❒ Basic Courses and Requirements

1. Mandatory Basic Course Requirements

Year	Requirements
2012 and thereafter	Basic Course : at least 32 credits ◦ Mandatory Basic Courses: 23 credits 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 Advance 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 Calculus I (3) or Honor Calculus I (3) ⑥ 1 course of Calculus II (3) or Honor Calculus 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) ※ There are 3 levels (Beginner, Intermediate, Advanced) in Mandatory Basic Courses since 2000. ◦ Elective Basic Courses: at least 9 credits (Each department has different specific requirements. Please refer to the departmental requirements for course completion.) ※ Students having a double major take at least 3 or 6 credits.
2008~ 2011	Basic Course : at least 32 credits ◦ Mandatory Basic Courses: 26 credits 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 Advance 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 Calculus I (3) or Honor Calculus I (3) ⑥ 1 course of Calculus II (3) or Honor Calculus 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) ⑩ Introduction to Design and Communication(3) - Introduction to Design and Communication(3) was divided into two courses : Introduction to System Design(2) and Communication for Design(1) in 2009 ※ There are 3 levels (Beginner, Intermediate, Advanced) in Mandatory Basic Courses since 2000. ※ The students who major in Industrial Design should complete 20 credits and are exempt from taking General Physics II (Basic, General, Advanced), and Calculus II (General, Advanced). ◦ Elective Basic Courses: at least 6 credits (Each department has different specific requirements. Please refer to the departmental requirements for course completion.) ※ Students having a double major take at least 3 credits.

Year	Requirements
2000~ 2007	Basic Course : at least 29 credits ◦ Mandatory Basic Courses: 23 credits 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 Advance 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 Calculus I (3) or Honor Calculus I (3) ⑥ 1 course of Calculus II (3) or Honor Calculus 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) ※ There are 3 levels (Beginner, Intermediate, Advanced) in Mandatory Basic Courses since 2000. ※ The students who major in Industrial Design should complete 17 credits and are exempt from taking General Physics II (Basic, General, Advanced), and Calculus II (General, Advanced). ◦ Elective Basic Courses: at least 6 credits (Each department has different specific requirements. Please refer to the departmental requirements for course completion.) ※ Students having a double major take at least 3 credits.

2. **Elective Basic Course Requirements:** Each department has different requirements. Please refer to individual departmental requirements for course completion.

Dept./Div.	Credits	Designated subject
Physics	9↑	PH152
Mathematical Sciences		Include at least 2 among MAS109, MAS201, MAS202
Chemistry		CH103, CH104
Biological Sciences		CH103
Bio and Brain Engineering		MAS109, MAS201
Civil and Environmental Engineering		-
Mechanical Engineering		-
Aerospace Engineering		Include at least 2 among MAS109, MAS201, MAS202
Chemical and Biomolecular Engineering		-
Materials Science & Engineering		-
Nuclear and Quantum Engineering		-
Electrical Engineering		Include at least 2 among MAS109, MAS201, MAS202
Computer Science		MAS109
Industrial & Systems Engineering		MAS109
Industrial Design		ID202, ED100

- applicable to students entering KAIST in 2012 and thereafter; for those who have entered KAIST in and before 2011, refer to the Course Completion Requirements by Year of Admission

◦ Elective Basic Course Requirements for Double Major

Dept./Div.	Credits	Designated subject
Chemistry	6 ↑	CH103
Biological Sciences	6 ↑	CH103
Bio and Brain Engineering	3 ↑	Include at least 1 among MAS109, MAS201
Civil and Environmental Engineering	6 ↑	-
Mechanical Engineering	3 ↑	-
Aerospace Engineering	6 ↑	Include at least 1 among MAS109, MAS201, MAS202
Chemical and Biomolecular Engineering	6 ↑	-
Materials Science & Engineering	3 ↑	-
Nuclear and Quantum Engineering	3 ↑	-
Electrical Engineering	3 ↑	Include at least 1 among MAS109, MAS201, MAS202
Computer Science	3 ↑	MAS109
Industrial & Systems Engineering	6 ↑	MAS109
Industrial Design	6 ↑	ID202, ED100

- applicable to students entering KAIST in 2012 and thereafter (for students majoring Industrial & Systems Engineering, this Course requirements is applicable to students who have entered KAIST in 2010 and thereafter); for those who have entered KAIST in and before 2011, refer to the Course Completion Requirements by Year of Admission

3. Basic Courses Curriculum

Classif.	Subject No.	Subject Name	Lec: Lab: Credit (Assignment)	Department	Remark
Mandatory Basic Courses (23 Credits)	PH121	Fundamental Physics I	3:1:3(6)	Physics	
	PH141	General Physics I	3:1:3(6)	Physics	
	PH161	Advanced Physics I	3:1:3(6)	Physics	
	PH122	Fundamental Physics II	3:1:3(6)	Physics	
	PH142	General Physics II	3:1:3(6)	Physics	
	PH162	Advanced Physics II	3:1:3(6)	Physics	
	PH151	General Physics Laboratory I	0:3:1(3)	Physics	
	BS110	Basic Biology	3:0:3(2)	Biological Sciences	
	BS120	General Biology	3:0:3(2)	Biological Sciences	
	MAS101	Calculus I	3:1:3(6)	Mathematical Sciences	
	MAS103	Honor Calculus I	3:1:3(6)	Mathematical Sciences	
	MAS102	Calculus II	3:1:3(6)	Mathematical Sciences	
	MAS104	Honor Calculus II	3:1:3(6)	Mathematical Sciences	
	CH100	General Chemistry (Elementary)	3:0:3(3)	Chemistry	
	CH101	General Chemistry I	3:0:3(3)	Chemistry	

Courses (6 credits or more)	PH152	General Physics Laboratory II	0:3:1(3)	Physics	
	MAS109	Introduction to Linear Algebra	3:1:3(6)	Mathematical Sciences	
	MAS201	Differential Equations and Applications	3:1:3(6)	Mathematical Sciences	
	MAS202	Applied Mathematical Analysis	3:1:3(6)	Mathematical Sciences	
	MAS250	Probability and Statistics	3:1:3(6)	Mathematical Sciences	
	CH103	General Chemistry II	3:0:3(3)	Chemistry	
	CH104	General Chemistry Experiment II	0:3:1(1.5)	Chemistry	
	BiS102	Introduction to Bioengineering	3:0:3(6)	Bio&Brain Eng.	
	CE101	Human Civilization and Construction	3:0:3(5)	Civil&Environmental. Eng.	
	MAE106	Human and Machine	3:0:3(3)	Mechanical Eng.	
	MAE107	Sky and Space	3:0:3	Aerospace Eng.	
	MAE208	Experiences in New Mechanical Engineering Fields	2:3:3(3)	Mechanical Eng.	
	MS211	Introduction to Materials Science and Engineering	3:0:3(3)	Materials Science & Eng.	
	NQE101	Nuclear and Quantum World	3:0:3(3)	Nuclear&Quantum Eng.	
	EE105	Introduction to Electronic Engineering	3:0:3(6)	Electrical Engineering	
	CS109	Programing Practice	2:3:3	Computer Science	
	IE200	Introduction to Operations Research	3:1:3(4)	Industrial&Systems Eng.	
	ID201	Design and Living	3:0:3(2)	Industrial Design	
	ID202	Idea & Expression	3:1:3(3)	Industrial Design	
	MGT201	Management Engineering Practice	2:3:3(4)	Techno-MBA	
	ED100	Introduction to Design and Communication	3:3:3	Undeclared	
	ED200	Light, Color, and Life	3:0:3	Interdisciplinary course	

※ Substitutes for abolished and changed courses

A. Design of Machine & Manufacture → Creative Design and Manufacturing → New Design and Experience in Mechanical Systems

B. Repeating courses according to the course levels(Basic, General, Advanced) of basic mandatory courses; possible to repeat the course without considering the course levels

C. ED100 Introduction to Design and Communication(3credits) was divided into two courses : ED100 Introduction to System Design and ED101 Communication for Design.

· Students having taken them in Spring 2009 : If they want to repeat ED100 Introduction to System Design(3credits) and Communication for Design (1credits), they should take Introduction to Design and Communication(3credits) and consider it as 4 credits

· Students having taken them in Fall 2009 : ED100 Introduction to System Design (2credits) & ED101 Communication for Design (1credit) → Introduction to Design and Communication (3credit)

4. Descriptions of Basic Courses

❒ Mandatory Basic Courses

PH121 Fundamental Physics I **3:1:3(4)**

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 **3:1:3(4)**

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 **3:1:3(6)**

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 **3:1:3(6)**

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 **0:3:1(3)**

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.

PH161 Advanced Physics Ⅰ **3:1:3(6)**

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

PH162 Advanced Physics Ⅱ **3:1:3(6)**

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

BS110 Basic Biology / BS120 General Biology

This general biology class is designated 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.

MAS101 Calculus Ⅰ **3:1:3(6)**

This course deals 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.

MAS102 Calculus Ⅱ **3:1:3(6)**

This course deals with differentiation and integration of multivariable real-valued functions, emphasizing basic concepts and applications. The topics are: vector space, inner products, cross products, matrices, 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.

MAS103 Honor Calculus I **3:1:3(6)**

This course deals with the same topics introduced in MAS101 Calculus I with more rigor.

MAS104 Honor Calculus II **3:1:3(6)**

This course deals with the same topics introduced in MAS102 Calculus II with more rigor.

CH100 Basic Chemistry **3:0:3(3)**

This lecture course deals with both basic chemical principals and related applications in chemistry.

CH101 General Chemistry I **3:0:3(3)**

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 **0:3:1(1.5)**

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

CH105 Advanced Chemistry **3:0:3(3)**

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 **0:3:1(1.5)**

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.

CS101 Introduction to Programming **2:3:3(5)**

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 **2:3:3(5)**

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.

❒ Elective Basic Courses

AA100 Understanding of Modern Science and Technology **3:0:1**

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).

PH152 General Physics Laboratory Ⅱ **0:3:1(3)**

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.

MAS109 Introduction to Linear Algebra **3:1:3(6)**

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.

MAS201 Differential Equations and Applications **3:1:3(6)**

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.

MAS202 Applied Mathematical Analysis **3:1:3(6)**

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

MAS250 Probability and Statistics **3:1:3(6)**

This is an introduction to probability theory. Topics include independence of events and random variables, various probability distributions, expectation, conditional expectation, the law of large numbers, the central limit theorem, tests of hypothesis, the analysis of variance, and regression.

CH103 General Chemistry Ⅱ **3:0:3(3)**

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 Lab. Ⅱ **0:3:1(1.5)**

This course consists of the elcture portion of CH103 including qualitative analysis and basic quantitative analysis.

BiS102 Introduction to Bioengineering **3:0:3(6)**

As an introductory course of bioengineering field, we introduce basic concepts, tools and application in bioengineering. This will give students a perspective on the relationship between biology, engineering, and biotechnology.

CE101 Human Civilization and Construction **3:0:3(5)**

This course introduces several construction activities during human civilization and deals with basic theories and problems involved in important structures related with civil and environmental engineering.

MAE106 Human and Machine **3:0:3(3)**

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.

MAE107 Sky and Space **3:0:3(3)**

This coursework deals with the basics of flying in the air and through the space with the coverage of the history of flight, flight principles, materials and structures for flight vehicles, propulsion systems, space environment, satellites and their orbits, deep space exploration, and human beings in space. Students will join field tours to Korea Aerospace Research Institute twice and need to make group presentations.

MAE208 New Design and Experience in Mechanical Systems **2:3:3(3)**

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.

MS211 Introduction to Materials Science and Engineering **3:0:3(3)**

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

NQE101 Nuclear and Quantum World **3:0:3(3)**

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.

EE105 Introduction to Electronic Engineering **3:0:3(6)**

This course covers broad aspects of electrical engineering as top down manner. By using typical systems, underlying fundamental concepts and their applications including history will be discussed. Roles and futures of electrical engineering are also addressed in this course. This course is designed for students who have not selected major.

CS109 Programming Practice **2:3:3**

In this course students who have taken CS101 but who have otherwise little programming experience can develop their programming skills. The course introduces basic concepts of programming and computer science, such as dynamic and static typing, dynamic memory allocation, objects and methods, binary representation of numbers, using an editor and compiler from the command line, running programs with arguments from the commmand line, graphical user interfaces and event-based programming, using libraries, and the use of basic data structures such as arrays, lists, stacks, sets, and maps.

IE200 Introduction to Operations Research **3:1:3(4)**

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.

IE201 Applications and Laboratories of Industrial Engineering **2:3:3(4)**

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 and Living **3:0:3(2)**

This course aims to cultivate abilities for fundamental understanding of design in its context of human living, culture, and technology. This course covers various key topics in design such as history of design, basic attributes of design and their principles, design and human being, and their relationships.

ID202 Idea & Expression **3:1:3(3)**

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,

MGT201 Management Engineering Practice **2:3:3(4)**

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.

ED100 Introduction to Design and Communication **3:3:3**

This course introduces the fundamentals of conceptual design and design theory. Student work in small teams to develop creative solution to real world problems using formal design methodologies. In addition, it also applies the fundamentals of technical communication to real world design problems. Topics include team work, professional communication, background research, and technical, oral, and visual communication skills. Must be taken with ED100.

ED200 Light, Color, and Life **3:0:3**

This course deals with various topics in light, color, and life, and teaches students certain expertise in the physical properties of light, the accommodation of light in biological phenomena and medical applications, and the dynamic ways that light is experienced through color in everyday life. Through the convergence of diverse knowledge, creative research topics will be explored and interdisciplinary inquires that show most potential and professionalism will be further studied.