❒ Basic Courses and Requirements

1. **Mandatory Basic Course Requirements:** 23 credits (Take 1 course from each of the following 9 catergories)
   ① 1 course among Fundamental Physics I (3), General Physics I (3), and Advanced Physics I (3)
   ② 1 course among Fundamental Physics II (3), General Physics II (3), and Advanced Physics II (3)
   ③ 1 course of General Physics Lab I (1)
   ④ 1 course of Basic Biology (3) or General Biology (3)
   ⑤ 1 course of Differential & Integral I (3) or Advanced Differential & Integral I (3)
   ⑥ 1 course of Differential & Integral II (3) or Advanced Differential & Integral II (3)
   ⑦ 1 course among Basic Chemistry (3), General Chemistry I (3), and Advanced Chemistry (3)
   ⑧ 1 course of General Chemistry Lab I (1) or Advanced Chemistry Lab (1)
   ⑨ 1 course of Basic Programming (3) or Advanced Programming(3)

   ※ The students who major in Industrial Design should complete 17 credit hours aside from the exemption of taking General Physics II (Basic, General, Advanced), and Differential & Integral Ⅱ (General, Advanced).

2. **Elective Basic Course Requirements:** at least 9 credits (Each department has different requirements. Please refer to individual departmental requirements for course completion.)
   ※ The students who major in Industrial Design can take General Physics II (Beginner, Intermediate, Advanced), and Differential & Integral II (Intermediate, Advanced) for elective basic courses.

Dept./Div.	Designated subject	Remark
Physics	PH152	
Biological Sciences	CH103	
Mathematics	MA201, MA202, MA111	
Applied Mathematics	MA201	
Chemistry	CH103, CH104	
Civil and Environmental Engineering	-	
Mechanical Engineering	-	
Aerospace Engineering	MA201, MA202	
Industrial Engineering	-	
Industrial Design	ID202	
Chemical and Biomolecular Engineering	-	
Materials Science & Engineering	-	
Nuclear and Quantum Engineering	-	
Electrical Engineering	MA111, MA201, MA202	
Computer Science	-	
BioSystems	-	
Graduate School of Management Management Engineering	MA111, IE200	

3. Basic Courses Curriculum

Classification	Subject No.	Subject Name	Lecture: Lab: Credit (Assignment)	Remark
Mandatory Basic Courses (23 Credits)	PH121	Fundamental Physics I	3:1:3(6)	
	PH141	General Physics I	3:1:3(6)	
	PH161	Advanced Physics I	3:1:3(6)	
	PH122	Fundamental Physics II	3:1:3(6)	
	PH142	General Physics II	3:1:3(6)	
	PH162	Advanced Physics II	3:1:3(6)	
	PH151	General Physics Laboratory I	0:3:1(3)	
	BS110	Basic Biology	3:0:3(2)	
	BS120	General Biology	3:0:3(2)	
	MA101	Calculus I	3:1:3(6)	
	MA103	Honor Calculus I	3:1:3(6)	
	MA102	Calculus II	3:1:3(6)	
	MA104	Honor Calculus II	3:1:3(6)	
	CH100	General Chemistry (Elementary)	3:0:3(3)	
	CH101	General Chemistry I	3:0:3(3)	
	CH105	General Chemistry (Advanced)	3:0:3(3)	
	CH102	General Chemistry Experiment I	0:3:1(1.5)	
	CH106	Advanced Chemistry Experiment	0:3:1(1.5)	
	CS101	Introduction to Programming	2:3:3(5)	
	CS102	Advanced Programming	2:3:3(5)	
Elective Basic Courses (9 credits or more)	AA100	Understanding of Modern Science and Technology	3:0:1	
	MA111	Introduction to Linear Algebra	3:1:3(6)	
	MA201	Differential Equations and Applications	3:1:3(6)	
	MA202	Applied Mathematical Analysis	3:1:3(6)	
	CH103	General Chemistry II	3:0:3(3)	
	MAE106	Human and Machine	3:0:3(3)	
	MAE208	Experiences in New Mechanical Engineering Fields	2:3:3(3)	
	IE200	Introduction to Operations Research	3:1:3(4)	
	ID201	Design Culture and Technology	3:0:3(2)	
	CBE202	Introduction to Chemical and Biomolecular Engineering	3:0:3(3)	
	NQE101	Nuclear and Quantum World	3:0:3(3)	
	MS211	Introduction to Materials Science and Engineering	3:0:3(3)	
	EE200	Introduction to Electronic Engineering	3:0:3(6)	
	PH152	General Physics Laboratory II	0:3:1(3)	
	MA100	Mathematics with Computer Lab.	1:6:3(6)	
	CH104	General Chemistry Experiment II	0:3:1(1.5)	
	IE201	Introduction to Operations Research	2:3:3(4)	
	ID202	Creativity & Visualization	2:2:3(3)	
	EE103	Introductory Lab. for Electrical and Electronic Engineering	2:3:3(6)	
	MGT201	Management Engineering Practice	2:3:3(4)	

4. Descriptions of Basic Courses

AA100 Understanding of Modern Science and Technology

This course broadly introduces the newest R&D throughout entire science/engineering fields and contains the promising research and prospects. This course introduces and discusses on the fields that have active research and the fields with bright future from the entire department/major of KAIST (A grade of S or U is given).

PH121 Fundamental Physics I

This course is the first half of a two-semester sequence in non-calculus-based introductory physics intended for students in disciplines other than science and engineering. This course emphasizes basic conceptual understanding of physics principles, and it covers Newton's laws, rotational motion, work and energy, momentum, fluid motion, thermodynamics, and waves and oscillations.

PH122 Fundamental Physics II

This course is the second half of a two-semester sequence in non-calculus-based introductory physics intended for students in disciplines other than science and engineering. This course emphasizes basic conceptual understanding of physics principles, and it covers electricity and magnetism, optics, relativity, and modern physics.

PH141 General Physics I

This is the first course of a two-semester sequence in introductory physics. The purpose of this course is to help students develop a fundamental and thorough knowledge of classical mechanics. It covers basic Newtonian mechanics (work, energy, momentum, rotational motion, and fluid mechanics), thermodynamics, and waves and oscillations.

PH142 General Physics II

This is the second course of a two-semester sequence in introductory physics. The purpose of the course is to help students to develop a fundamental and thorough knowledge on electricity and magnetism, optics, relativity, and modern physics.

PH151 General Physics Laboratory I

The aim of this course is for students to understand, by direct experience, the basic principles and laws of physics that is taught in General Physics I. Students are to learn the aim and method of the experiment, how to process and interpret the experimental data, and how to deal with the experimental error.

PH152 General Physics Laboratory II

The aim of this course is for students to understand, by direct experience, the basic principles and laws of physics that is taught in General Physics II. Students learn the aims and methods of experiments, how to process and interpret the experimental data, and how to deal with experimental error.

PH161 Advanced Physics I

Introduces classical physics at a more advanced level than in PH141. Topics include Newtonian mechanics and thermal physics.

PH162 Advanced Physics II

Introduces classical physics at a more advanced level than in PH142. Topics include electricity and magnetism, and waves and optics.

BS 110 Basic Biology / BS120 General Biology

This general biology class is designed to make freshmen understand concepts of biology and their connections to their lives. Thus, students can understand the basic knowledge and appreciation for how science works in an era when informed decisions regarding health, environmental problems and applications of new technology are prevalent. BS110 is for the students who do not intend to major in biology and BS120 is for biology majored students.

MA100 Mathematics with Computer Lab.

This course introduces the usage of computers for mathematics, helps students develop skills to solve mathematical problems by practicing mathematical computation with computers.

MA101 Calculus I

This is a standard course for students in science and engineering, dealing with differentiation and integration of one variable real-valued functions, emphasizing basic concepts and applications. The topics are : differentiation and integration of trigonometric functions, logarithmic functions, hyperbolic functions and their inverse functions; improper integral and its convergence tests, polar coordinates, infinite series and their convergence tests, Taylor series, and power series.

MA102 Calculus II

This is a standard course for students in science and engineering, dealing with differentiation and integration of multivariable real-valued functions, emphasizing basic concepts and applications. The topics are : vector space, inner products, cross products, matrixes, determinants, cylindrical coordinates, spherical coordinates, quadratic surfaces, limits and continuity of multivariable vector-valued functions, differentiability of multivariable functions, partial derivatives, directional derivatives, tangent planes, multiple integrals, vector fields and their divergence and curl, line integrals, surface integrals, Green's theorem, Stokes' theorem, divergence theorem, and conservative vector fields.

MA103 Honor Calculus I

This is an advanced course for students in science and engineering, dealing with differentiation and integration of one variable real-valued functions, emphasizing basic concepts and applications. The topics are : differentiation and integration of trigonometric functions, logarithmic functions, hyperbolic functions and their inverse functions; improper integral and its convergence tests, polar coordinates, infinite series and their convergence tests, Taylor series, and power series. Except in extenuating circumstances, this course may not be repeated. Instead MA101 Calculus I must be substituted.

MA104 Honor Calculus II

This is an advanced course for students in science and engineering, dealing with differentiation and integration of multivariable real-valued functions, emphasizing basic concepts and applications. The topics are : vector spaces, inner product, cross product, matrix, determinant, cylindrical coordinates, spherical coordinates, quadratic surfaces, limits and continuity of multivariable vector-valued functions, differentiability of multivariable functions, partial derivatives, directional derivatives, tangent planes, multiple integrals, vector fields and their divergence and curl, line integrals, surface integrals, Green's theorem, Stokes' theorem, divergence theorem, and conservative vector fields. Except in extenuating circumstances, this course may not be repeated. Instead MA102 Calculus II must be substituted.

MA111 Introduction to Linear Algebra

This course introduces basics of linear algebra. The topics include matrices, determinants, characteristic equations, eigenvalues, eigenvectors, inner product spaces, orthogonalization, diagonalization of square matrices and quadratic forms.

MA201 Differential Equations and Applications
This course introduces the basics of differential equations. The topics include ordinary linear differential equations, Laplace transform, systems of differential equations and some partial differential equations.

MA202 Applied Mathematical Analysis
This course introduces Fourier series, Fourier transform, differentiation and integration of complex variable functions, power series for complex variable functions, and residue theorem.

CH100 General Chemistry (Elementary)
This lecture course deals with both basic chemical principals and related applications in chemistry.

CH101 General Chemistry I
This lecture course emphasizes introductory chemical concepts, focusing on the physical properties of elements in gas and condensed phases, quantum mechanics, molecular structure and thermodynamics.

CH102 General Chemistry Experiment I
This course consists of the lecture portion of CH101 including the basis for performing experiments involving glass-working, using the chemical balance, etc.

CH103 General Chemistry II
This lecture course complements the coverage of chemical concepts discussed in CH101 and includes electrochemistry, the quantum-mechanical description of the chemical bond and transition-metal chemistry.

CH104 General Chemistry Experiment II
This course consists of the lecture portion of CH103 including qualitative analysis and basic quantitative analysis.

CH105 General Chemistry (Advanced)
This lecture course presents concepts in quantum mechanics, chemical bonding, and thermodynamics and is designed for students who have a strong chemistry background or those interested in entering a chemistry-related field.

CH106 Advanced Chemistry Experiment
Through conducting experiments related to the contents of advanced chemistry, CH105 aids understanding of advanced chemistry. Student will acquire skills in observation and analysis regarding experimentation and learn basic experimental techniques necessary to safely and effectively conduct laboratory work.

MAE106 Human and Machine
This course is designed to provide freshmen with perspectives, directions and methods necessary to help them pursue successful careers, not only as students at KAIST, but ultimately as responsible and competent professionals. To this end, this course covers: goal-setting method for life planning, strategies for a successful career, and time-management skills; and systematic methodologies for analysis and design. This deals with the various attributes of mechanical civilization to identify the advanced civilization in which the scientists and engineers drive the main stream. Cultural attitude and technical methodologies are studied to secure the leadership of engineers.

MAE208 Experiences in New Mechanical Engineering Fields
The course provides fundamental principle and basic experiment experience of the new areas of mechanical engineering such as rapid prototyping, MEMS (Micro Electro Mechanical System), and fuel cell. It also gives opportunity of new academic experience of experiments and base for applications to other mechanical fields.

IE 200 Introduction to Operations Research

Operations Research is a theory which investigates the optimal way of designing or operating a system consisting of human, machine and resources. Various optimization methods and probability analysis are main areas of Operations Research. This course is designed for students who may not major in Operations Research but are rather interested in the tools of OR. Students will study optimization and probabilistic decision-making.

IE 201 Applications and Laboratories of Industrial Engineering

The purpose of this course is to introduce the basic principles of industrial engineering, and offer the projects for the applications of the theories to industrial systems. The theories include manufacturing systems, operations research, statistics, computer applications, industrial management, human factors and the projects include the application of the theories to the industrial systems based on an educational manufacturing system.

ID201 Design Culture and Technology

This is an introductory course to present basics of design for those who are interested in design or who are in beginning stage of design course. The course takes a comprehensive view of design as fundamental human activity which is deeply connected with culture, society and man-made technology. The course covers basic definition of design, principles of aesthetic perception, design history, design with human being (body, emotion, cognition, society), design and culture, and design and technology.

ID202 Creativity & Visualization

This is an introductory course to show creativity development methods and diverse presentation techniques. Through this course, students will possess the integrated capability of visual and flexible thinking.

CBE202 Introduction to Chemical and Biomolecular Engineering

General concepts of applying physics, chemistry, biology and mathematics to chemical and biological systems. The applications of material and energy balances, reaction engineering, viscous and potential flows, heat and mass transfer and thermodynamics will be introduced. Special topics include heat, security, materials and energy.

NQE101 Nuclear and Quantum World

Elementary particles such as atom, proton, neutron, electron and photon are wave-particles which are governed by quantum principles. This course introduces the basic concepts of quantum mechanics and quantum phenomena through historical reviews and non-mathematical approach, and discusses the major fields of nuclear and quantum engineering such as nuclear fission and fusion, quantum beam science, medical imaging, quantum imaging, quantum computing, etc. In addition to the technical aspects, the course discusses the impacts of energy development on international politics and environmental issues, and the role of quantum technology in the 21st century.

MS211 Introduction to Materials Science and Engineering

This course covers atomic bonding, crystal structures, crystal defects, diffusion, phase diagrams and microstructure, mechanical and electromagnetic properties of metals, ceramics, semiconductors and polymers.

EE103 Introductory Lab for Electrical and Electronic Engineering

This subject teaches beginning engineering students and practitioners who are interested in robot soccer with manufacturing techniques and with an electronic foundation and the application of circuits facilitated in the electronic fields. The motion principle of the robot soccer system, the core part of the electronics engineering technology is understood, and through experiments using the robot system and the vision system,

the knowledge of the overall system is studied to develop general knowledge and technology of electronics engineering.

EE200 Introduction to Electronic Engineering

This course handles the basic concept of circuit, circuit element, power function, excess phenomenon of simple circuit and normal response of sine wave, multiphase circuit, crystal structure combining of semiconductors, energy model, pn connection and application, connection transistor, composition of transistor and applicable circuit, basic theory of digital system, introduction of basic principle of computer.

CS101 Introduction to Programming

The course teaches the basic technique of computer programming and the basic knowledge in the computer structure, and use of the elective programming language to resolve given problems in structural programming. Based on the elective programming language, it teaches the data structure, input and output, flow control and incidental program, and by using the systematic division of problem solution and concept of module to solve the problems in numerical value field and non-numerical value field with the program experiment.

CS102 Advanced Programming

The course teaches the basic techniques of computer programming and the basic knowledge of computer structure, and uses the elective programming language to learn how to solve given engineering problems in numerical value interpretation method and structural programming method. Based on the elective programming language, data structure, arrangement, pointer, method of use for auxiliary program are learned, and, uses the concept of systematic division of problem solving and the concept of module to make the algorithm analysis and program practice of problems on the numerical value field and non-numerical value field.

MGT201 Management Engineering Practice

By selecting important topics with implications of management engineering field, and the basic management theory is learned, and through the on-site research and case analysis, the problems are analyzed and formulate the problem solving plan. The purpose of this course is to heighten the understanding on the management site and apply management theory to enhance the capability to resolve actual problems.