

Graduate School of Engineering
Bulletin Digest

1. Our Philosophy

The Graduate School of Engineering offers programs to train students to become engineers and researchers with the frontier spirit who can pursue their areas of interest on their own and make comprehensive decisions to address newly emerging issues from a wide perspective. These programs are designed to help students develop abilities to be involved in research and technology not only in their specialized field but also in other fields. With 1) highly specialized education and 2) education with a wide perspective to deal with interdisciplinary technology as its major objectives, The Graduate School of Engineering has established three departments to achieve these objectives. The aim is that students of these departments will become creative and progress-minded development engineers and researchers who can create, research and develop unique science and technology, and are willing to create a new discipline and industry.

2. Objectives and Characteristics

The master's program is positioned as the core of the university's graduate education in engineering. Its goal is to cultivate engineers and researchers richly endowed with a frontier spirit who can explore their respective fields and make flexible, comprehensive judgments from a broad perspective about unfamiliar subjects. The program includes education related to advanced, basic learning that develops an ability not just to deeply explore one's own specialized field but also to turn one's attention to a wide range of other fields of research and technology; and provides an education that makes it possible to develop original technologies and areas of study.

The doctoral program cultivates highly creative and progressive development engineers and researchers able to create, research and develop original technologies and areas of study and take the initiative in opening up new industries and avenues of learning.

Especially in the master's program, the objectives are: (1) an advanced, specialized education, and (2) education that provides a broad perspective able to deal with scientific technology originating from a diversity of fields. To achieve those objectives, the following three departments have been established.

- Department of Materials Science and Engineering
- Department of Systems Integration
- Department of Physics, Electrical and Computer Engineering

To cultivate a broad perspective, joint classes with the Faculty of Engineering have been established in each of the three departments, and joint classes between the departments have been created as well. To realize an advanced, specialized education, specialized courses have been instituted in the departments; and each course in the master's program offers students a group of Elective Recommended Classes. In the larger courses, moreover, multiple groups of Elective

Recommended Classes have been established, making it possible to provide an education that is both detailed and diverse.

Department of Materials Science and Engineering

The Department of Materials Science and Engineering offers two specializations: Advanced Materials Chemistry, and Chemical and Energy Engineering. Both specializations are based on chemistry, and aim at solving the actual problems such as on sustainable life, future energy, etc. through research and development of new material/substance or new process/device.

1) Specialization in Advanced Materials Chemistry

In this specialization, students systematically study design, synthesis, and characterization of new materials related to life materials science, science and environmental science. They also survey physical and chemical properties of functional materials using advanced technology. The specialization covers functional organic chemistry, biophysical as well as bioorganic chemistry, catalytic chemistry, photo-reactive materials chemistry, electrochemistry, polymer chemistry, synthetic organic chemistry, organic molecular design, laser chemistry, chemical analysis and instrumentation, electronic materials science and calculation chemistry. Students in this specialization will acquire advanced knowledge, methods and skills needed to become a well-established chemist or a chemical engineer.

2) Specialization in Chemical and Energy Engineering

A well-designed educational program is provided for students who shall get a profession in research and development of chemicals and energy as well as their production processes. The graduates should have thorough grounding in the basic sciences including chemistry, physics, and biology, and also have sufficient knowledge in the application of these basic sciences to enable them to design, analyze, and control chemical, physical, and biological processes consistent with the program educational objectives.

In this specialization, Refresh Education Course for materials and chemical engineering was placed in 2000. This course set up for providing practical-minded higher engineering education programs in the field of industrial physical chemistry. This course is mainly geared toward mid-career engineers and professionals who wish to improve their technical abilities or knowledge base in advanced technologies through lifelong learning. Various open training seminars are conducted as part of social action work and partly implanted in PED (II -type Engineering Degree) Course.

Department of Systems Integration

The Department of Systems Integration offers courses on advanced systems, by combining, ocean and space engineering, and solid state materials and engineering. The curriculum emphasizes a comprehensive understanding of science and engineering, and harmony with the environment.

1) Specialization in Mechanical Engineering

This specialization offers courses on basic mechanical engineering such as materials processing, thermodynamics, fluid dynamics, and mechanical design and systems engineering. Also offered are interdisciplinary courses that cover environmental engineering, space engineering, and medical engineering.

2) Specialization in Ocean and Space Engineering

The fields covered by this specialization are expanding from the surface of the ocean, and atmosphere to the deep sea, and space. The main targets of our education and research are the development of mobile structure and energy system in harmony with the environment operated in these broad fields. The objective of the curriculum is to produce advanced engineers and researchers who can explore and resolve engineering problems in such fields.

3) Specialization in Solid State Materials and Engineering

Through systematic education and research, this specialization aims to train its students to be first-rate engineers and scientists that keep abreast of the latest developments in the field of functional and structural materials.

Department of Physics, Electrical and Computer Engineering

This department encompasses vast areas of engineering including electrical, electronics, information, computer and material engineering. Advanced mathematics and physics are used to study the process of novel physical phenomena and new materials through laboratory experiments and computer simulations. Graduate programs within the department are designed to develop the students' understanding of the basics in mathematics and physics, and provide them with deeper knowledge in selected areas of electrical power engineering, electronics, information and communication engineering, computer engineering, simulation, phenomenon analysis and materials science.

1) Specialization in Electrical and Computer Engineering

This specialization is dedicated to producing talented graduates in areas of electrical power engineering, electronics, information and communication engineering, and computer engineering. The graduate program is particularly designed for those individuals wishing to pursue careers in engineering research and development as well as in teaching. The curriculum includes highly specialized and interdisciplinary lectures, seminars, laboratory work and course work. Students are required to carry out an original research project and to complete a thesis for a Master's degree, and a doctoral dissertation for a Doctoral degree.

2) Specialization in Physics

The students in this specialization are educated to become innovative engineers and scientists in the vast fields of engineering through the program. Their future professional activities may include mechanical, material, electric, electronics, and information engineering. The specialization emphasizes modern physics developed in the 21st century as well as computer

science.

3. Educational Systems

[TED and PED Programs]

The objective of the “TED program”, the conventional graduate course, is to educate students to become progress-minded, highly specialized engineers and researchers who can be engaged in creative activities in a highly industrialized society. To achieve this goal, each student is required to choose a specific area and the final evaluation for the master’s and doctoral degree is mainly based on his/her dissertations on a topic of the chosen area.

The “PED program” is an educational program unique to YNU, also called the Yokohama method graduate school education, to educate students to become practice-oriented engineers and researchers who can address present-day issues in a diversified and technologically advanced industrialized society. Students undertake a coursework program consisting of laboratory studies, seminars and internships (including a long-team internship) independently, instead of belonging to any specific research group led by a faculty member. The final evaluation for the master’s degree is made based on the outcomes (portfolio) of their learning and projects during the two-year master’s program. It is not required for them to submit a dissertation. In the subsequent doctoral program, students are required to complete a doctoral dissertation, which is evaluated from the standpoint of a practice-oriented researcher developing highly-sophisticated products.

The abbreviation “PED” represents Pi-type Engineering Degree which is based on (at least) two specialized fields, as the Greece letter “Π” having two “pillars”, while “TED” does T-type Engineering Degree which is typically based on a single specialized field.

4. TED (T-type Engineering Degree) Program Courses and Credits

*Most courses are offered in English.

Master’s Course Work

	Minimum Credits Required
Basic Engineering and Sciences	6
Basic Major Courses	14 (including 4 from Basic Major Courses)
Major Courses	
Foreign Languages	elective
Total Credits	30

- A minimum of 20 credits must be earned in the graduate course. A graduate student can earn a maximum of 10 credits of undergraduate work with the approval of the student’s supervisor. The credits earned in the college of Engineering and the college of Engineering Science are transferable to graduate credits with the provision that the designated junior and senior year undergraduate credits are counted as graduate credits and other undergraduate credits are

counted as a half credit.

- Foreign language subjects and thesis work are non-credit courses.

Doctoral Course Work

	Minimum Credits Required
Basic Engineering and Sciences Basic Major Courses Major Courses	6
Seminar or Laboratory Training Teaching Practice Field Study or Off-campus Activity	1
Special Research Project	2
Foreign Language	elective
Total Credits	9

- Foreign language requirements for the Doctoral degree: The doctoral student must either complete one foreign language course offered by the Graduate School, or pass the examination in one foreign language.

5. PED (II-type Engineering Degree) Program: Courses and Credits

PED program is provided for the students who wish to be a professional engineer in their careers. All master course students must study two types of project-based course works. Doctor of Engineering candidates in the PED course are reviewed and examined as for the execution and management ability for some project as well as academic capability.

Master's Course Work

for students enrolled before the Academic year 2012

	Minimum Credits as Module	Minimum Credits as Unit
Modules	4	24
Presentation English	-	2
Total	4	30

for students enrolled in or after the Academic year 2013

	Minimum Credits as Module	Minimum Credits as Unit
Modules	4	24
Presentation English	-	2
PED Basic Engineering and Science	-	2
Total	4	30

- Every single module requires a minimum of 4 credits from studios and 2 credits from courses

offered by the module.

- Students shall not double-count credits of courses for two or more modules.

Doctoral Course Work

	Credits as Module	Credits as Unit
Modules	1	6
Total	1	9

- A module requires a minimum of 4 credits from studios and 2 credits from courses offered by the module.