2-2-3)

Focusing on the human–computer interaction (HCI) domain within IT convergence, this course addresses both the theory and practice of human-centered design (HCD). As IT technology advances rapidly, creative solutions grounded in human-centered and design thinking are becoming increasingly important.

The course develops students' ability to create IT solutions based on process-oriented rather than outcome-oriented thinking, emphasizing human-centered perspectives and design methodologies.

CITE411/IMEN412/ENTP301 – Applied Creative Entrepreneurship ····· (3-0-3)

This course provides students with practical experience in developing their own business plans by applying various business methodologies to identify and create innovative business opportunities. Conducted in a team-based workshop format, students progress through the entire process: selecting a new business idea, analyzing market environments and consumer needs, developing a business model, creating a service/technology roadmap, formulating technology acquisition and marketing strategies, and drafting a feasibility-validated business plan.

The course also features mentoring from venture CEOs, venture capitalists, and patent experts, offering insights into success and failure factors and supporting students through a continuous mentoring network. By completing this course, students gain a solid understanding of business opportunities and startups, as well as the experience and perspective necessary to design and pursue an entrepreneurial career.

CITE421/CSED357 – Database Systems ····· (3-2-4)

Recommended Prerequisite: CSED331 (Algorithms)

This course covers file structures and access methods, techniques for performance analysis and storage management, and the various database models, implementation methods, and technologies. Students learn about data reliability, protection, and integrity, and examine key issues in database design and management. The course also provides hands-on experience in designing a database.

CITE441/EECE423 – Modern Control Theory ····· (3-0-3)

This course focuses on system analysis and design using state variables, introducing computer control systems and widely used modern techniques. Topics include linearization methods for nonlinear systems, optimization techniques for linear systems, input–output identification of unknown systems, and self-tuning control methods.

CITE451/MECH423 – Biomaterials and Biofabrication Methods ····· (3-0-3)

This course introduces biomaterials widely used in biomedical engineering and the biofabrication techniques that employ them. Students develop multidisciplinary skills to integrate these technologies into multiscale human tissue models and translational medicine applications. The course covers state-of-the-art techniques such as 3D bioprinting, electrospinning, soft lithography, and microfluidics, as well as the latest trends in the field. Students also examine the physical and chemical properties of various biocompatible materials, including metals, polymers, ceramics, and hydrogels.

CITE452 – Biomedical Device: Engineering for Diagnostics and Therapeutics ····· (3-0-3)

As advancements in biohealth continue to drive interest in biomedical engineering, this course provides students with the engineering knowledge necessary to design and develop medical devices. Topics include the principles and mechanisms of therapeutic devices at the physiological level, with an introduction to technologies such as neuroelectronics.

CITE453 – Biomedical Systems and Signal Processing ····· (3-0-3)

This course introduces fundamental signal processing concepts in both the time and frequency domains as a foundation for analyzing signals and systems, with applications to biomedical systems. Students gain

an understanding of the cardiovascular, respiratory, and circulatory systems and learn to apply signal processing techniques to analyze and design biomedical systems.

CITE390A/Z – Special Topics in IT Convergence Engineering A-Z ····· (Varied Credits)

CITE399A/D – Research Participation A-D ····· (0-2-1)

CITE399M – Special Research Participation M ····· (0-6-3)

CITE490A/Z – Advanced Special Topics in IT Convergence Engineering A-Z ····· (Varied Credits)

CITE495 – Long-Term Field Training ····· (0-0-12)

This course provides students with an opportunity to actively explore their research interests through an extended internship during a regular semester.

※ Internship participation period: At least 16 weeks

※ Up to 9 credits may be counted toward graduation (including the POSTECH-approved field training courses).

Department of Semiconductor Engineering

1. Educational Goals

The educational goal of the Department of Semiconductor Engineering is to cultivate Korea's top semiconductor professionals. Here, "semiconductor professionals" refers to individuals who not only possess advanced engineering knowledge and the ability to apply it, but also demonstrate leadership in the semiconductor field grounded in a broad foundation in the humanities.

To this end, the Department offers comprehensive basic and advanced education spanning all areas of semiconductors, including devices, processes, design, and systems. In addition, it has established an integrated practical training system that combines semiconductor fabrication, analysis, and design, nurturing experts who excel in both theory and practice. Finally, the Department runs systematic educational programs designed to enhance creative thinking and practical problem-solving skills for leading future technologies, fostering the next generation of global leaders equipped with both expertise and leadership.

2. Curriculum Overview

The curriculum is designed to cultivate professionals who embody the four key qualifications defined by the department.

▪ Professionals with comprehensive basic and applied knowledge across all areas of semiconductors, including materials, devices, processes, and design

Relevant courses:

1) BER: Mathematics, Physics, and Chemistry, and more
2) MR: Physics for Semiconductors, Semiconductor Devices I, Introduction to Semiconductor Materials, Introduction to Semiconductor Integration Processes I·II, Fundamentals of Semiconductor Circuits, Semiconductor Electronic Circuits I, and more

▪ Practice-oriented professionals with hands-on skills in prototype fabrication, measurement, and analysis

Relevant courses: ME courses including VLSI Design, Full-custom Integrated Circuit Design, Memory Devices and Process Technology, Electrical Test and Reliability, BEOL/Advanced Packaging, and more

▪ Leadership-oriented professionals who can grasp the latest semiconductor technology trends and conduct market analysis

Relevant courses: Executive Seminar on Semiconductor Industry, Semiconductor and Intellectual Properties, Global Technology Expert Lecture, Domestic Industrial Field Training, Overseas Field Training, and more

▪ Humanities-based professionals with strong values, communication skills, leadership, and a business mindset

Relevant courses: various courses in the Humanities and Social Sciences Electives category

▶Guidelines for Double Major and Minor

[Double Major]
Students from other departments who wish to complete a double major in Semiconductor Engineering must complete all 26 credits in MR and 9 credits in ME, for a total of at least 35 credits.

[Minor]
Students from other departments who wish to complete a minor in Semiconductor Engineering must complete 15 credits in MR and 6 credits in ME, for a total of at least 21 credits.

3. Summary of Curriculum Requirements

Category	Course Title	Credits	Note
GER	Expository Writing (2) (Only new students who have entered as foreigners: Korean Program)	2	A maximum of 2 credits in Physical Education may be counted toward graduation.
	English Program (Tier 1)	4	
	Physical Education (Physical Fitness (1) and another one (1) from the PE course list are mandatory)	2	
	HASS-CPMPASS: Required for students enrolled in 2026 and later (Only new students who have entered as foreigners: K-HASS-CPMPASS)	3	
	Future Planning for University Life I (0.5) and II (0.5)	1	
	Subtotal	**12**	
HSSE	3 credits in courses in Humanities and Arts are required.	18	① Credits exceeding the 18-credit requirement will count toward FE. ② At least one 400-level course (3 credits), regardless of track, must be completed (students admitted in 2026 and later)
	3 credits in courses in Social Sciences are required.		
	Subtotal	**18**	
BER	Calculus I (3) and II (3)	6	*Exclude Exploring Academic major (1).
	Choose one: General Physics: Mechanics & Waves (3) or General Physics(H): Mechanics & Waves (3) Choose one: General Physics: Electromagnetism & Optics (3) or General Physics(H): Electromagnetism & Optics (3) General Physics Lab I (1)	7	
	General Chemistry I (3), General Chemistry Lab I (1)	4	
	Choose one: General Life Science (3) or General Life Science (H) (3)	3	
	Programming and Problem-solving (3)	3	
	Introduction to Artificial Intelligence (2)	2	
	*Exploring Academic major (1)	-	
	Subtotal	**25**	
BEE	General Physics Lab Ⅱ: Design and Construction (1), General Physics Recitation: Mechanics & Waves (1) and General Physics Recitation: Electromagnetism & Optics (1), General Chemistry II (3), General Chemistry Lab II (1), General Life Science Laboratory (1), up to two Departmental Introductory Courses (1), Introduction to Programming (3), Entrepreneurship and Technology Innovation (2), Freshman Research Participation (1), Creative Value Design Studio (2), Introduction to	**Choose from the list to fulfill 5 credits**	Credits exceeding the 5-credit requirement will count toward FE.

Category	Course Title	Credits	Note
	Environmental Science (3)		
MR	All MR courses offered by the Department	26	
ME	1) Preconditions -Excluding SEMI399A-D Research Participation A/D, students must complete at least 20 credits in the remaining undergraduate ME courses offered by the Department. -If all 4 credits in Research Participation A/D (1 credit each) are completed, up to 10 credits in items 2)-4) below may be recognized as ME credits toward graduation. 2) All STC courses offered by other departments are recognized as ME credits. -Exception: EECE231 Circuit Theory and DISU231 Electric Circuits are recognized as ME credits only for students who took them in the first semester of 2023. Students taking these courses thereafter will not receive ME credits for them. 3) Among MR and ME courses offered by other departments (excluding STC courses), only those listed in "6. Approved Graduate and Other Department Courses for Major Credits" are recognized as ME credits. 4) Graduate-level courses offered by the Department of Semiconductor Engineering, Graduate School of Semiconductor Technology, Department of Electrical and Electronics Engineering, Department of Materials Science and Engineering, or Department of Computer Science and Engineering are recognized as ME credits. (However, research courses, including graduate seminars, are not recognized.) ※ Graduate-level credit courses offered by the Department of Semiconductor Engineering will be recognized only for students who completed them by the 2025 academic year.	34	
FE	Courses taken in areas of interest outside the student's major (i.e., courses offered by other departments) are classified as FE. While these courses count toward the semester credit load and are included in GPA calculations, they do not count toward the graduation credit requirements of the Department of Semiconductor Engineering.	-	
Subtotal		120	

[Course Category] GER: General Education Requirements, HSSE: Humanities and Social Sciences Electives, BER: Basic Education Requirements, BEE: Basic Education Electives, MR: Major Requirements, ME: Major Electives, DME: Designated Major Electives, FE: Free Electives

※ Exploring Academic Major (1): This course is excluded from the curriculum of the Department.
※ STC Courses: Students must complete 15 credits, regardless of department or discipline.
※ English Program
- Placement in Tier 1 is required for students admitted in 2026 or later.
※ Students may take Departmental Introductory Courses and Freshman Research Participation across multiple departments; however, only 2 credits for Departmental Introductory Courses and 1 credit for Freshman Research Participation may be counted toward graduation. (Duplicate enrollment in courses with the same course code is not permitted.)

※ List of STC Courses

Department	Course Code	Course Title
Mathematics	MATH200	Differential Equations
	MATH203	Applied Linear Algebra
	MATH210	Applied Complex Variables
	MATH230/MATH231/IMEN272	Probability and Statistics/Statistics for Experimental Research/Probability and Statistics for Engineering
	MATH261	Discrete Mathematics
Physics	PHYS201	Introduction to Quantum Physics
	PHYS202	Introduction to the Theory of Relativity
	PHYS203	Mechanics
Chemistry	CHEM221	Organic Chemistry I

Department	Course Code	Course Title
	CHEM231	Introduction to Nanochemistry
	CHEM243	Chemical Analysis
	CHEM261	Chemistry for Medicine and Life
Life Sciences	LIFE217	Cell Biology
	LIFE218	The Principles of Life Sciences
	LIFE219	Convergence of Biology and Engineering
Materials Science and Engineering	AMSE201	Fundamentals of Materials Science and Engineering
	AMSE208	Structure of Materials (For students enrolled in 2021 or later)
	AMSE211	Materials Design
	AMSE412	Nanoscience and Nanotechnology (For students enrolled in 2020 or before)
Mechanical Engineering	MECH240	Solid Mechanics
	MECH250	Thermodynamics
Industrial and Management Engineering	IMEN203	Financial Accounting
	IMEN260/IMEN261	Operations Research I /Introduction to Operations Research
Electronics and Electrical Engineering	EECE231/DISU231	Circuit Theory/Electric Circuits
	EECE233	Signals and Systems
	EECE236	Learning About Electrical Engineering Using MatLab
Computer Science and Engineering	CSED211	Introduction to Computer Software Systems
	CSED232	Principles of Software Construction
	CSED233	Data Structure
Chemical Engineering	CHEB201	Physical Chemistry for Chemical Engineering I
	CHEB206	Organic Chemistry for Chemical Engineers I
	CHEB208	Fundamentals in Engineering Biology
	CHEB214	Energy and Environmental Engineering
IT Convergence Engineering	CITE241/MECH361/EECE480	Introduction to Biomedical Engineering
Semiconductor Engineering	SEMI202	Physics for Semiconductors
	SEMI203/EECE211	Semiconductor Devices I /Semiconductor Electronics I
	SEMI206	Introduction to Semiconductor Materials

4. Comprehensive List of Major Courses

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
BEE	SEMI100	Introduction to Semiconductor Engineering	1-0-1	
	SEMI199	Freshman Research Participation	0-2-1	
MR	SEMI201	Industrial Mathematics for Semiconductors	3-0-3	Introduction to Semiconductor Engineering
	SEMI202	Physics for Semiconductors (STC)	3-0-3	Introduction to Semiconductor Engineering
	SEMI203	Semiconductor Devices I (STC)	3-0-3	
	SEMI204	Introduction to Semiconductor Engineering Lab	1-3-2	Introduction to Semiconductor Engineering
	SEMI205	Semiconductor Electronic Circuits I	3-0-3	Choose one: Fundamentals of Semiconductor Circuits or Circuit Theory
	SEMI206	Introduction to Semiconductor Materials (STC)	3-0-3	Introduction to Semiconductor Engineering
	SEMI207	Introduction to Semiconductor Integration Processes I : Capstone Design	2-2-3	Introduction to Semiconductor Engineering, Seminar on Semiconductor Industry Management
	SEMI208	Introduction to Semiconductor Integration Processes Ⅱ	2-2-3	Introduction to Semiconductor Integration Processes I : Capstone Design
	SEMI209	Fundamentals of Semiconductor Circuits	3-0-3	Introduction to Semiconductor Engineering

Category	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite
ME	SEMI111	Executive Seminar on Semiconductor Industry	2-0-2	Introduction to Semiconductor Engineering
	SEMI211	Semiconductors and Intellectual Property	3-0-3	Introduction to Semiconductor Engineering Semiconductor Devices I
	SEMI212	Introduction to Electromagnetics for Semiconductor Engineering	3-0-3	Introduction to Semiconductor Engineering
	SEMI311	Global Technology Expert Lecture	3-0-3	Introduction to Semiconductor Engineering
	SEMI312	Overseas Field Training	0-6-3	Introduction to Semiconductor Engineering
	SEMI313	Probability and Stochastic Process	3-0-3	Industrial Mathematics for Semiconductors
	SEMI321	Semiconductor Devices Ⅱ	3-0-3	Semiconductor Devices I
	SEMI322	Memory Devices and Process Technology	3-0-3	Introduction to Semiconductor Engineering Semiconductor Devices I
	SEMI323	Semiconductor Testing and Reliability	2-2-3	Introduction to Semiconductor Engineering Semiconductor Devices I
	SEMI341	Semiconductor Logic System Design	3-0-3	
	SEMI342	Computer Architecture Design	3-0-3	Choose one: Fundamentals of Semiconductor Circuits or Digital System Design
	SEMI343	Semiconductor Electronic Circuits Ⅱ	3-0-3	Semiconductor Electronic Circuits I
	SEMI344	VLSI Design	3-0-3	Choose one: Fundamentals of Semiconductor Circuits or Digital System Design
	SEMI361	Electrical Characterization of Semiconductors	3-0-3	Semiconductor Devices I
	SEMI362	Semiconductor Materials Analysis	3-0-3	Introduction to Semiconductor Engineering
	SEMI363	BEOL/Packaging	3-0-3	Introduction to Semiconductor Materials
	SEMI399A-D	Research Participation A-D	0-2-1	
	SEMI412	Domestic Industrial Field Training	0-6-3	Introduction to Semiconductor Engineering
	SEMI421	Nanoelectronic Devices	3-0-3	Introduction to Semiconductor Engineering Semiconductor Devices I
	SEMI422	Quantum Devices and Computing	3-0-3	
	SEMI423	Fundamentals of Semiconductor Optoelectronic Devices	3-0-3	Introduction to Semiconductor Engineering
	SEMI442	Full-Custom Integrated Circuit Design	3-0-3	Semiconductor Electronic Circuits I
	SEMI443	Embedded System-on-Chip Design	3-0-3	Computer Architecture Design
	SEMI445	Introduction to RF and Analog Circuit Design	3-0-3	
	SEMI490A-Z	Special Topics in Semiconductor Engineering A-Z	Varied Credits	
	1) All STC courses offered by other departments Exception: EECE231 Circuit Theory and DISU231 Electric Circuits are recognized as ME credits only for students who took them in the first semester of 2023. 2) Courses included in "6. Approved Graduate and Other Department Courses for Major Credits" 3) Graduate-level courses offered by the Department of Semiconductor Engineering, Graduate School of Semiconductor Technology, Department of Electrical and Electronics Engineering, Department of Materials Science and Engineering, or Department of Computer Science and Engineering ※ Graduate-level credit courses offered by the Department of Semiconductor Engineering will be recognized only for students who completed them by the 2025 academic year. ※ However, excluding SEMI399A-D Research Participation A-D, students must complete at least 20 credits in the remaining undergraduate ME courses offered by the Department.			

※ Up to 9 credits in POSTECH-approved field training courses may be counted toward graduation.
-SEMI312 Overseas Field Training and SEMI412 Domestic Industrial Field Training count as ME.
-Other field training courses count as FE.

5. Major Course List by Year and Semester

School Year	1st Semester			2nd Semester		
	Category	Course Code	Course Title	Course Code	Course Title	Course Title
Freshman	BEE	SEMI100	Introduction to Semiconductor Engineering	ME	SEMI111	Executive Seminar on Semiconductor Industry
	BEE	SEMI199	Freshman Research Participation			
Sophomore	MR	SEMI201	Industrial Mathematics for Semiconductors	MR	SEMI202	Physics for Semiconductors (STC)
	MR	SEMI203	Semiconductor Devices Ⅰ (STC)	MR	SEMI205	Semiconductor Electronic Circuits Ⅰ
	MR	SEMI204	Introduction to Semiconductor Engineering Lab	MR	SEMI206	Introduction to Semiconductor Materials (STC)
	MR	SEMI207	Introduction to Semiconductor Integrated Processes Ⅰ: Capstone Design	MR	SEMI208	Introduction to Semiconductor Integration Processes Ⅱ
	MR	SEMI209	Fundamentals of Semiconductor Circuits	ME	SEMI212	Introduction to Electromagnetics for Semiconductor Engineering
				ME	SEMI211	Semiconductors and Intellectual Property
Junior	ME	SEMI311	Global Technology Expert Lecture	ME	SEMI313	Probability and Stochastic Process
	ME	SEMI321	Semiconductor Devices Ⅱ	ME	SEMI323	Semiconductor Testing and Reliability
	ME	SEMI322	Memory Devices and Process Technology	ME	SEMI342	Computer Architecture Design
	ME	SEMI341	Semiconductor Logic System Design	ME	SEMI343	Semiconductor Electronic Circuits Ⅱ
	ME	SEMI344	VLSI Design	ME	SEMI362	Semiconductor Materials Analysis
	ME	SEMI361	Electrical Characterization of Semiconductors	ME	SEMI399A/D	Research Participation A-D
	ME	SEMI363	BEOL/Packaging	ME	SEMI312	Overseas Field Training
	ME	SEMI399A/D	Research Participation A-D			
Senior	ME	SEMI421	Nanoelectronic Devices	ME	SEMI423	Fundamentals of Semiconductor Optoelectronic Devices
	ME	SEMI422	Quantum Devices and Computing	ME	SEMI443	Embedded System-on-Chip Design
	ME	SEMI412	Domestic Industrial Field Training	ME	SEMI490A/Z	Special Topics in Semiconductor Engineering A-Z
	ME	SEMI442	Full-Custom Integrated Circuit Design	ME	Graduate courses offered by the Department of Semiconductor Engineering, Graduate School of Semiconductor Technology, Department of Electronics and Electrical Engineering, Department of Materials Science and Engineering, Department of Computer Science and Engineering	
	ME	SEMI445	Introduction to RF and Analog Circuit Design			
	ME	SEMI490A/Z	Special Topics in Semiconductor Engineering A-Z			
	ME	Graduate courses offered by the Department of Semiconductor Engineering, Graduate School of Semiconductor Technology, Department of Electronics and Electrical Engineering, Department of Materials Science and Engineering, Department of Computer Science and Engineering				

※ The semester in which senior-year ME courses are offered may vary.

※ SEMI312 Overseas Field Training and SEMI412 Domestic Industrial Field Training are available during seasonal semesters (summer or winter).

※ Graduate-level credit courses offered by the Department of Semiconductor Engineering will be recognized only for students who completed them by the 2025 academic year.

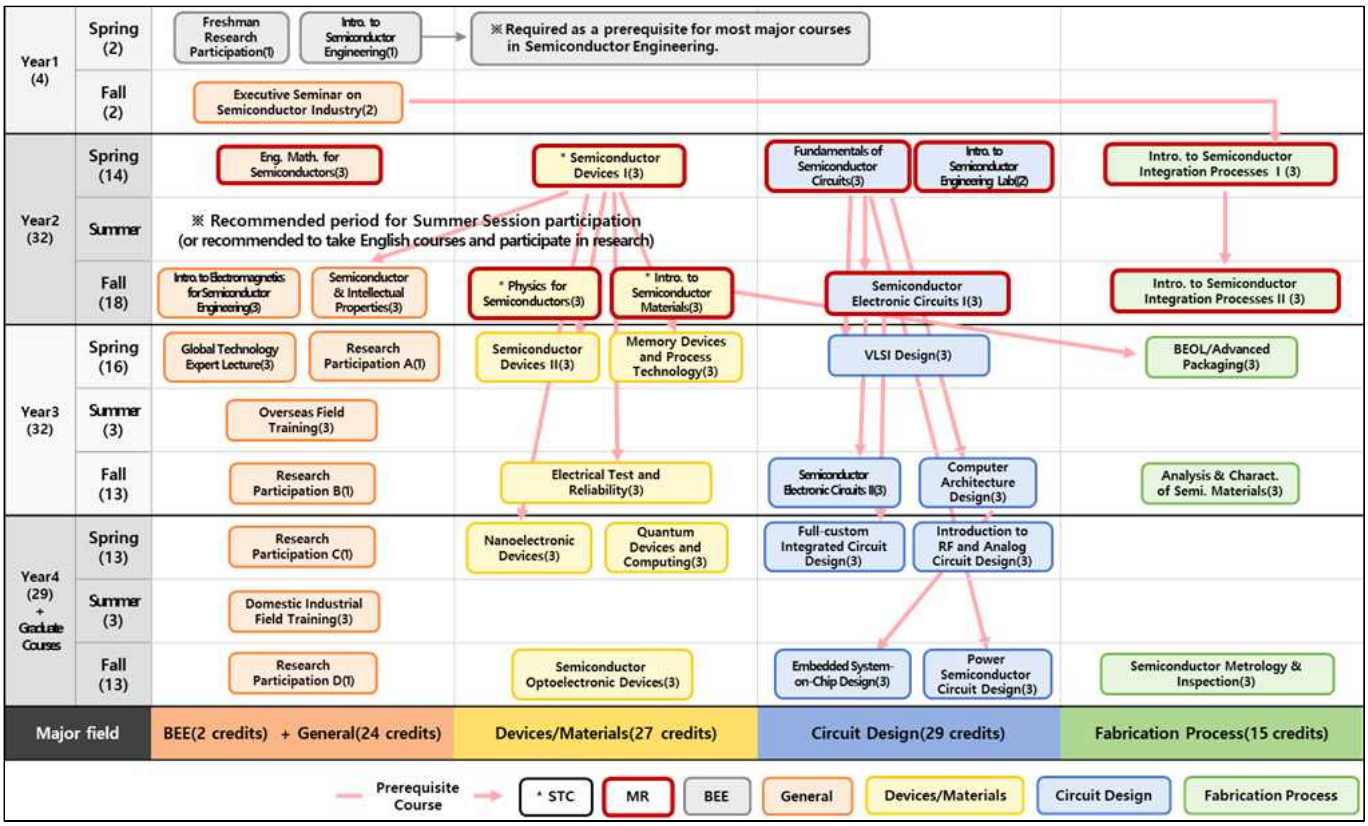
6. Overall Curriculum Roadmap for Undergraduate Students

※ Major Required (MR): Red / Major Elective (ME): Blue / STC: *

(A) Year 1		(B) Year 2		(C) Year 3		(D) Year 4	
Spring Semester (20.5 credits)	Fall Semester (19.5 credits)	Spring Semester (20 credits)	Fall Semester (21 credits)	Spring Semester (22 credits)	Fall Semester (20 credits)	Spring Semester (16 credits)	Fall Semester (16 credits)
SEMI199 Freshman Research Participation(1)	SEMI111 Executive Seminar on Semiconductor Industry(2)	SEMI201 Eng. Math. for Semiconductors(3)	SEMI202 * Physics for Semiconductors (3)	SEMI399A Research ParticipationA(1)	SEMI399B Research ParticipationB(1)	SEMI399C Research ParticipationC(1)	SEMI399D Research ParticipationD(1)
SEMI100 Intro. to Semiconductor Engineering(1)	Basic Elective(3)	SEMI203 * Semiconductor Devices I(3)	SEMI206 * Intro. to Semiconductor Materials(3)	SEMI311 Global Technology Expert Lecture(3)	SEMI323 Electrical Test and Reliability(3)	SEMI421 Nanoelectronic Devices(3)	SEMI423 Semiconductor Optoelectronic Devices(3)
LIFE103 General Life Science(3)	MATH102 Calculus II(3)	SEMI207 Intro. to Semiconductor Integration Processes I (3)	SEMI208 Intro. to Semiconductor Integration Processes II (3)	SEMI321 Semiconductor Devices II(3)	SEMI362 Analysis & Charact. of Semi. Materials(3)	SEMI422 Quantum Devices and Computing(3)	SEMI490A Power Semiconductor Circuit Design(3)
MATH101 Calculus I(3)	PHYS102 General Physics II(3)	SEMI209 Fundamentals of Semiconductor Circuits(3)	SEMI205 Semiconductor Electronic Circuits I(3)	SEMI322 Memory Devices and Process Technology(3)	SEMI343 Semiconductor Electronic Circuits II(3)	SEMI445 Introduction to RF and Analog Circuit Design(3)	SEMI490B Semiconductor Metrology & Inspection(3)
PHYS101 General Physics I(3)	CHEM101 General Chemistry I(3)	SEMI204 Intro. to Semiconductor Engineering Lab(2)	SEMI211 Semiconductor& Intellectual Properties(3)	SEMI363 BEOL/Advanced Packaging(3)	SEMI342 Computer Architecture Design(3)	SEMI442 Full-custom Integrated Circuit Design(3)	SEMI443 Embedded System-on-Chip Design(3)
PHYS103 General Physics Lab. I(1)	CHEM102 General Chemistry Lab.I(1)	* STC courses from other departments(3)	SEMI212 Intro. to Electromagnetics for Semiconductor Engineering(3)	SEMI344 VLSI Design(3)	Humanities and Social Sciences Electives(3)	Graduate Courses(3)	Graduate Courses(3)
CSED101 Programming & Problem solving(3)	GEDU101 Expository Writing(2)	HASS-COMPASS(3)	* STC courses from other departments(3)	Humanities and Social Sciences Electives(3)	Graduate Courses(3)		
CSED105 Introduction to Artificial Intelligence(3)	MSUS103 Future Planning for College Life II(0.5)			Graduate Courses(3)	Physical Education course(1)		
GEDU151 Physical Fitness(1)	English course(2)						
MSUS102 Future Planning for College Life I (0.5)							
English course(2)							

(A) Summer/Winter Session: Recommended period for participating in inter-university credit exchange
(B) Summer/Winter Session: It is recommended to complete a total of 4 credits in English courses and simultaneously participate in research.
(C)~(D) Summer/Winter Session: Students are required to complete 「Domestic Industrial Field Training (SEMI412, ME, 3 credits)」 in the summer/winter session immediately before their final regular semester prior to graduation

7. Undergraduate Major Curriculum Flowchart



8. Approved ME/MR Courses Offered by Other Departments

※ For recognition of other departments' courses as ME graduation credits and their categories, please refer to *3. Summary of Curriculum Requirements* when selecting courses.

8-1. All STC courses offered by other departments are recognized as ME credits.
※ Exception: EECE231 Circuit Theory and DISU231 Electric Circuits are recognized as ME credits only for students who took them in the first semester of 2023; students taking the courses thereafter will not receive ME credits.

8-2. Graduate-level courses offered by the Graduate School of Semiconductor Technology, Department of Electrical and Electronics Engineering, Department of Materials Science and Engineering, or Department of Computer Science and Engineering are recognized as ME credits.

8-3. The following courses offered by other departments are recognized as ME credits, with the following exceptions:
※ Exceptions

1) When taking SEMI342 Computer Architecture Design or EECE375 Computer Design, CSED241 Introduction to Computer Architecture is not recognized as ME.
(Duplicate enrollment in similar courses — ① SEMI342 Computer Architecture Design or EECE375 Computer Design and ② CSED241 Introduction to Computer Architecture — is not allowed. Students must choose one.)
2) AMSE313 Physics of Materials is recognized as ME credits only for students who took it in the first semester of 2023.
3) Research Participation–type courses are recognized for graduation credits up to a maximum of 4 credits.
- Only one credit from SEMI399A–D or DISU399A–D may be counted toward degree requirements per semester. Concurrent enrollment in both courses in the same semester is not permitted.
- The total of SEMI399A–D and DISU399A–D is counted, with a maximum of 4 credits recognized toward graduation.

No.	Department	Course Code	Course Title
1	Electronics and Electrical Engineering	EECE372	Microprocessor Architecture and Applications
2	Electronics and Electrical Engineering	EECE312	Introduction to Machine Learning Systems
3	Electronics and Electrical Engineering	EECE202	Introduction to Probability and Random Processes
4	Electronics and Electrical Engineering	EECE308	Introduction to Digital Communication
5	Electronics and Electrical Engineering	EECE451	Introduction to Digital Signal Processing
6	Electronics and Electrical Engineering	EECE490F	Introduction to AI Programming
7	Electronics and Electrical Engineering	EECE490W	Introduction to Reinforcement Learning
8	Electronics and Electrical Engineering	EECE419 / EECE490E	Advanced Electronic Circuits / ST: Advanced Electronic Circuits ※ Starting from Spring 2026, the existing special topics courses have been converted into regular courses, and both of the above courses are recognized as major elective credits.
9	Next-Generation Semiconductor Innovation Convergence University	DISU402	High-Speed Semiconductor I/O Circuits
10	Materials Science and Engineering	AMSE361	Introduction to Polymer Materials
11	Materials Science and Engineering	AMSE464	Polymer Properties and Applications
12	Materials Science and Engineering	AMSE315	Phase Equilibrium and Transformation

No.	Department	Course Code	Course Title
13	Materials Science and Engineering	AMSE207	Materials Chemistry
14	Materials Science and Engineering	AMSE205	Thermodynamics of Materials
15	Materials Science and Engineering	AMSE441	Electroceramics: Electrical Properties of Ceramics
16	Computer Science and Engineering	CSED241	Introduction to Computer Architecture
17	Computer Science and Engineering	CSED312	Operating Systems
18	Computer Science and Engineering	CSED331	Algorithms
19	Computer Science and Engineering	CSED353	Computer Networks
20	Computer Science and Engineering	CSED357	Database Systems
21	Computer Science and Engineering	CSED423	Compiler Design
22	Physics	PHYS301	Quantum Physics I
23	Physics	PHYS304	Thermal Physics
24	Physics	PHYS410	Optical Physics
25	Next-Generation Semiconductor Innovation Convergence University	DISU399A-D	Undergraduate Research Internship (Applicable from the 2025 Summer Semester)

9. Course Description

SEMI100 – Introduction to Semiconductor Engineering ····· (1-0-1)

This course introduces the materials and devices that make up semiconductors, along with their characteristics and historical development. Students learn the principles and types of memory semiconductors, logic semiconductors, and AI semiconductors, as well as emerging technologies such as two-dimensional nanosemiconductors and quantum computers. The course also covers the principles of analog design, very-large-scale integration (VLSI) system design, and next-generation computing architecture design needed to systematize semiconductors. Students explore front-end and back-end processes, packaging, and performance evaluation technologies used in implementing semiconductor devices and systems. Finally, the course examines the global and domestic semiconductor industry ecosystem—including integrated device manufacturers (IDMs), fabless companies, foundries, and outsourced semiconductor assembly and test (OSAT) companies—to help students understand the direction of semiconductor technology and industry development.

SEMI199 – Freshman Research Participation ····· (0-2-1)

This course provides freshmen in the Department with opportunities to participate in semiconductor-related research or gain experience in research labs of their choice. It broadens their understanding of semiconductor engineering early in their studies and introduces them to the excitement of research.

SEMI111 – Executive Seminar on Semiconductor Industry ····· (2-0-2)

This course introduces students to trends in ICT technologies and industries centered on semiconductors, presented from the perspective of business leaders. It helps students reflect on and define their academic and career paths within semiconductor engineering by deepening their understanding of semiconductor technologies and the broader industrial landscape. Insights into the current state and future directions of the semiconductor industry are delivered through invited lectures and seminars by key industry leaders, highlighting the significance of semiconductor engineering in a global context.

SEMI201 – Engineering Mathematics for Semiconductors ····· (3-0-3)

This course develops mathematical reasoning skills essential for students in the Department. The curriculum is organized into six chapters covering topics such as ordinary differential equations, vectors and linear algebra, qualitative methods for systems, vector analysis, and Fourier analysis.

SEMI202 – Physics for Semiconductors ····· (3-0-3)

Although thousands of materials exhibit semiconductor properties, only a select few are suitable and commercially viable as devices. This course teaches common analytical methods for evaluating material properties and the conditions needed to make them functional. It also examines the requirements for bringing emerging materials, such as low-dimensional semiconductors, into industrial applications.

SEMI203 – Semiconductor Devices Ⅰ ····· (3-0-3)

This course introduces the fundamental operating principles of semiconductor devices. Students build a foundational understanding of semiconductor properties, carrier transport, and junction structures, and learn the operating principles of diodes and transistors.

SEMI204 – Introduction to Semiconductor Engineering Lab ····· (1-3-2)

This course integrates theoretical and experimental study of circuits and semiconductor principles fundamental to semiconductor engineering. Students verify Kirchhoff's laws for current and voltage using linear circuit elements such as resistors, inductors, and capacitors. They learn the concept of equivalent circuits through Thévenin's and Norton's theorems, and study circuits designed for maximum power transfer. Through analysis of RL, RC, and RLC circuits, students examine transient behavior and energy storage and release in the time domain. The course also covers the operation of semiconductor devices such as diodes, bipolar junction transistors (BJTs), and metal–oxide–semiconductor field-effect transistors (MOSFETs), as well as logic gates and memory circuits based on these devices. Finally, students develop proficiency in LabVIEW programming and conduct experiments on automated measurement, sensors, and data acquisition.

SEMI205 – Semiconductor Electronic Circuits Ⅰ ····· (3-0-3)

This course introduces fundamental methods for analyzing circuits composed of electronic devices. Students study circuits built with components such as resistors (R), inductors (L), capacitors (C), diodes, BJTs, and MOSFETs, and gain the ability to independently analyze and design circuits by validating their results using the SPICE design tool.

SEMI206 – Introduction to Semiconductor Materials ····· (3-0-3)

This course introduces the crystal structure, material properties, charge transport, and synthesis methods of semiconductor materials. It provides fundamental theories and explains the operating principles of key semiconductor structures, such as p–n junctions, from a materials science perspective.

SEMI207 – Introduction to Semiconductor Integration Processes Ⅰ: Capstone Design ····· (2-2-3)

This course lays the foundation for understanding processes and devices involved in semiconductor integration by focusing on the technology development of each module. Students gain virtual experience with device integration processes using Technology Computer-Aided Design (TCAD) and gain hands-on experience at facilities of the Center for Semiconductor Technology Convergence (CSTC) and the National Institute for Nanomaterials Technology (NINT) on campus. They learn to operate real process equipment

and perform practical work, including fabricating and testing MOS capacitors.

SEMI208 – Introduction to Semiconductor Integration Processes Ⅱ ····· (2-2-3)

Building on the foundation from Introduction to Semiconductor Integration ProcessesⅠ, this course guides students through the fabrication of a complementary metal–oxide–semiconductor (CMOS) inverter, the fundamental unit of logic semiconductors. Students deepen their understanding of semiconductor integration by studying advanced, specialized knowledge in processing and devices, and exploring the development of multiple technology generations. They perform virtual simulations of integration processes using TCAD, operate real process equipment in CSTC and NINT facilities, and fabricate and test a CMOS inverter. The course enhances both theoretical and practical knowledge of semiconductor processing, device fabrication, and characterization, providing a comprehensive understanding of semiconductor integration processes.

SEMI209 – Fundamentals of Semiconductor Circuits ····· (3-0-3)

This course develops students' ability to analyze and design electrical circuits composed of fundamental elements of semiconductor devices and circuits. Students learn key concepts including charge, current, voltage, resistance, capacitance, inductance, power, and energy, along with Kirchhoff's laws, impedance, maximum power transfer, Thévenin's theorem, and Norton's theorem. They practice circuit analysis using the phasor method and Laplace transform, and develop design and analysis skills using computer programs.

SEMI211 – Semiconductor and Intellectual Properties ····· (3-0-3)

This course introduces basic methods for searching and drafting patents essential for securing intellectual property rights. Students examine case studies of commercializing intellectual property based on emerging device technologies, then undertake a project to invent a new device and analyze its strengths and weaknesses. The course also guides students through the process of patenting their inventions, providing an opportunity to apply creativity and the knowledge acquired in class.

SEMI212 – Introduction to Electromagnetics for Semiconductor Engineering ····· (3-0-3)

This course provides students with a comprehensive understanding of electromagnetics as it applies to semiconductor engineering. Topics are covered across 11 chapters, including electromagnetic models, vector analysis, electrostatic fields, solutions to electrostatic problems, steady currents, magnetostatics, Maxwell's equations in the time domain, plane electromagnetic waves, transmission line theory and applications, waveguides and resonators, and antennas and radiation systems.

SEMI311 – Global Technology Expert Lecture ····· (3-0-3)

This course features lectures by members of the Department's Technical Advisory Board (TAB), who deliver one-week introductory sessions on their respective areas of expertise. The course exposes students to a broad range of cutting-edge technologies in the semiconductor field.

SEMI312 – Overseas Field Training ····· (0-6-3)

This course gives students the opportunity to observe how the theories and practices learned in the semiconductor engineering curriculum are applied in real-world production environments. Students gain insight into the diverse functional roles involved in semiconductor device manufacturing—an interdisciplinary integration of electronics, materials science, physics, mechanical engineering, and chemistry

—and use this perspective to shape their future career paths. The course also develops students' ability to lead collaborative efforts and make collective decisions necessary to achieve shared goals as future technology leaders. In addition, students build a broad professional network and formulate a personal growth strategy.

SEMI313 – Probability and Stochastic Process ····· (3-0-3)

Advanced semiconductor engineering requires a solid foundation in several mathematical disciplines, particularly a precise understanding of probability, statistics, and stochastic processes to develop innovative solutions that go beyond current limitations. This course equips students with fundamental knowledge of probability, random variables, and stochastic processes, and teaches them how to apply these concepts to semiconductor engineering, laying the groundwork for advanced research in the field.

SEMI321 – Semiconductor DevicesⅡ ····· (3-0-3)

This course deepens students' understanding of semiconductor device operating principles and equips them with the foundational knowledge needed to develop next-generation devices. Students learn to analyze and explain the operating characteristics of scaled planar MOSFETs (at or below the 32 nm node) using physical equations, understand the necessity and development trends of multi-gate MOSFETs currently in use in the industry, and examine the advantages and disadvantages of alternative device technologies.

SEMI322 – Memory Devices and Process Technology ····· (3-0-3)

Building on a foundation in semiconductor device physics, this course systematically explores the operating principles of dynamic RAM (DRAM), static RAM (SRAM), and FLASH memory devices. Students learn about the fabrication processes of MOSFETs and three-dimensional memory devices, covering both unit and integration processes. The course also introduces the basic operating principles of next-generation memory technologies, including phase-change RAM (PRAM), magnetoresistive RAM (MRAM), resistive RAM (RRAM), and ferroelectric RAM (FeRAM), as well as storage-class memory (SCM) devices based on these technologies. In addition, it covers the selection devices required for their implementation and neuromorphic synaptic devices for hardware-based artificial intelligence.

SEMI323 – Electrical Test and Reliability ····· (2-2-3)

This course covers both basic and advanced electrical characterization methods for electronic devices, enabling students to apply these techniques effectively in their research with a clear understanding of each method's validity and limitations. By the end of the course, students will be able to develop customized test methods and interpret electrical test results with confidence based on sound theoretical knowledge.

SEMI341 – Semiconductor Logic System Design ····· (3-0-3)

This course covers the fundamental concepts of digital systems and methods for their analysis and design. Students learn about combinational and sequential logic circuits and gain practical experience in digital system design, from simple logic circuits to sequential circuit systems and the use of hardware description languages (HDL).

SEMI342 – Computer Architecture Design ····· (3-0-3)

As the core of digital system semiconductors, computers require a precise understanding of their

operating principles and internal architecture. This course moves beyond treating computers as simple components by addressing structural and design challenges aimed at performance optimization. Students acquire key optimization techniques in digital system semiconductor design. The course also introduces major methodologies for implementing digital hardware, enabling students to understand real-world challenges in creating high-performance computer architectures and to explore various semiconductor design techniques used to overcome them.

SEMI343 – Semiconductor Electronic CircuitsⅡ ····· (3-0-3)

Building on Semiconductor Electronic CircuitsⅠ, this course deepens students' understanding of semiconductor electronic circuits. Students analyze differential amplifier circuits and multistage amplifier concepts and implementations, study frequency response and feedback circuits, and examine filters, signal generation circuits, and amplifier output stages.

SEMI344 – VLSI Design ····· (3-0-3)

This course provides comprehensive knowledge and design methodologies for system semiconductor design. Students learn about combinational and sequential logic circuits, practice digital design using HDL, and gain hands-on experience with logic synthesis and physical design through commercial EDA software.

SEMI361 – Electrical Characterization of Semiconductors ····· (3-0-3)

This course teaches students how to measure fabricated semiconductor devices, extract their physical parameters, and quantitatively analyze and compare their electrical characteristics—essential skills for future semiconductor engineers.

SEMI362 – Analysis and Characterization of Semiconductor Materials ····· (3-0-3)

Upon completing this course, students will understand the basic principles behind advanced scientific instruments used to analyze and characterize semiconductor materials. The knowledge acquired can be readily applied to operating and understanding other types of characterization equipment.

SEMI363 – BEOL/Advanced Packaging ····· (3-0-3)

The semiconductor fabrication process includes a front-end-of-line (FEOL) stage, where transistors are formed, and a back-end-of-line (BEOL) stage, where metal interconnections are created. Electronic packaging processes then establish I/O terminals by mechanically, thermally, and electrically connecting various devices (such as capacitors and resistors) to the semiconductor device.

This course covers BEOL processes and the packaging technologies that enable the final application of semiconductor devices. Students also study advanced packaging techniques and 3D heterogeneous integration processes and theories suited for the "More than Moore" era, cultivating their ability to innovate in future semiconductor applications.

SEMI399A/D – Research Participation A-D ····· (0-2-1)

Students participate in research projects under the guidance of a faculty advisor, gaining hands-on experience with research methods and practices.

SEMI412 – Domestic Industrial Field Training ····· (0-6-3)

This course offers students the opportunity to work directly within Korea's semiconductor and related industries, applying classroom theories and skills to real-world settings. Students engage in research

activities and business operations to build practical experience. The course ensures meaningful on-site learning through close coordination between the instructor and industry supervisors, motivating students and preparing them to grow as future innovation leaders. It also fosters valuable networking and relationship-building among students, faculty, and domestic semiconductor companies.

SEMI421 – Nanoelectronic Devices ····· (3-0-3)

To address the limitations of traditional silicon-based semiconductor devices, research is expanding into new materials, principles, and structures for nanoelectronic devices. This course fills a gap in current curricula by introducing students to the fundamental concepts, operating principles, and applications of various nanoelectronic devices. It provides students with a comprehensive understanding of future semiconductor technologies and builds a foundation for leading research in next-generation devices.

SEMI422 – Quantum Devices and Computing ····· (3-0-3)

This course introduces the fundamental principles of quantum mechanics required to understand quantum information processing. Students learn the operating principles of qubits—the basic computational units of quantum information and quantum computers—and the functioning of single- and multi-qubit quantum logic gates.

The course explores decoherence, which disrupts qubit coherence, and presents basic mathematical techniques to mitigate it. Students also study quantum information processing algorithms implemented with qubits, examine practical hardware such as ion traps and superconducting qubits, and review the semiconductor processing technologies used in these systems. The course concludes with an introduction to quantum communication, quantum networks, and basic quantum error correction.

SEMI423 – Fundamentals of Semiconductor Optoelectronic Devices ····· (3-0-3)

This course aims to study the principles and applications of various optoelectronic devices based on the interaction between semiconductors and light. Students will learn the optical properties of semiconductor materials and understand the mechanisms of light emission and detection. Based on these fundamentals, the course covers the structures and operating principles of devices such as LEDs, laser diodes, display devices, photodiodes, and image sensors. In addition, recent image sensor technologies and next-generation optoelectronic devices are introduced to help students understand not only the fundamental knowledge of semiconductor devices but also their industrial applications and current research trends.

SEMI442 – Full-custom Integrated Circuit Design ····· (3-0-3)

This course provides an overview of full-custom memory semiconductor circuit design and offers hands-on experience in designing memory circuits and performing chip tape-out in a professional design environment equivalent to industry standards. Through these projects, students develop practical full-custom design skills and independent problem-solving abilities.

SEMI443 – Embedded System-on-Chip Design ····· (3-0-3)

This course builds foundational knowledge in computer architecture, embedded programming, digital circuit design, and accelerator system design, while teaching optimization techniques that integrate these disciplines. Students design system-on-chip (SoC) architectures that combine embedded processors and accelerators using Verilog, and implement their designs on commercial field-programmable gate array (FPGA) systems. Conducted in a project-based learning (PBL) format, the course enables students to

optimize and refine their own SoC architectures based on the knowledge and skills they have acquired.

SEMI445 – Introduction to RF and Analog Circuit Design ····· (3-0-3)

This course introduces the operating principles of wireless communication and radar systems, analyzing their system architectures from an RF/analog circuit perspective. Students learn the fundamental concepts and basic design theories of RF/analog circuits—a key area of analog integrated circuit design. Topics include transmission line theory, impedance matching, circuit design using S-parameters and Smith charts, and performance metrics for various RF/analog circuits. The course also covers the analysis of circuits such as power amplifiers, low-noise amplifiers, frequency converters, and signal generators. Students gain practical experience designing and analyzing basic RF circuits using commercial design simulation tools.

SEMI490A/Z – Special Topics in Semiconductor Engineering A-Z ····· (Varied credits, up to 3)

This course explores specialized topics in semiconductor engineering not included in the standard curriculum, introducing new subjects or areas of interest aligned with the latest advancements and trends in the field.

School of Convergence Science and Technology

1. Educational Goals

The School of Convergence Science and Technology seeks to transcend the boundaries of traditional academic disciplines and cultivate global talent across the full spectrum, from industry-oriented professionals to core research personnel. To achieve this, it offers a variety of demand-driven curricula for interdisciplinary minors and double majors. The interdisciplinary programs currently offered by the Division are as follows.

2. Overview of Interdisciplinary Minors and Double Majors

To promote education beyond disciplinary boundaries and to drive innovation tailored to societal and industrial needs, the following interdisciplinary minors and double majors have been established. According to the completion guidelines for each program, a minimum of 35 credits is required for an interdisciplinary double major and a minimum of 21 credits is required for an interdisciplinary minor. Additionally, credits earned from the same course may be double-counted toward requirements for a major, minor, double major, and interdisciplinary minor or double major.

Type	Major Title	Target	Note
Interdisciplinary Minors and Double Majors	Synthetic Biology	All students	
	Biomedical Engineering	All students	
Interdisciplinary Minors	Eco-Friendly Energy	All students	
	Economics and Finance	All students	
	Science and Technology Studies	All students	
	Entrepreneurship	All students enrolled in 2015 or after	

[Interdisciplinary Minor or Double Major in Synthetic Biology]

The interdisciplinary minor or double major in Synthetic Biology were established to nurture professionals who will lead the field in the future. A minimum of 35 credits is required for the double major, and a minimum of 21 credits is required for the minor.

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Area	Note
Minors or Double Major	Synthetic Biology	CHEM221	Organic Chemistry I	3-0-3	Physics and Chemistry	**Required Courses:** At least one course from each of at least three areas must be completed.
		CHEB206	Organic Chemistry for Chemical Engineers I	3-0-3		
		CHEM461	Biochemistry	3-0-3	Life Sciences	
		LIFE319	Biochemistry I	3-0-3		
		LIFE321	Molecular Biology	3-0-3		
		MATH200	Differential Equations	3-1-3	Mathematical Sciences	
		MATH203	Applied Linear Algebra	3-1-3		
		AMSE207	Materials Chemistry	3-0-3	Chemistry-Materials Engineering Applications	
		CHEB208	Fundamentals in Engineering Biology	3-0-3		
		PHYS312	Computational Physics	2-2-3	Physics and Chemistry	**Elective Courses:** At least one course from each of at least three areas must be completed. *MATH230, MATH231, and IMEN272 are recognized as equivalent courses.
		PHYS413	Biological Physics	3-0-3		
		CHEM261	Chemistry for Medicine and Life	3-0-3		
		CHEB207	Organic Chemistry for Chemical Engineers Ⅱ	3-0-3		
		LIFE217	Cell Biology	3-0-3	Life Sciences	
		LIFE219	Convergence of Biology and Engineering	3-0-3		
		LIFE320	Biochemistry Ⅱ	3-0-3		
		LIFE325	Biotechnology	3-0-3		
		LIFE414	Systems Biology	3-0-3		
		LIFE619	Bioinformatics	3-0-3		
		MATH230	Probability and Statistics	3-1-3	Mathematical Sciences	
		MATH231	Statistics for Experimental Research	3-1-3		
		MATH313	Introduction to Partial Differential Equations	3-0-3		
		MATH351	Introduction to Numerical Analysis	3-0-3		
		IMEN260	Operations Research I	3-0-3		
		IMEN272	Probability and Statistics for Engineering	3-1-3		
		AMSE201	Fundamentals of Materials Science and Engineering	3-1-3	Chemistry-Materials	

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Area	Note
		AMSE361	Introduction to Polymer Materials	3-0-3	Engineering Applications	
		AMSE407	Materials Analysis and Characterization	3-0-3		
		AMSE412	Nanoscience and Nanotechnology	3-0-3		
		AMSE416	Biomedical Materials	3-0-3		
		AMSE464	Polymer Properties and Applications	3-0-3		
		CHEB213	Engineering Biology Laboratory	0-4-2		
		CHEB216	Chemical Engineering Lab	0-6-3		
		CHEB301	Programming and AI in Chemical Engineering	3-0-3		
		CHEB308	Introduction to Biotechnology	3-0-3		
		CHEB409	Introduction to Synthetic Biology	3-0-3		
		CHEB417	Transport Phenomena	3-0-3		
		CHEB418	Energy & Mass Transfer	3-0-3		
		CHEB469D	Special Topics: Introduction to Bioengineering	3-0-3		
		CHEB313	Introduction to Colloid and Interface Phenomena	3-0-3		
		CHEB469A	Special Topics: Systems Biochemistry	3-0-3		
	* If the credits earned from required courses exceed the prescribed number, the excess credits shall be recognized as elective credits within the same category.					

■ Curriculum Roadmap

- Spring Entry

	2nd Year		3th Year		4th Year	
	Spring Sem.	Fall Sem.	Spring Sem.	Fall Sem.	Spring Sem.	Fall Sem.
Physics and Chemistry	CHEM221 Organic Chemistry I (3-0-3) CHEB206 Organic Chemistry for Chemical Engineers I (3-0-3)	CHEM261 Chemistry for Medicine & Life (3-0-3) CHEB207 Organic Chemistry for Chemical EngineersⅡ (3-0-3)		PHYS312 Computers for Physics (2-2-3)	PHYS413 Biological Physics (3-0-3)	
Life Sciences	LIFE219 Convergence of Biology and Engineering (3-0-3)	LIFE217 Cell Biology (3-0-3)	LIFE319 Biochemistry I (3-0-3)	LIFE321 Molecular Biology (3-0-3) LIFE320 BiochemistryⅡ (3-0-3) LIFE325 Biotechnology (3-0-3)		CHEM461 Biochemistry (3-0-3) LIFE414 Systems Biology (3-0-3) LIFE619 Bioinformatics (3-0-3)
Mathematical Sciences	MATH200 Differential Equations (3-1-3) MATH203 Applied Linear Algebra (3-1-3) MATH230 Probability and Statistics (3-1-3) MATH231 Statistics for Experimental Research (3-1-3) IMEN260 Operations Research I (3-0-3) IMEN272 Probability and Statistics for Engineers (3-1-3)		MATH313 Introduction to Partial Differential Equations (3-0-3) MATH351 Introduction to Numerical Analysis (3-0-3)			
Chemistry -Materials Engineering Applications	CHEB208 Fundamentals in Engineering Biology (3-0-3) AMSE201 Fundamentals of Materials Science and Engineering (3-1-3) CHEB213 Engineering Biology Laboratory (0-4-2)	AMSE207 Materials Chemistry (3-0-3) CHEB216 Chemical Engineering Laboratory (0-6-3) CHEB469D Bioengineering Basics (3-0-3)	CHEB308 Introduction to Biotechnology (3-0-3)	AMSE361 Introduction to Polymers (3-0-3) CHEB301 Programming and AI in Chemical Engineering (3-0-3) CHEB313 Introduction to Colloid and Interfacial Phenome (3-0-3)	CHEB417 Transport Phenomena (3-0-3) AMSE464 Physical Properties and Applications of Polymers (3-0-3)	AMSE407 Instruments for Materials Characterization (3-0-3) AMSE412 Nanoscience and Nanotechnology (3-0-3) AMSE416 Biomedical Materials (3-0-3) CHEB409 Biochemical Engineering (3-0-3) CHEB418 Biochemical Engineering (3-0-3) CHEB469A System biochemistry (3-0-3)

Required Courses

Elective Courses

Required Courses
: Students must complete at least one course in each of at least three different areas.

Elective Courses
: Students must complete at least one course in each of at least three different areas.

CHEB469D Bioengineering Basics
: Regardless of admission term, this course must be taken in the Fall Semester of the 2nd year.

- Fall Entry

	2nd Year		3th Year		4th Year	
	Fall Sem.	Spring Sem.	Fall Sem.	Spring Sem.	Fall Sem.	Spring Sem.
Physics and Chemistry	CHEM261 Chemistry for Medicine & Life (3-0-3)	CHEM221 Organic Chemistry I (3-0-3) CHEB206 Organic Chemistry for Chemical Engineers I (3-0-3)	PHYS312 Computers for Physics (2-2-3) CHEB207 Organic Chemistry for Chemical EngineersⅡ (3-0-3)			PHYS413 Biological Physics (3-0-3)
Life Sciences	LIFE217 Cell Biology (3-0-3)	LIFE219 Convergence of Biology and Engineering (3-0-3)	LIFE321 Molecular Biology (3-0-3) LIFE325 Biotechnology (3-0-3)	LIFE319 Biochemistry I (3-0-3)	CHEM461 Biochemistry (3-0-3) LIFE414 Systems Biology (3-0-3) LIFE619 Bioinformatics (3-0-3) LIFE320 BiochemistryⅡ (3-0-3)	
Mathematical Sciences		MATH200 Differential Equations (3-1-3) MATH203 Applied Linear Algebra (3-1-3) MATH230 Probability and Statistics (3-1-3) MATH231 Statistics for Experimental Research (3-1-3) IMEN260 Operations Research I (3-0-3) IMEN272 Probability and Statistics for Engineers (3-1-3)		MATH313 Introduction to Partial Differential Equations (3-0-3) MATH351 Introduction to Numerical Analysis (3-0-3)		
Chemistry -Materials Engineering Applications	AMSE207 Materials Chemistry (3-0-3) CHEB216 Chemical Engineering Laboratory (0-6-3) CHEB469D Bioengineering Basics (3-0-3)	CHEB208 Fundamentals in Engineering Biology (3-0-3) AMSE201 Fundamentals of Materials Science and Engineering (3-1-3) CHEB213 Engineering Biology Laboratory (0-4-2)	AMSE361 Introduction to Polymers (3-0-3) CHEB301 Programming and AI in Chemical Engineering (3-0-3) CHEB313 Introduction to Colloid and Interfacial Phenome (3-0-3)	CHEB308 Introduction to Biotechnology (3-0-3)	AMSE407 Instruments for Materials Characterization (3-0-3) AMSE412 Nanoscience and Nanotechnology (3-0-3) AMSE416 Biomedical Materials (3-0-3) CHEB409 Biochemical Engineering (3-0-3) CHEB418 Biochemical Engineering (3-0-3) CHEB469A System biochemistry (3-0-3)	CHEB417 Transport Phenomena (3-0-3) AMSE464 Physical Properties and Applications of Polymers (3-0-3)

Required Courses

Elective Courses

Required Courses
: Students must complete at least one course in each of at least three different areas.

Elective Courses
: Students must complete at least one course in each of at least three different areas.

CHEB469D Bioengineering Basics
: Regardless of admission term, this course must be taken in the Fall Semester of the 2nd year.

[Interdisciplinary Minor or Double Major in Biomedical Engineering]

The interdisciplinary minor or double major in Biomedical Engineering were established to cultivate professionals who will drive future advancements in medical science and biomedical engineering. A minimum of 35 credits is required for the double major, and a minimum of 21 credits is required for the minor.

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Note	
Minor or Double Major	Biomedical Engineering	CITE241	Introduction to Biomedical Engineering	3-0-3	Biomedical Engineering	**Required Courses:** Complete three courses for 12 credits.
		CITE201	Convergence IT Design Ⅰ: Fundamentals	1-4-3	Convergence Design	
		CITE202	Convergence IT Design Ⅱ: Basic Design	2-8-6		
		CITE451	Biomaterials and Biofabrication Methods	3-0-3	Biomedical Engineering	**Elective Courses:** At least one course from each of at least three areas must be completed.
		CITE452	Biomedical Device: Engineering for Diagnostics and Therapeutics	3-0-3		
		CITE453	Biomedical Systems and Signal Processing	3-0-3		
		CITE490C	Advanced Topics: Introduction to Medicine	3-0-3		
		CITE490J	Advanced Topics: Basic Clinical Pathology	3-0-3		
		LIFE216	Physiology	3-0-3	Life Sciences, Chemistry	
		LIFE217	Cell Biology	3-0-3		
		LIFE220	Introduction of Biomedical Science	3-0-3		
		LIFE414	Systems Biology	3-0-3		
		LIFE419	An Introduction to Brain and Behavior	3-0-3		
		CITE390B	Special Topics: Clinical Anatomy and Physiology for Science and Engineering	3-0-3		
		CHEM261	Chemistry for Medicine and Life	3-0-3		
		CHEM461	Biochemistry	3-0-3		
		CHEM481B	Special Topics: Biomedical Chemistry	3-0-3		
		MECH280	Sensors and Measurements	2-3-3	Mechanical and Advanced Materials Engineering Applications	
		MECH330	Materials Processing	3-0-3		
		MECH244	Mechanical Behaviors and Processing of Materials	3-0-3		
		MECH528	Human-Robot Interface	3-0-3		
		MECH427	Optics and Microscopy	3-0-3		
		AMSE416	Biomedical Materials	3-0-3		
		CITE301	Convergence IT Design Ⅲ: Advanced Design	2-8-6	Convergence Design	
		CITE302	Convergence IT Design Ⅳ: System Integration	2-8-6		

■ Curriculum Roadmap

❑ Spring Entry(Biomedical Engineering Double Major: 36 credits)

Type	Year 2		Year 3		Year 4	
	Spring Semester	Fall Semester (6 credits)	Spring Semester (9 credits)	Fall Semester (9 credits)	Spring Semester (6 credits)	Fall Semester (6 credits)
Biomedical Science/ Engineering Concentration		(CITE201) Convergence IT Design Ⅰ: Fundamentals (LIFE216) Physiology	(*CITE241) Introduction to Biomedical Engineering (CITE202) Convergence IT DesignⅡ: Basic Design	(MECH280) Sensors and Measurements (CITE301) Convergence IT DesignⅢ: Advanced Design	(CITE453) Biomedical Systems & Signal Processing (CITE490C) ST: Introduction to Medicine	(CHEM461) Biochemistry (CITE490J) ST: Basic Clinical Pathology
Life Science/ Chemistry Concentration		(CITE201) Convergence IT Design Ⅰ: Fundamentals (LIFE216) Physiology	(*CITE241) Introduction to Biomedical Engineering (CITE202) Convergence IT DesignⅡ: Basic Design	(CHEM261) Chemistry for Medicine & Life (LIFE217) Cell Biology (MECH438) Human-Robot Interface	(CITE490C) ST: Introduction to Medicine (LIFE419) An Introduction to Brain and Behavior	(CHEM461) Biochemistry (LIFE414) Systems Biology
Mechanical Engineering/ Material Science Concentration		(CITE201) Convergence IT Design Ⅰ: Fundamentals (LIFE220) Introduction to Biomedical Science	(*CITE241) Introduction to Biomedical Engineering (MECH244) Mechanical Behaviors and Processing of Materials (CITE452) Biomedical Devices: Engineering for Diagnostics and Therapeutics	(CITE202) Convergence IT DesignⅡ: Basic Design (MECH330) Materials Processing	(CITE451) Biomaterials and Biofabrication Methods (MECH419) Introduction to Robotics	(MECH438) Human-Robot Interface (AMSE416) Biomedical Materials

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

❑ Spring Entry(Biomedical Engineering Minor: 21 credits)

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester (3 credits)	Spring Semester (6 credits)	Fall Semester (6 credits)	Spring Semester (3 credits)	Fall Semester (3 credits)
	(CITE201) Convergence IT Design Ⅰ: Fundamentals	(*CITE241) Introduction to Biomedical Engineering (CITE453) Biomedical Systems & Signal Processing	(CITE202) Convergence IT DesignⅡ: Basic Design	(LIFE419) An Introduction to Brain and Behavior	(MECH438) Human-Robot Interface

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

❑ Fall Entry(Biomedical Engineering Double Major: 36 credits)

Type	Year 2		Year 3		Year 4	
	Spring Semester	Fall Semester (6 credits)	Spring Semester (9 credits)	Fall Semester (9 credits)	Spring Semester (6 credits)	Fall Semester (6 credits)
Biomedical Science/ Engineering Concentration		(CITE201) Convergence IT Design Ⅰ: Fundamentals (LIFE216) Physiology	(*CITE241) Introduction to Biomedical Engineering (CITE202) Convergence IT DesignⅡ: Basic Design	(MECH280) Sensors and Measurements (CITE301) Convergence IT DesignⅢ: Advanced Design	(CITE453) Biomedical Systems & Signal Processing (CITE490C) ST: Introduction to Medicine	(CHEM461) Biochemistry (CITE490J) ST: Basic Clinical Pathology
Life Science/ Chemistry Concentration		(CITE201) Convergence IT Design Ⅰ: Fundamentals (LIFE216) Physiology	(*CITE241) Introduction to Biomedical Engineering (CITE202) Convergence IT DesignⅡ: Basic Design	(CHEM261) Chemistry for Medicine & Life (LIFE217) Cell Biology (MECH438) Human-Robot Interface	(CITE490C) ST: Introduction to Medicine (LIFE419) An Introduction to Brain and Behavior	(CHEM461) Biochemistry (LIFE414) Systems Biology
Mechanical Engineering/ Material Science Concentration		(CITE201) Convergence IT Design Ⅰ: Fundamentals (LIFE220) Introduction to Biomedical Science	(*CITE241) Introduction to Biomedical Engineering (MECH244) Mechanical Behaviors and Processing of Materials (CITE452) Biomedical Device Engineering for Diagnostics and Therapeutics	(CITE202) Convergence IT DesignⅡ: Basic Design (MECH330) Materials Processing	(CITE451) Biomaterials and Biofabrication Methods (MECH419) Introduction to Robotics	(MECH438) Human-Robot Interface (AMSE416) Biomedical Materials

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

❑ Fall Entry(Biomedical Engineering Minor: 21 credits)

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester (3 credits)	Spring Semester (6 credits)	Fall Semester (6 credits)	Spring Semester (3 credits)	Fall Semester (3 credits)
	(CITE201) Convergence IT Design Ⅰ: Fundamentals	(*CITE241) Introduction to Biomedical Engineering (CITE453) Biomedical Systems & Signal Processing	(CITE202) Convergence IT DesignⅡ: Basic Design	(LIFE419) An Introduction to Brain and Behavior	(MECH438) Human-Robot Interface

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

[Interdisciplinary Minor in Eco-Friendly Energy Materials]

The interdisciplinary minor in Eco-Friendly Energy Materials was established to train high-level talent capable of driving innovation in eco-friendly energy materials. The program aims to eliminate barriers between department-specific curricula and reorganize coursework to align with regional industry needs. A minimum of 21 credits is required to complete the interdisciplinary minor.

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Note	
Interdisciplinary Minor	Eco-Friendly Energy Materials	CHEB412	Chemical Engineering Process for Rechargeable Battery	3-0-3	Required Courses	Complete 6 credits
		AMSE414	Energy Materials	3-0-3		
		CHEB202	Physical Chemistry for Chemical EngineeringⅡ	3-0-3	Elective Courses	Complete 15 credits
		CHEB212	Physical Chemical Lab	0-4-2		
		CHEB214	Energy and Environmental Engineering	3-0-3		
		CHEB301	Programming and AI in Chemical Engineering	3-0-3		
		CHEB305	Reaction Engineering	3-0-3		
		CHEB314	Introduction to Intermolecular and Surface Forces	3-0-3		
		CHEB315	Smart Soft Material Engineering	3-0-3		
		CHEB413	Introduction to Characterization of Energy and Environmental Materials	3-0-3		
		CHEB417	Transport Phenomena	3-0-3		
		CHEB427	Chemical Engineering Capstone Design	0-6-3		
		CHEB465	Structure and Properties of Polymers	3-0-3		
		CHEB469Y	Special Topics: Quantum Chemistry in Chemical Engineering	3-0-3		
		CHEB469Z	Special Topics: Introduction to Organic Materials	3-0-3		
		CHEB469A	Special Topics: Eco-Friendly Energy Materials - Basics of Secondary Batteries	1-0-1		
		CHEB469B	Special Topics: Eco-Friendly Energy Materials - Hydrogen Production	1-0-1		
		CHEB469C	Special Topics: Eco-Friendly Energy Materials - Biosystems	1-0-1		
		CHEB562	Carbon-Based Materials for energy storage	3-0-3		
		CHEB563	Advanced Hydrogen Energy	3-0-3		
		CHEM311	Physical ChemistryⅡ	4-0-4		
		CHEM314	(Up to Class of 2024) Physical Chemistry and Instrumental Analysis Laboratory (Class of 2025 onwards) Chemistry Lab II: Physical Chemistry and Instrumental Analysis	0-8-4		
		CHEM325	(Up to Class of 2024) Synthesis Laboratory (Class of 2025 onwards) Contemporary Chemistry Lab	0-4-2 0-6-3		
		CHEM331	Inorganic Chemistry	4-0-4		
		CHEM342	Instrumental Analysis	3-0-3		
		CHEM451	Macromolecular Chemistry	3-0-3		
		CHEM481B	Special Topics: Spectroscopic Analysis Capstone Design	3-1-3		
		CHEM481D	Special Topics: Industry-Academia-Research Collaborative Colloquium	1-0-1		
		CHEM531	Advanced Inorganic ChemistryⅠ	3-0-3		
		CHEM621	Organometallic Chemistry	3-0-3		
		AMSE313	Physics of Materials	3-0-3		
		AMSE341	Introduction to Ceramic Materials	3-0-3		
		AMSE344	Ceramics Design and Laboratory	0-6-3		
		AMSE361	Introduction to Polymer Materials	3-0-3		
		AMSE412	Nanoscience and Technology	3-0-3		
		AMSE513	Electrochemistry for Energy Applications	3-0-3		
		GIFT518	Intro to battery system	3-0-3		
		GIFT761	Active materials for lithium-ion	3-0-3		
		GIFT762	Energy Storage System and Design	3-0-3		
		GIFT769	Advanced Battery Science and Engineering	3-0-3		
		GIFT770	Analytical techniques for nano &energy materials	3-0-3		

■ Curriculum Roadmap

❑ Spring Entry(Required: 6 credits, Electives: 15 credits)

Year 2		Year 3		Year 4	
Spring Semester	Fall Semester	Spring Semester (6 credits)	Fall Semester (6 credits)	Spring Semester (3+3 credits)	Fall Semester (3 credits)
		(CHEB202) Physical Chemistry for Chemical Eng. I (CHEB214) Chem. Eng. For Energy & Environment (CHEB305) Reaction Eng. (CHEB315) Smart Soft Material Engineering (CHEB417) Transport Phenomena (CHEM311) Physical Chemistry for Chemical Eng. II (CHEM331) Inorganic Chemistry (AMSE313) Material Physics (AMSE341) Introduction to Ceramics (GIFT518) Intro to battery system	(CHEB301) Programming & AI in Chemical Engineering (CHEB314) Intro. To Intermolecular & Surface Forces (CHEB413) Characterization of Energy & Environmental Materials (CHEM342) Instrumental Analysis (AMSE361) Introduction to Polymers (GIFT761) Active materials for lithium-ion	(AMSE414) Energy Materials (CHEB427) Chemical Engineering Capston Design (CHEB469Y) ST: Quantum Chemistry in Chemical Engineering (CHEB562) Carbon-based Material for Energy Storage (CHEM531) Advanced Inorganic Chemistry (AMSE412) Nanoscience & Nanotechnology (GIFT762) Energy Storage System and Design	(CHEB412) Chem. Eng. Process for Rechargeable Battery (CHEB563) Advanced Hydrogen Energy (CHEM451) Polymer Chemistry (CHEM621) Organometallic Chemistry (AMSE513) Electrochem. For Energy Application (GIFT769) Advanced Battery Science and Engineering (GIFT770) Analytical techniques for nano &energy materials

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

❑ Fall Entry(Required: 6 credits, Electives: 15 credits)

Year 2		Year 3		Year 4	
Fall Semester	Spring Semester (3 credits)	Fall Semester (3 credits)	Spring Semester (3 credits)	Fall Semester (3+3 credits)	Spring Semester (3+3 credits)
	(CHEB202) Physical Chemistry for Chemical Eng. I (CHEB214) Chem. Eng. For Energy & Environment	(CHEB301) Programming & AI in Chemical Engineering (CHEB314) Intro. To Intermolecular & Surface Forces (CHEB413) Characterization of Energy & Environmental Materials (CHEM342) Instrumental Analysis (AMSE361) Introduction to Polymers (GIFT761) Active materials for lithium-ion	(CHEB305) Reaction Eng. (CHEB315) Smart Soft Material Engineering (CHEB417) Transport Phenomena (CHEM311) Physical Chemistry for Chemical Eng. II (CHEM331) Inorganic Chemistry (AMSE313) Material Physics (AMSE341) Introduction to Ceramics (GIFT518) Intro to battery system	(CHEB412) Chem. Eng. Process for Rechargeable Battery (CHEB563) Advanced Hydrogen Energy (CHEM451) Polymer Chemistry (CHEM621) Organometallic Chemistry (AMSE513) Electrochem. For Energy Application (GIFT769) Advanced Battery Science and Engineering (GIFT770) Analytical techniques for nano &energy materials	(AMSE414) Energy Materials (CHEB427) Chemical Engineering Capston Design (CHEB469Y) ST: Quantum Chemistry in Chemical Engineering (CHEB562) Carbon-based Material for Energy Storage (CHEM531) Advanced Inorganic Chemistry (AMSE412) Nanoscience & Nanotechnology (GIFT762) Energy Storage System and Design

※ **Major required**: Red / **Major elective**: Blue / **Others**: Black / **STC**: *

[Interdisciplinary Minor in Economics and Finance]

The interdisciplinary minor in Economics and Finance was established to foster global leaders in science and engineering equipped with knowledge in economics and finance. Students must complete at least 21 credits to fulfill the requirements.

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Note	
Interdisciplinary Minor	Economics and Finance	CMEF301	Principles of Economics	3-0-3	Basic Courses	Complete 15 credits
		CMEF302	Microeconomics	3-0-3		
		CMEF303	Macroeconomics	3-0-3		
		CMEF304	Financial Economics	3-0-3		
		CMEF305	Financial Management	3-0-3		
		CMEF306	Sustainability & ESG	3-0-3		
		CMEF401	Econometrics	3-0-3	Advanced Courses	Complete 6 credits
		CMEF402	Money and Banking	3-0-3		
		CMEF405	Introduction to Fixed Income Markets	3-0-3		
		CMEF406	Game Theory	3-0-3		
		CMEF407	Industrial Organization	3-0-3		
		CMEF408	Economics of Information	3-0-3		
		CMEF409	Law and Economics	3-0-3		
		CMEF410	Political Economy	3-0-3		
		CMEF411	Market Design	3-0-3		
		CMEF414	Behavioral-Experimental Economics	3-0-3		
		CMEF499	Special Topics in Economics	3-0-3		
		IMEN388	Investment Theory	3-0-3		
		IMEN487	Corporate Finance	3-0-3		

- Each student may complete one of the following: the Interdisciplinary Minor in Economics and Finance or the Interdisciplinary Minor in Science and Technology Studies.
- For the Interdisciplinary Minor in Economics and Finance, any three courses (9 credits) from the Basic Courses may be recognized as Humanities and Social Sciences Electives (HSSE). For the Interdisciplinary Minor in Science and Technology Studies, any three courses (9 credits) may be recognized as HSSE, regardless of whether they are Basic or Advanced Courses.
- Interdisciplinary minor courses are categorized as HSSE. Any credits earned beyond the required 21 credits for the minor are also recognized as HSSE.
- Although interdisciplinary minors were officially established in the first semester of 2019, any credits earned from these courses prior to that semester are also recognized.

※ Note for the Class of 2026 and thereafter: Applicants for the Interdisciplinary Minor in Economics and Finance or the Interdisciplinary Minor in Science and Technology Studies must complete at least one Capstone course (1 credit).

* Capstone Course (1 credit) - [CS-Course Title] (Pass/No Record)
  - This is a supplementary guidance course taken in conjunction with a core course within the interdisciplinary minor. (The course provides additional supervision for the integration and application of knowledge through theses, policy proposals, creative work, or interdisciplinary collaborative projects.)
  - The Capstone course must be taken during the same semester as the corresponding core course. (If the core course is dropped or results in an 'F' grade, the Capstone course will reported as 'No Record'.)

[Interdisciplinary Minor in Science and Technology Studies]

The interdisciplinary minor in Science and Technology Studies was established to train students aspiring to enter law, business, public administration, or professional graduate schools with expertise in science and technology, as well as to cultivate science and technology specialists for international organizations and research institutes. Students must complete at least 21 credits to fulfill the requirements of the interdisciplinary minor.

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Note	
Interdisciplinary Minor	Science and Technology Studies	CMST301	Logic and Critical Thinking	3-0-3	Basic Courses	Complete 21 credits, regardless of whether they are from Basic or Advanced Courses)
		CMST302	History of Science	3-0-3		
		CMST303	Philosophy of Science	3-0-3		
		CMST304	Science Technology Studies	3-0-3		
		CMST305	Sociology of Science	3-0-3		
		CMST307	History of Science and Technology in Korea	3-0-3		
		ARTS315	The Origin of Images and visual Literacy	3-0-3		
		SOSC337	Introduction to Human Evolution	3-0-3		
		CONF319	Special Topics in Confluence	3-0-3		
		CMST401	Policy for Science and Technology	3-0-3	Advanced Courses	
		CMST402	Science Communication	3-0-3		
		CMST404	History of Science and Technology in East Asia	3-0-3		
		CMST406	Philosophy of Spacetime and Matter	3-0-3		
		CMST408	Body and Technology	3-0-3		
		CMST409	Evolution and Human Society	3-0-3		
		CMST410	Risk Society and Communications	3-0-3		
		CMST411	Artificial Intelligence and Law	3-0-3		
		CMST412	Modern Society and Science	3-0-3		
		ARTS412	Art, Science, and Technology	3-0-3		
		SOSC412	Politics and Policymaking	3-0-3		
		CMST499	Special Topics in Science and Technology Studies	3-0-3		
		PHYS360	Pioneers in Physics	3-0-3		
	- Each student may complete one of the following: the Interdisciplinary Minor in Economics and Finance or the Interdisciplinary Minor in Science and Technology Studies. - For the Interdisciplinary Minor in Economics and Finance, any three courses (9 credits) from the Basic Courses may be recognized as Humanities and Social Sciences Electives (HSSE). For the Interdisciplinary Minor in Science and Technology Studies, any three courses (9 credits) may be recognized as HSSE, regardless of whether they are Basic or Advanced Courses. - Interdisciplinary minor courses are categorized as HSSE. Any credits earned beyond the required 21 credits for the minor are also recognized as HSSE. - Although interdisciplinary minors were officially established in the first semester of 2019, any credits earned from these courses prior to that semester are also recognized. ※ Note for the Class of 2026 and thereafter: Applicants for the Interdisciplinary Minor in Economics and Finance or the Interdisciplinary Minor in Science and Technology Studies must complete at least one Capstone course (1 credit).					

Type	Major Title	Course Code	Course Title	Lecture-Lab/ Practicum-Credit	Note
	* Capstone Course (1 credit) - [CS-Course Title] (Pass/No Record) - This is a supplementary guidance course taken in conjunction with a core course within the interdisciplinary minor. (The course provides additional supervision for the integration and application of knowledge through theses, policy proposals, creative work, or interdisciplinary collaborative projects.) - The Capstone course must be taken during the same semester as the corresponding core course. (If the core course is dropped or results in an 'F' grade, the Capstone course will reported as 'No Record'.)				

[Interdisciplinary Minor in Entrepreneurship]

The interdisciplinary minor in Entrepreneurship was established to foster leaders who can meet the diverse needs of society—including in industry and academia—by promoting entrepreneurship. Students must complete a minimum of 21 credits to fulfill the requirements of the interdisciplinary minor.

The Entrepreneurship Convergence Minor was established in 2015 to promote a culture of entrepreneurship on campus, and to provide systematic education and training for aspiring entrepreneurs.

This program is designed to cultivate an entrepreneurial mindset and practical skills not only for start-ups but also for leaders who respond to diverse societal demands, including industry and academia. This program aims to achieve these goals by linking entrepreneurship courses with major-related subjects, thereby encouraging students to integrate their disciplinary knowledge with entrepreneurial thinking.

By understanding the relationship between technology and society, and by fostering development of entrepreneurs into professionals and technologies needed by society, this program will help students acquire not only knowledge but also motivation, strategies, and skills that are necessary for business activities.

In addition, the program operates various practical initiatives, including courses in entrepreneurship start-up support programs, and in planning and development of government, local, and external institutional projects; it also provides on-site education and mentoring by instructors who have experience in venture entrepreneurship, and thereby offers concrete support for students who are interested in starting a business.

By providing these educational activities, POSTECH aims to establish a uniquely optimized start-up education and support platform as a "cradle of new value creation," to lead the future of both the university and the nation. The program will continue to pursue systematic entrepreneurship education, tailored support for aspiring entrepreneurs, and foster the campus-wide activation and spread of entrepreneurial culture.

Type	Major Title	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note	
Interdisciplinary Minor	Entrepreneurship	ENTP201 (IMEN411)	Introduction to Entrepreneurship	3-0-3	Required Courses	Complete 9 credits
		ENTP301 (IMEN412) /CITE411	Action Learning in Business Planning/Applied Creative Entrepreneurship	3-0-3		
		ENTP491	Entrepreneurship Seminar	1-0-1		
		ENTP492	Entrepreneurial Practice and Planning	2-0-2		
		IMEN203	Financial Accounting	3-0-3	Elective Courses	Complete 12 credits
		IMEN301	Technology Management and Strategy	3-0-3		
		IMEN302	Principles of Business Administration	3-0-3		
		IMEN303	Marketing	3-0-3		
		IMEN304	Strategic Management	3-0-3		
		IMEN305	Organizational Behavior	3-0-3		

Type	Major Title	Course Code	Course Title	Lecture-Lab/Practicum-Credit	Note	
		IMEN400	Emerging Technology and Innovation	Varied Credits		
		IMEN371	Quality Management	3-0-3		
		IMEN422	Supply Chain Management	3-0-3		
		IMEN423	Product Lifecycle Engineering	3-0-3		
		IMEN462	Pricing and Revenue Management	3-0-3		
		IMEN482	Introduction to SSME (Service Science, Management, and Engineering)	3-0-3		
		IMEN487	Corporate Finance	3-0-3		
		CMEF301	Principles of Economics	3-0-3		
		SOSC354	Group Communication and Leadership	3-0-3		
		SOSC451	Persuasion and Social Influence	3-0-3		
		SOSC459	Special Topics in Communication	3-0-3		
		CMEF303	Macroeconomics	3-0-3		
		CMEF304	Financial Economics	3-0-3		
		CMEF305	Financial Management	3-0-3		
		CMEF402	Money and Banking	3-0-3		
		CMEF405	Introduction to Fixed Income Markets	3-0-3		
		CMEF407	Industrial Organization	3-0-3		
		CMEF411	Market Design	3-0-3		
		ENTP493	Special Topics in Entrepreneurship	Varied Credits		
		ENTP451A~Z	Special Topics in Start-up Practice A-Z	Varied Credits		
		CITE203	Interaction Design Studio	2-2-3		
		CITE303	Life Sensibility and Transhuman Studio	2-2-3		
		CITE306	Business Model Studio	2-2-3		
		CITE215	Introduction to Makers	2-2-3		
		CITE211	Human Resource and Organization Theory	2-0-2		
		CITE212	Technology Financing	2-0-2		
		CITE213	Technology Marketing	2-0-2		
		CITE214	Economics of Technological Innovation	3-0-3		
		CITE311	Technology Innovation and Commercialization	3-0-3		
		CITE312	Entrepreneurship	2-0-2		
		INTN301	Start-up Internship Practicum	Varied Credits		
		INTN302	Start-up Practicum	Varied Credits		

Department-specific Guidelines for Double Major and Minor

1. Double Major Requirements

If the MR courses in the double major department total 35 or more credits, all MR courses must be completed. If they total fewer than 35 credits, all MR courses must still be completed, along with additional ME courses—including Approved ME Courses Offered by Other Departments (by the student's primary major)—as needed to reach at least 35 credits. Double-counting of credits from the same course toward both the primary major and the double major is permitted.

2. Minor Requirements

At least 21 credits must be completed in accordance with the minor requirements of the respective department. Double-counting of credits from the same course toward both the primary major and the minor is not permitted.

Department	Double Major	Minor
Mathematics	-Complete at least 35 credits, including 3 credits in MR, 12 credits in DME, and 12 credits in ME offered by the Department. -Fulfill the graduation requirement by either submitting a bachelor's thesis or, at the student's request, taking the graduation qualification exam. -Probability and Statistics, Statistics for Experimental Research, and Basic Engineering Statistics are considered equivalent courses. However, Statistics for Experimental Research and Basic Engineering Statistics are not accepted as DME for either the Mathematics major or minor.	-Complete at least 21 credits, including 3 credits in a MR, 12 credits in DME, and 6 credits in ME. -Probability and Statistics, Statistics for Experimental Research, and Basic Engineering Statistics are considered equivalent courses. However, Statistics for Experimental Research and Basic Engineering Statistics are not accepted as DME for either the Mathematics major or minor.
Physics	Complete more than 38 credits in major courses including: -27 credits in MR -At least 11 credits in ME courses offered by the Department (including Introduction to Quantum Physics and Introduction to the Theory of Relativity, if desired) -The undergraduate thesis requirement is waived.	Complete at least 21 credits in major courses including: -9 credits in MR: Mechanics, Electromagnetism I, and Quantum Physics I -3 credits in ME: Choose one from Electromagnetism II, Quantum Physics II, or Thermal Physics -9 additional credits: Choose from among MR or ME courses offered by the Department
Chemistry	Complete at least 30 credits in MR and 5 credits in ME courses offered by the Department.	Complete at least 21 credits in MR and ME offered by the Department.
Life Sciences	Complete 25 credits in MR and an additional 10 credits in ME designated by the Department.	Complete 9 credits in the following required courses offered by the Department: LIFE217 (Cell Biology), LIFE319 (Biochemistry I), and LIFE321 (Molecular Biology). In addition, complete 12 more credits from MR or ME offered by the Department, for a total of 21 credits.
Materials Science and Engineering	Complete 19 credits in MR and 6 credits in DME, plus additional courses approved as ME, for a total of 35 credits.	Complete 15 credits in MR and two introductory courses (6 credits) from DME, excluding Senior Research Project I and II, for a total of 21 credits.
Mechanical Engineering	Complete at least 37 credits, including 22 credits in MR, 12 credits in DME, and at least 3 credits in ME.	Complete at least 21 credits in MR and DME.

Department	Double Major	Minor
Industrial and Management Engineering	-Complete at least 35 credits, including all 27 credits in MR courses, plus additional credits in ME courses, both offered by the Department. -However, only ME courses offered by the Department are eligible for credit recognition. -IMEN272 (Probability and Statistics for Engineering) may be substituted with MATH230 (Probability and Statistics) or MATH231 (Statistics for Experimental Research).	-Complete at least 21 credits in MR and ME courses offered by the Department. -However, only ME courses offered by the Department are eligible for credit recognition. -IMEN382 (Database System) may be substituted with CSED357 (Database Systems). -IMEN272 (Probability and Statistics for Engineering) may be substituted with MATH230 (Probability and Statistics) or MATH231 (Statistics for Experimental Research).
Electronics and Electrical Engineering	**-MR: 28 credits** **[Common Required Courses - 7 credits]** EECE231 Circuit Theory (3), EECE233 Signals and Systems (3), EECE491 Capstone Design Project 1 (1) **[Track Required Courses - 9 credits)** Students must choose one of the following two tracks: ▶Systems Track (9 credits): EECE202 Introduction to Probability and Random Processes (3) EECE274 Digital System Design (3) EECE320 Introduction to Automatic Control (3) ▶Devices Track (9 credits): EECE211 Semiconductor Electronics I (3) EECE261 Introduction to Electromagnetics (3) EECE331 Electronic Circuits I (3) **[Common Elective-Required Courses - 12 credits)** At least 9 credits from EE major courses and 3 credits from Mathematics. **-ME: 7 credits** Students must complete at least 7 credits from the following: EE courses offered by the School of Electrical and Electronic Engineering, approved EE-related courses offered by other departments, STC courses offered by other departments, and major-required courses offered by other departments. [Course Substitutions] CSED273 Digital System Design may be substituted for EECE274 Digital System Design; CSED241 Introduction to Computer Architecture may be substituted for EECE375 Computer Design; CSED211 Introduction to Computer Software systems Systems may be substituted for EECE372 Microprocessor Architecture and Applications; and PHYS206 Electromagnetism I may be substituted for EECE261 Introduction to Electromagnetism.	**-MR: 16 credits** **[Common Required Courses - 7 credits]** EECE231 Circuit Theory (3), EECE233 Signals and Systems (3), EECE491 Capstone Design Project 1 (1) **[Track Required Courses - 9 credits]** Students must choose one of the following two tracks: ▶Systems Track (9 credits): EECE202 Introduction to Probability and Random Processes (3) EECE274 Digital System Design (3) EECE320 Introduction to Automatic Control (3) ▶Devices Track (9 credits): EECE211 Semiconductor Electronics I (3) EECE261 Introduction to Electromagnetics (3) EECE331 Electronic Circuits I (3) **-ME: 5 credits** Students must complete at least 5 credits from the following: EE courses offered by the School of Electrical and Electronic Engineering, approved EE-related courses offered by other departments, STC courses offered by other departments, and major-required courses offered by other departments. [Course Substitutions] CSED273 Digital System Design may be substituted for EECE274 Digital System Design; CSED241 Introduction to Computer Architecture may be substituted for EECE375 Computer Design; CSED211 Introduction to Computer Software systems may be substituted for EECE372 Microprocessor Architecture and Applications; and PHYS206 Electromagnetism I may be substituted for EECE261 Introduction to Electromagnetism.
Computer Science and Engineering	Complete all MR courses, at least 6 credits in DME courses, and a minimum of 35 total credits including ME courses.	Complete at least 15 credits in MR courses and at least 6 credits in DME courses, for a total of at least 21 credits.
Chemical Engineering	Complete all MR courses in the Department (30 credits) as well as at least 5 additional credits in the Department's ME courses.	-MR: 9 credits in CHEB204 Chemical Engineering Thermodynamics, CHEB305 Reaction Engineering, and CHEB417 Transport Phenomena -12 additional credits in 300-level or higher courses offered by the Department.

Department	Double Major	Minor
IT Convergence Engineering	-Students enrolled in 2022 or earlier: 32 credits in all MR courses and 3 credits in ME for a total of 35 credits -Students enrolled in 2023 or later: 23 credits in all MR courses and 12 credits in ME for a total of 35 credits	-Students enrolled in 2022 or earlier: 24 credits including 21 credits in 창의IT설계 Level Ⅰ-Ⅳ (CITE201, CITE202, CITE301, and CITE302) and 3 credits in the Creative Studio course group (CITE203, CITE303, CITE304, CITE306, and CITE405) -Students enrolled in 2023 or later: 24 credits including 15 credits in (CITE201, CITE202, and CITE301); 3 credits in the Creative Studio course group (CITE203, CITE303, CITE304, CITE306, and CITE405); and additional ME credits as needed.
Semiconduct or Engineering	Complete all 26 credits in MR and 9 credits in ME, for a total of at least 35 credits.	Complete 15 credits in MR and 6 credits in ME, for a total of at least 21 credits.

3. Interdisciplinary Double Major Requirements

At least 35 credits must be completed in accordance with the interdisciplinary double major requirements. Double-counting of credits from the same course toward both the primary major and the interdisciplinary double major is permitted.

4. Interdisciplinary Minor Requirements

At least 21 credits must be completed in accordance with the interdisciplinary minor requirements. Double-counting of credits from the same course toward both the primary major and the interdisciplinary minor is permitted.

Discipline	Double Major	Minor
Entrepreneurship	-	Credits may be double-counted toward graduation requirements for the primary major or double major.) **-Requirements (9 credits)** : ENTP201 (IMEN411) Introduction to Entrepreneurship (3) ENTP301 (IMEN412) Action Learning in Business Planning (3) or CITE411 Applied Creative Entrepreneurship (3) ENTP491 Entrepreneurship Seminar (1), ENTP492 Entrepreneurial Practice and Planning (2) **-Electives (12 credits)** : IMEN203 Financial Accounting (3), IMEN301 Technology Management and Strategy (3), IMEN302 Principles of Business Administration (3), IMEN303 Marketing (3), IMEN304 Strategic Management (3), IMEN305 Organizational Behavior (3), IMEN400 Emerging Technology and Innovation (Varied Credits), IMEN371 Quality Management (3), IMEN422 Supply Chain Management (3), IMEN423 Product Lifecycle Engineering (3), IMEN462 Pricing and Revenue Management (3), IMEN482 Introduction to SSME (Service Science, Management, and Engineering (3), IMEN487 Corporate Finance (3) CMEF301 Principles of Economics (3), SOSC354 Group Communication and Leadership (3), SOSC451 Persuasion and Social Influence (3), CMEF303 Macroeconomics (3), CMEF304 Financial Economics (3), CMEF305 Financial Management (3), CMEF402 Money and Banking (3), CMEF405 Introduction to Fixed Income Markets (3), CMEF407 Industrial Organization (3), CMEF411 Market Design (3) SOSC459 Special Topics in Communication (3) ENTP493 Special Topics in Entrepreneurship (Varied Credits), ENTP451A-Z Special Topics in Start-up Practice A-Z (Varied Credits) CITE203 Interaction Design Studio (3), CITE211 Human Resource and Organization Theory (2), CITE212 Technology Financing (2), CITE213 Technology Marketing (2), CITE214 Economics of Technological Innovation (3), CITE215 Introduction to Makers (3), CITE303 Life Sensibility and Transhuman Studio (3), CITE306 Business Model Studio (3), CITE311 Technology Innovation and Commercialization (3), CITE312 Entrepreneurship (2) INTN301 Start-up Internship Practicum (Varied Credits), INTN302 Start-up Practicum (Varied Credits)

Discipline	Double Major	Minor
Science and Technology Studies	-	*Each student may choose and complete only one interdisciplinary minor from among, Science and Technology Studies, and Economics and Finance. *Any three courses (9 credits) may be recognized as Humanities and Social Sciences Electives (HSSE), regardless of whether they are Basic or Advanced Courses. *Applicants must complete at least one Capstone course (1 credit). **21 credits (may be completed without distinction between basic and advanced courses)** **1) Basic Courses** CMST301 Logic and Critical Thinking (3), CMST302 History of Science (3), CMST303 Philosophy of Science (3), CMST304 Science Technology Studies (3), CMST305 Sociology of Science (3), CMST307 History of Science and Technology in Korea (3), CONF319 Special Topics in Confluence (3), SOSC337 Introduction to Human Evolution (3), ARTS315 The Origin of Images and visual Literacy (3) **2) Advanced Courses** CMST401 Policy for Science and Technology (3), CMST402 Science Communication (3), CMST404 History of Science and Technology in East Asia (3), CMST406 Philosophy of Spacetime and Matter (3), CMST408 Body and Technology (3), CMST409 Evolution and Human Society (3), CMST410 Risk Society and Communications (3), CMST411 Artificial Intelligence and Law (3), CMST412 Modern Society and Science (3), ARTS412 Art, Science, and Technology (3), SOSC412 Politics and Policymaking (3), CMST499 Special Topics in Science and Technology Studies (3), PHYS360 Pioneers in Physics (3)
Economics and Finance	-	*Each student may choose and complete only one interdisciplinary minor from among, Science and Technology Studies, and Economics and Finance. *Any three courses (9 credits) from the Basic Courses may be recognized as Humanities and Social Sciences Electives (HSSE). *Applicants must complete at least one Capstone course (1 credit). **21 credits (15 from Basic Courses + 6 from Advanced Courses)** **1) Basic Courses – 15 credits (5 courses)** CMEF301 Principles of Economics (3), CMEF302 Microeconomics (3), CMEF303 Macroeconomics (3), CMEF304 Financial Economics (3), CMEF305 Financial Management (3), CMEF306 Sustainability & ESG (3) **2) Advanced Courses – 6 credits (2 courses)** CMEF401 Econometrics (3), CMEF402 Money and Banking (3), CMEF405 Introduction to Fixed Income Markets (3), CMEF406 Game Theory (3), CMEF407 Industrial Organization (3), CMEF408 Economics of Information (3), CMEF409 Law and Economics (3), CMEF410 Political Economy (3), CMEF411 Market Design (3), CMEF414 Behavioral-Experimental Economics (3), CMEF499 Special Topics in Economics (3) IMEN388 Investment Theory (3), IMEN487 Corporate Finance (3)
Next-Generation Communications and Networks	-	**21 credits (MR 12 + ME 9)** **1. MR – 12 credits** -The course Introduction to Communications and Network (3-0-3) is required. -At least three DME courses (9 credits) must be completed, including: at least one from among Algorithms, Software Design Methods, Computer Networks; and at least one from among Mathematics for Electronics and Electrical Engineers A, Introduction to Communication Systems, Introduction to Digital Communication. -Courses Available: NGCN301 Introduction to Communications and Network CSED331 Algorithms, CSED332 Software Design Methods, CSED353 Computer Networks EECE202 Introduction to Probability and Random Processes, EECE341 Introduction to Communication Systems, EECE308 Introduction to Digital Communication **2. ME – 9 credits** -Courses Available: NGCN302 Communications and Network Lab CSED342 Artificial Intelligence, CSED343 Mathematics for Machine Learning, CSED352 Data Communications, CSED415 Computer Security, CSED416 Peer-to-peer Networking, CSED417 Internet of Things, CSED500 Advanced Linear Algebra for CSE, CSED505 Network Performance Analysis, CSED530 Advanced Probability Theory for CSE EECE361 Applied Electromagnetic Waves, EECE414 Microelectronics 3B: RF/Analog Circuits, EECE451 Introduction to Digital Signal Processing, EECE574 Probability and Stochastic Process, EECE575 Communication and Sensing Systems, EECE576 Statistical Communication Theory, EECE577 Information Theory, EECE578 Digital Communications, EECE579 Information and Communication Security, EECE581 Digital Signal Processing, EECE582 Error-Correcting Codes, EECE583 Advanced Linear Algebra, EECE589 Modern Coding Theory MATH430 Theory of Mathematical Statistics, MATH442 Mathematics for AI, MATH448 Introduction to Coding Theory, MATH449 Introduction to Cryptography, MATH565 Coding Theory, MATH567 Algebraic cryptography, IMEN561 Network Theory **3. Note** - Up to 9 credits (3 courses) from major courses offered by the Department of Computer Science and Engineering and the Department of Electronics and Electrical Engineering, designated as part of the interdisciplinary minor, may also be counted toward this minor. - "Mathematics for Machine Learning" and "Mathematics for AI" are considered equivalent courses, and only one of them can be recognized for credit.

Discipline	Double Major	Minor
Environment	-	**21 credits (12 credits in courses offered by the** Division of Environmental Science and Engineering **+ 9 credits in courses offered by other departments)** *Credits may overlap with the graduation requirements of the primary or double major. **1. 12 credits in courses offered by the** Division of Environmental Science and Engineering: EVSE101 Introduction to Environmental Science, EVSE202 Understanding Climate Change, EVSE490A Special Topics: Air Pollution and Mitigation Technologies, EVSE490B Special Topics: Ecology and Environment, EVSE490C Special Topics: Water Environment and Society, EVSE490D Special Topics: Environmental Monitoring and Practicum, EVSE579 Environmental Statistics INGE101 Modern Civilization and Environmental Technology **2. 9 credits in courses offered by other departments:** CMEF306 Sustainability & ESG, MATH200 Differential Equations, MATH230/MATH231 Probability and Statistics/Statistics for Experimental Research, CHEM221 Organic Chemistry I, CHEM231 Introduction to Nanochemistry, CHEM243 Chemical Analysis, CHEM261 Chemistry for Medicine and Life, LIFE217 Cell Biology, LIFE219 Convergence of Biology and Engineering, MECH250 Thermodynamics, CHEB208 Fundamentals in Engineering Biology, CHEB214 Energy and Environmental Engineering
Eco-Friendly Energy Materials	-	**21 credits** *Credits may overlap with the graduation requirements of the primary or double major. **1. Required Courses – 6 credits** CHEB412 Chemical Engineering Process for Rechargeable Battery (3), AMSE414 Energy Materials (3) **2. Elective Courses – 15 credits** (Choose from the list below to fulfill 15 credits) CHEB202 Physical Chemistry for Chemical EngineeringⅡ (3), CHEB212 Physical Chemical Lab (2), CHEB214 Energy and Environmental Engineering (3), CHEB301 Programming and AI in Chemical Engineering (3), CHEB305 Reaction Engineering (3), CHEB314 Introduction to Intermolecular and Surface Forces (3), CHEB315 Smart Soft Materials Engineering (3), CHEB413 Introduction to Characterization of Energy and Environmental Materials (3), CHEB417 Transport Phenomena (3), CHEB427 Chemical Engineering Capstone Design (3), CHEB465 Structure and Properties of Polymers (3), CHEB469Y Special Topics: Quantum Chemistry in Chemical Engineering (3), CHEB469Z Special Topics: Introduction to Organic Materials (3), CHEB469A Special Topics: Eco-Friendly Energy Materials – Basics of Secondary Batteries (1), CHEB469B Special Topics: Eco-Friendly Energy Materials – Hydrogen Production (1), CHEB469C Special Topics: Eco-Friendly Energy Materials – Biosystems (1), CHEB562 Carbon-Based Materials for energy storage (3), CHEB563 Advanced Hydrogen Energy (3) CHEM311 Physical ChemistryⅡ (4), CHEM314 Chemistry Lab II: Physical Chemistry and Instrumental Analysis (4), CHEM325 Contemporary Chemistry Lab (3), CHEM331 Inorganic Chemistry (4), CHEM342 Instrumental Analysis (3), CHEM451 Macromolecular Chemistry (3), CHEM481B Special Topics: Spectroscopic Analysis Capstone Design (3), CHEM481D Special Topics: Industry-Academia-Research Collaborative Colloquium (1), CHEM531 Advanced Inorganic ChemistryⅠ(3), CHEM621 Organometallic Chemistry (3) AMSE313 Physics of Materials (3), AMSE341 Introduction to Ceramic Materials (3), AMSE344 Ceramics Design and Laboratory (3), AMSE361 Introduction to Polymer Materials (3), AMSE412 Nanoscience and Technology (3), AMSE513 Electrochemistry for Energy Applications (3) GIFT518 Intro to battery system (3), GIFT761 Active materials for lithium-ion (3), GIFT762 Energy Storage System and Design (3), GIFT769 Advanced Battery Science and Engineering (3), GIFT770 Analytical techniques for nano &energy materials (3)

Discipline	Double Major	Interdisciplinary Minor
Synthetic Biology	**35 credits or more** (Credits may overlap with the graduation requirements of the primary or double major.)	**21 credits or more** (Credits may overlap with the graduation requirements of the primary or double major.)
	1. Required Courses At least one course must be completed in each of three different areas from the list below: **[Physics and Chemistry]** CHEM221 Organic Chemistry I (3), CHEB206 Organic Chemistry for Chemical Engineers I (3) **[Life Sciences]** CHEM461 Biochemistry (3), LIFE319 Biochemistry I (3), LIFE321 Molecular Biology (3) **[Mathematical Sciences]** MATH200 Differential Equations (3), MATH203 Applied Linear Algebra (3) **[Chemistry-Materials Engineering Applications]** AMSE207 Materials Chemistry (3), CHEB208 Fundamentals in Engineering Biology (3) **2. Elective Courses** At least one course must be completed in each of three different areas from the list below: **[Physics and Chemistry]** PHYS312 Computational Physics (3), PHYS413 Biological Physics (3), CHEM261 Chemistry for Medicine and Life (3), CHEB207 Organic Chemistry for Chemical Engineers Ⅱ (3) **[Life Sciences]** LIFE217 Cell Biology (3), LIFE219 Convergence of Biology and Engineering (3), LIFE320 Biochemistry Ⅱ (3), LIFE325 Biotechnology (3), LIFE414 Systems Biology (3), LIFE619 Bioinformatics (3) **[Mathematical Sciences]** MATH230 Probability and Statistics (3), MATH231 Statistics for Experimental Research (3), MATH313 Introduction to Partial Differential Equations (3), MATH351 Introduction to Numerical Analysis (3), IMEN260 Operations Research I (3), IMEN272 Probability and Statistics for Engineering (3) (MATH230, MATH231, and IMEN272 are recognized as equivalent courses.) **[Chemistry-Materials Engineering Applications]** AMSE201 Fundamentals of Materials Science and Engineering (3), AMSE361 Introduction to Polymer Materials (3), AMSE407 Materials Analysis and Characterization (3), AMSE412 Nanoscience and Nanotechnology (3), AMSE416 Biomedical Materials (3), AMSE464 Polymer Properties and Applications (3) CHEB213 Engineering Biology Laboratory (2), CHEB216 Chemical Engineering Lab (3), CHEB301 Programming and AI in Chemical Engineering (3), CHEB308 Introduction to Biotechnology (3), CHEB409 Introduction to Synthetic Biology (3), CHEB417 Transport Phenomena (3), CHEB418 Energy & Mass Transfer (3), CHEB469D Special Topics: Introduction to Bioengineering (3), CHEB313 Introduction to Colloid and Interface Phenomena (3), CHEB469A Special Topics: Systems Biochemistry (3)	

Discipline	Double Major	Interdisciplinary Minor
Biomedical Engineering	**35 credits or more** (Credits may overlap with the graduation requirements of the primary or double major.)	**21 credits or more** (Credits may overlap with the graduation requirements of the primary or double major.)
	1. Required Courses 3 courses (12 credits) required **[Biomedical Engineering]** CITE241 Introduction to Biomedical Engineering (3) **[Convergence Design]** CITE201 Convergence IT Design Ⅰ: Fundamentals (3), CITE202 Convergence IT Design Ⅱ: Basic Design (6) **2. Elective Courses** At least one course must be completed in each of three different areas from the list below: **[Biomedical Engineering]** CITE451 Biomaterials and Biofabrication Methods (3), CITE452 Bioelectronic Devices: Engineering for Diagnostics and Therapeutics (3), CITE453 Biological Systems and Signal Processing (3), CITE490C Advanced Topics: Introduction to Medicine (3), CITE490J Advanced Topics: Basic Clinical Pathology (3) **[Life Sciences, Chemistry]** LIFE216 Physiology (3), LIFE217 Cell Biology (3), LIFE220 Introduction of Biomedical Science (3), LIFE414 Systems Biology (3), LIFE419 An Introduction to Brain and Behavior (3) CITE390B Special Topics: Clinical Anatomy and Physiology for Science and Engineering (3) CHEM261 Chemistry for Medicine and Life (3), CHEM461 Biochemistry (3), CHEM481B Special Topics: Biomedical Chemistry (3) **[Mechanical and Advanced Materials Engineering Applications]** MECH280 Sensors and Measurements (3), MECH330 Materials Processing (3), MECH244 Mechanical Behaviors and Processing of Materials (3), MECH528 Human-Robot Interface (3), MECH427 Optics and Microscopy (3) AMSE416 Biomaterials (3) **[Convergence Design]** CITE301 Convergence IT Design Ⅲ: Advanced Design (6), CITE302 Convergence IT Design Ⅳ: System Integration (6)	

AI Intensive Course

1. Program Overview

The AI Intensive Course is a program designed for undergraduate students to cultivate foundational literacy and advanced knowledge in artificial intelligence (AI).

-Certification is granted upon completion of both the basic and advanced courses in AI.

-For the advanced courses, students must complete a total of three courses, including at least one AI-Core course.

*AI-Core: Courses that delve deeply into the fundamentals of AI technologies.

AI+X: Courses that focus on the integration of AI technologies with specific disciplines.

※ Applicable to students enrolled in 2020 or later.

2. Completion Requirements

-Complete 2 credits in the introductory course:

Students enrolled in 2020–2022: AIGS101 Introduction to Artificial Intelligence I (1),
AIGS102 Introduction to Artificial Intelligence II (1)

Students enrolled in 2023 or after: CSED105 Introduction to Artificial Intelligence (2)

-Complete 9 credits (3 courses) from the advanced courses, including at least one AI-Core course.

[AI Core Courses]

MATH442 Mathematics for AI (3), MATH402 Computational Linear Algebra and Its Applications (3),
MATH432 Mathematical Data Science (3),
MECH437 Artificial Intelligence for M.E. (3),
IMEN472 Data Science Methodology (3),
EECE312 Introduction to Machine Learning Systems (3), EECE490W Introduction to Reinforcement Learning (3),
CSED331 Algorithms (3), CSED342 Artificial Intelligence (3), CSED343 Mathematics for Machine Learning (3)
(EECE) Artificial Neural Network Optimization and Applications (3, to be offered)

[AI+X Courses]

CHEM481 Special Topics: Artificial Intelligence Chemistry (3),
LIFE451Y Special Topics: Biohealth Artificial Intelligence (3),
IMEN473 Business Analytics (3), IMEN491U Special Topics: Industrial System Control (3)

※ If additional advanced AI courses are designated, they will be retroactively recognized for students enrolled from 2020 onward.

<Notes>
-All advanced AI courses are recognized as ME credits.
-Credits earned through the AI Intensive Course program also count toward major graduation requirements.

[This is an optional educational program outside the degree requirements. Students must meet the completion criteria for each program. Depending on the nature of the program, completion will be officially certified on academic records and transcripts.]

Convergence and Open Sharing System: Next-Generation Semiconductor

1. Educational Goals

The Convergence and Open Sharing System: Next-Generation Semiconductor (COSS-NGS) was established as a new higher education model, not only to train students from non-electronics majors as semiconductor experts, but also to provide all students interested in semiconductors with meaningful educational opportunities in the field. The major objectives of COSS-NGS are as follows:

1) Promoting a paradigm shift — Demonstrating the strong commitment of the consortium universities to break away from the constraints of the fixed curricula of each university and to build a new model of a convergence university from the ground up.

2) Giving opportunities — Providing students with a second chance to redefine their career paths beyond what they chose when they entered university, supporting those who wish to chart their own futures.

3) Realizing limitless potential — Implementing programs designed to fully unlock the potential of participating students.

4) Upholding the highest standards — Sharing the nation's best educational system in next-generation intelligent and system semiconductors, and maintaining the distinction and high standing of its graduates, regardless of their home university.

5) Promoting collaboration — Encouraging participants to go beyond simply acquiring knowledge and to engage in more discussions, debates, and collaborative efforts—things that cannot be achieved alone.

6) Expanding the reach and impact of the outcomes — Launching the POLARIS Semiconductor Achievement Dissemination Center to broaden the reach and amplify the impact of the program's outcomes.

7) Sharing resources — Operating under the philosophy that the seven participating universities are "One Team," sharing educational content, expert faculty, equipment, and other human and material resources to achieve the best results through close collaboration.

2. Curriculum Overview

The curriculum of COSS-NGS consists of semiconductor-related courses available to students regardless of their home university or major. The curriculum is divided into the following fields: general, device & process, circuit & system, system & software, and AI semiconductors.

▶ How to Complete a Microdegree

-Earn 9 credits by completing standard courses offered by POSTECH and the participating universities (Kangwon National University, Daegu University, Seoul National University, Soongsil University, Chosun College of Science & Technology, and Chung-Ang University).

-The pilot course (DISU421 Basic Quantum Information (3)) is not counted toward the microdegree credits.

3. Comprehensive List of Major Courses Offered by COSS-NGS (at POSTECH)

Category		Course Code	Course Title	Lecture-Lab/Practicum-Credit	Recommended/Required Prerequisite	Note
ICU	POSTECH					
General Education	BE	DISU101	Introduction to Electrical Engineering	1-0-1		
ME	ME	DISU221	Semiconductor Manufacturing Equipment Training	0-3-1	Introduction to Electrical Engineering	
		DISU231	Electric Circuits (STC)	3-0-3		
		DISU232	Electric Circuits Lab	0-2-1	Electric Circuits	
		DISU301	Semiconductor Fabrication Laboratory	2-2-3		
		DISU361	Theory and Applications of Microwave Engineering	3-0-3	Introduction to Electromagnetism	
		DISU399A/D	Undergraduate Research Internship	0-2-1		
		DISU402	High-Speed Semiconductor I/O Circuits	3-1-3	Electric Circuit, Electronic Circuits Lab	
		DISU403	Lab for High-Speed Semi. Circuits	0-2-1		
		DISU404	Analog Amplifier Analysis and Design	3-0-3	Circuit Theory, Electronic Circuits I	
		DISU412	Semiconductor Device for Display Technology	3-0-3	Courses on semiconductor devices, Display Engineering I	
		DISU421	Basic Quantum Information	3-0-3		
		DISU431	Neuromorphic Semiconductor Device	3-0-3	Digital System Design Semiconductor Electronics I	
		DISU434	VLSI System Design	3-0-3	Digital System Design	
		DISU490R	Electric Circuits Practice	0-2-1		
		DISU496A-Z	**POLARIS: Capstone Design A-Z**	**Varied Credits**		

-Cross-listed courses: If you take a cross-listed course (with the course code starting with DISU) originally designated as an EECE course, it will be recognized under the EECE category.

-Regular (new) courses: All regular courses offered by the COSS-NGS are recognized as ME in Electronics and Electrical Engineering.

4. Standard Courses of COSS-NGS

▶ Available to students at all seven participating universities (Kangwon National University, Daegu University, Seoul National University, Soongsil University, Chosun College of Science & Technology, Chung-Ang University, and POSTECH).

▶ For detailed course information, visit: https://www.disu.ac.kr/ (Convergence and Open Sharing System: Next-Generation Semiconductor).

5. Course Description

DISU101 – Introduction to Electrical Engineering ····· (1-0-1)

This introductory course is designed for first-year undergraduate students with an interest in electrical engineering. It offers an overview of the current landscape and future developments of the field, emphasizes rapidly advancing research areas, and delineates faculty-led research initiatives within electrical engineering. No prerequisites are required.

DISU221 – Semiconductor Manufacturing Equipment Training ····· (0-3-1)

Prerequisite: Introduction to Electrical Engineering

This course offers a general understanding of the basic principles and terminology of semiconductor processes, along with hands-on experience in major process steps. Students acquire both theoretical and practical knowledge of semiconductor manufacturing, which is designed to motivate further study in the field.

DISU231 – Electric Circuits ····· (3-0-3)

This course develops students' ability to analyze electrical circuits. Topics include charge, current, voltage, resistance, capacitance, inductance, power and energy, Kirchhoff's laws, impedance, maximum power transfer, Thevenin's theorem, Norton's theorem, and computer-aided circuit analysis.

DISU232 – Electric Circuits Lab ····· (0-2-1)

Prerequisite: Electric Circuits

This laboratory course reinforces students' understanding of the fundamental principles of electrical circuit through hands-on experiments, culminating in the construction of an audio amplifier.

DISU301 – Semiconductor Fabrication Laboratory ····· (2-2-3)

Integrated Circuits (ICs) are the backbone of modern electronics—powering everything from smartphones and computers to electric vehicles and advanced artificial intelligence systems. This course, Semiconductor Fabrication Laboratory, introduces the fundamental principles, processes, and equipment used to fabricate semiconductor devices. Students will learn how a silicon wafer

is transformed into functional chips through a sequence of precisely controlled steps, including photolithography, thin-film deposition, etching, etc. The course also covers cleanroom fabrication labs for transistor fabrication and measurement experiments.

DISU361 – Theory and Applications of Microwave Engineering ····· (3-0-3)

Prerequisite: Introduction to Electromagnetism

This course covers Faraday's law, Maxwell's equations for time-varying electromagnetic waves, the wave equation, reflection and refraction of plane waves at dielectric boundaries, transmission line theory, the Smith chart, and impedance matching. It also includes theories related to waveguides, cavities, and the basic characteristics of antennas.

DISU399A/D – Undergraduate Research Internship ····· (0-2-1)

Under the guidance of a research advisor, students participate in research projects to gain hands-on experience.

DISU402 – High-Speed Semiconductor I/O Circuits ····· (3-1-3)

Prerequisites: Electric Circuits, Electric Circuits Lab, or equivalent

This course covers the fundamental theory and laboratory practices of high-speed semiconductor input/output circuits operating from several GHz (or Gbps) to tens of GHz (Gbps). Students gain the knowledge and skills needed to work with advanced high-speed semiconductor I/O circuits at frequencies reaching tens of GHz/Gbps. The course includes theoretical study and simulations of transmission lines—essential for high-speed circuit design—as well as experiments using high-speed measurement equipment to reinforce understanding of basic circuit principles. Students also develop design techniques through high-speed digital circuit theory, acquiring practical skills for designing high-speed I/O circuits. Additionally, the importance of impedance matching is demonstrated through experiments, giving students hands-on experience in analyzing the operation of high-speed I/O circuits.

DISU403 – Lab for High-Speed Semiconductor Circuits ····· (0-2-1)

Prerequisite: Electronic Circuits, Electronic Circuit experiment

It includes expensive measuring equipment theory and practice to measure the characteristics of semiconductor circuits that require high-speed operation.

DISU404 – Analog Amplifier Analysis and Design ····· (3-0-3)

Prerequisites: Electric Circuits, Electronic Circuits I

This course moves beyond analysis-focused approaches to teach practical, design-oriented advanced electronic circuits. Students develop intuitive and efficient techniques for analyzing and designing complex circuits.

DISU412 – Semiconductor Device for Display Technology ····· (3-0-3)

Prerequisite: Display Engineering I

Building on the understanding of optical characteristics, the history of display technologies, and general display structures covered in Display Engineering Ⅰ, this course examines key practical technologies in modern displays. Topics include thin-film transistors (TFTs), organic light-emitting devices, OLED components and processes for TVs, flexible and plastic OLED technologies, touch technologies and sensor integration, LCD components, wide viewing angle and ultra-high-speed switching mode technologies, and non-display convergence applications based on display technology. By the end of the course, students will have a solid understanding of the device structures and process characteristics of core display technologies—TFTs, OLEDs, flexible displays, and touch devices—and how these are applied and integrated into practical display systems.

DISU421 – Basic Quantum Information ····· (3-0-3)

This course helps students understand how quantum computing hardware operates. Students learn to quantitatively describe the principles of leading quantum information systems, including ion trap and superconducting qubit-based hardware. The principles of each system are presented mathematically, providing insight into the behavior of qubit systems when controlled using lasers and microwaves. The course also covers foundational topics in atomic physics and quantum optics essential for understanding these systems.

DISU431 – Neuromorphic Semiconductor Device ····· (3-0-3)

Prerequisites: Digital System Design, Semiconductor Electronics Ⅰ

This course examines the theories, fabrication processes, and applications of neuromorphic synapse devices–emerging technologies designed to overcome the limitations of conventional semiconductor technology in the rapidly evolving field of artificial intelligence. Students study how these devices enable low-power AI computation at the hardware level, develop an understanding of current technological trends, and consider potential directions for future development.

DISU434 – VLSI System Design ····· (3-0-3)

Prerequisite: Digital System Design

This course aims to study intelligent semiconductor technologies for the development of hardware systems optimized for artificial intelligence (AI) computation. AI technology is advancing rapidly and significantly transforming human life. Through neural network–based machine learning, which mimics how the human brain transmits and processes information via neurons and synapses, performance levels that considerably exceed those of traditional computing systems have been achieved in applications such as natural language processing and image recognition. This advancement is generating substantial ripple effects across various industries and society at large.

Nevertheless, the CPU and GPU architectures founded upon the von Neumann model—the cornerstone of modern computing—are hindered by memory bottlenecks. Consequently, training large-scale neural networks often requires days or even weeks utilizing data center–level infrastructures and expends substantial amounts of energy. To address these constraints, extensive research is ongoing regarding intelligent semiconductor technologies designed to supplant or complement existing hardware optimized for traditional computing. This course

investigates the theories, fabrication processes, and applications of neuromorphic synaptic devices, which represent a new frontier developed to surpass the limitations of conventional semiconductor technologies that have evolved over several decades. Students will acquire knowledge of current technological trends in low-power AI computation at the hardware level and will discuss prospective future directions for progress.

DISU490R – Electric Circuits Practice ····· (0-2-1)

This course helps undergraduates deepen their understanding of electrical circuit through active discussion and interactive learning.

DISU496A–Z – POLARIS: Capstone Design A-Z ····· (Varied Credits)

Given the growing importance of the semiconductor industry to national economic competitiveness, this course was developed in collaboration with industry experts to provide practical education in semiconductor experiments. In addition to textbook-based theory, students learn applied technologies and engage in advanced, hands-on field training.