

**2021 Engineering Science 21<sup>st</sup> Century Master's Course Program  
for Foreign Students with a MEXT Scholarship**

**“Special Training Program for Robotics Engineers for the Post-Corona Society”**

**Graduate School of Engineering Science, Osaka University**

**1-3, Machikaneyama, Toyonaka, Osaka 560-8531 JAPAN**

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Website URL: <http://osku.jp/r0592>

December 2020



# 2021 Engineering Science 21<sup>st</sup> Century Master's Course Program for Foreign Students with a MEXT Scholarship

## Graduate School of Engineering Science, OSAKA UNIVERSITY

The Graduate School of Engineering Science at Osaka University features one of our MEXT-granted programs: “Special Training Program for Robotics Engineers for the Post-Corona Society” in English, which starts in October 2021.

The Graduate School of Engineering Science is one of the world-leading schools in the field of Robotics Engineering. Under this program featuring Robotics Engineering as well as other related areas, we would like to welcome top-notch foreign students from all over the world.

Based on our educational philosophy: “Fundamentally developing scientific technology by integrating science and technology will create a true culture of humanity,” we will nurture human resources who possess a broad spectrum of multidisciplinary expertise, rich comprehensive understanding, synthetic imagination, and transcultural communicability, associated with Robotics-Engineering-related professional capability and skills, who can also contribute to establishing future Robotics industries in their home countries as well as promoting close cooperation with the Japanese industry, academia, and government internationally.

The detailed application guide is as follows.

Note: MEXT stands for the Ministry of Education, Culture, Sports, Science and Technology of the Japanese Government.

### 1. Admission Capacity

#### Master's Course Only

Four (4) students in total for the three departments below

Department of Materials Engineering Science  
Department of Mechanical Science and Bioengineering  
Department of Systems Innovation

Research areas and topics can be found at the website: [osku.jp/n0961](http://osku.jp/n0961)

With respect to advancing to the Doctoral Course, you will need to refer to Section 10. Note (4) below.

### 2. Application Requirements

- (1) Nationality: The applicant's nationality must be of a country that has diplomatic relations with the Japanese government.
- (2) Visa requirement: Non-Japanese nationals who are expected to obtain a resident visa (Student Visa) upon enrollment in the Graduate School, under the Immigration-Control and Refugee-Recognition Act.
- (3) Age: Applicants generally are required to have been born on or after April 2, 1986.
- (4) Applicants are required to have fulfilled at least one of the following items:

#### A Course applicant

- (a) has received a Bachelor's degree from a Japanese university/college or is expected to graduate prior to the date of enrollment to the course;
- (b) has completed 16 years of formal school education curriculum in countries other than Japan and either has received a Bachelor's degree, or is expected to graduate from a university/college prior to the date of enrollment to the course;
- (c) has received the equivalent of a Bachelor's degree through the completion of coursework which requires 3 or more years of study at an overseas university/college; or
- (d) is approved of being equivalent academically to a university graduate by the Graduate School of Engineering Science, Osaka University and is at least 22 years of age prior to the date of enrollment to

the course.

- (5) Language ability: Required English proficiency above 79 for TOEFL-iBT, 213 for TOEFL-CBT, 550 for TOEFL-PBT, 6.0 for IELTS or equivalent.
- (6) Attendance availability: Applicants should arrive in Japan immediately prior to the date of enrollment and start the course on the date of enrollment.
- (7) While the applicant is studying in Japan, he/she shall contribute to mutual understanding between Japan and the home country by participating in activities at schools and communities with the aim of contributing to the internationalization of Japan. The applicant shall make efforts to promote relations between the home country and Japan by maintaining close relations with the university attended after graduation, cooperating with the conducting of surveys and questionnaires after returning home, and cooperating with all relevant projects and events conducted by Japanese diplomatic missions in the applicant's home country.
- (8) Notes on ineligible applicants:
  - (a) Members of the armed forces
  - (b) The applicant who is a previous recipient of a Japanese government (MEXT) scholarship; provided, those that have educational research experience of three years or more from the first day of the month following the final payment of the previous scholarship to the beginning of the payment of this scholarship are excluded. In addition, this does not apply to the past recipients of Japanese studies scholarships or Japan-Korea Joint Government Scholarship Program for the Students in Science and Engineering Departments or Young Leaders Program who are eligible to apply as long as they enter the universities as research students;
  - (c) Those who are currently applying for other programs by a Japanese government (MEXT).
  - (d) Those who are currently enrolled at a Japanese university with a Student Visa; those enrolled, or scheduled to be enrolled, at a Japanese university as a privately financed international student during the period when the scholarship application was filed until prior to the start of the provision of the scholarship. This does not apply to current self-financed international students at Japanese universities who will complete their courses of study and return to their countries once before the end of the current fiscal year.
  - (e) Recipients of scholarships from institutions (including government institutions in their home countries) other than Japanese government (MEXT) and Japan Student Services Organization (JASSO) (including the prospective beneficiaries). Those who have been selected by support programs for international students that are organized by Japanese government (MEXT) or Japan Student Services Organization (JASSO) and continue to be at the university on or after October 2021 are included.
  - (f) Applicants who are expected to graduate at the time of application and cannot satisfy the qualifications and the conditions related to academic background by the deadline given.
  - (g) Holders of dual nationality at the time of application who cannot verify that they will give up Japanese nationality by the time of his or her arrival in Japan.
  - (h) Applicants who wish, from the time of application, to conduct fieldwork or participate in an internship outside of Japan.

### 3. Pre-application Screening

Among the Application Requirements mentioned above, those who intend to apply for the Course under (4)-(d) are required to undergo a pre-application screening before application. Please contact the Graduate Students Section in advance before the application deadline by email ([ki-daigakuin@office.osaka-u.ac.jp](mailto:ki-daigakuin@office.osaka-u.ac.jp)) to inquire about the necessary procedures.

### 4. Application Procedure

- (1) Application Period:

**Monday, December 7, 2020, to Sunday, December 20, 2020**

Note: To the extent possible, every applicant is asked to find a supervisor suitable for the research field in which the applicant is interested by contacting him/her by email to confirm whether the field will be appropriate for his/her laboratory. The research topics of faculty members of the Graduate School of Engineering Science can be found in the attached list and can also be found at the following website: [osku.jp/n0961](http://osku.jp/n0961)

- (2) Application Procedure:

All the application documents (a)-(h) (see below) should be scanned into PDF format(s), and the PDF

document(s) are to be submitted to the Graduate Students Section via e-mail within the application period (Japan Standard Time/JST).

Graduate Students Section, Graduate School of Engineering Science, Osaka University  
1-3 Machikaneyama, Toyonaka, Osaka 560-8531 JAPAN  
Email: ki-daigakuin@office.osaka-u.ac.jp  
Phone: +81-6-6850-6146

No application will be accepted if the documents are incomplete. Once the application procedure is completed, the submitted contents cannot be altered. If any of the application documents are falsified, admission will be cancelled even after he/she has enrolled.

Note: After document screening, successful applicants are required to submit all the original application documents (a)-(i) (NOT SCANNED) by registered *postal* mail such as Express Mail Service (EMS) by the designated date to the above address.

(3) Application documents:

It is essential that all the application documents (a)-(h) should be carefully completed in English, typed/printed or written in block letters (i.e. they must be written legibly in printed letters, sans-serif fonts, and not in cursive, so that it can be read easily.) on A4- or US letter-sized white paper. Official English translation is required for every formal document given in other languages. Application documents are non-returnable.

- (a) Form “Application for Admission for 2021 Engineering Science 21<sup>st</sup> Century Master’s Course Program for Foreign Students with a MEXT Scholarship” completed and signed.
- (b) “Details of proposed study” completed in about 2,000 words on the prescribed form.
- (c) Abstract of applicant’s Bachelor thesis, written in English within 2,000 words on the prescribed form.
- (d) Official document certifying the date or expected date of applicant’s graduation issued and signed by the officials of the most recent university or graduate school.
- (e) Academic records, which also indicate the GPA or its equivalent and its full score, issued and signed by officials of the most recent university or graduate school.
- (f) A copy of certificate of citizenship or a copy of the applicant’s passport on an A4- or US letter-sized paper.
- (g) Score report (original document) of the TOEFL test or equivalent as a certificate of English proficiency except for the cases below. Your TOEFL score may be sent to us directly from ETS. Our ETS institution code is 5413.
  - Applicants whose first language is English.
  - Applicants who have graduated from a university located in an English speaking country.
  - Applicants who have completed an undergraduate degree program where the language of instruction and examination was English. In this case, an official statement from the academic institution will be required, confirming the use of English as the language of instructions and examinations.
- (h) Recommendation letter from the Dean of the faculty or school from which the applicant has graduated to the president of Osaka University. When the applicant is an employee, a recommendation letter from the employer/executives will also be accepted.
- (i) One (1) photo 3.2 by 2.6 cm in size.
  - Color
  - Printed on photo quality paper.
  - Taken within the last 6 months prior to the application date to reflect the current appearance.
  - Taken clearly in front of a plain background.
  - Taken in full-face view directly facing the camera including upper body.
  - With a neutral facial expression and both eyes open. Do not wear a hat or head covering.
  - Write your name and nationality in block letters on the back of the photo.

## 5. Screening

- (1) **First screening:** Screening of applicants will be held on the basis of the application documents by the Graduate School of Engineering Science, Osaka University within the month of December 2020.  
An interview and academic examination will be conducted for those who have passed the initial application document screening within the month of January 2021.
- (2) **Second screening:** MEXT will decide the recipients of the MEXT Scholarship among the recommended preliminary candidates selected by the Graduate School of Engineering Science, Osaka University.

## 6. Notification of Results

The result of the first screening will be mailed to the applicants by the middle of February 2021.  
The result of the second screening will be mailed to the applicants at the beginning of July 2021.  
Inquiry about the results by telephone etc. is strictly prohibited.

## 7. Date of Enrollment to the Course

October 1<sup>st</sup>, 2021

## 8. Policy on Handling Personal Information

- (1) Names, addresses, and other personal information will be used in the entrance examination process, in the publication of the list of successful applicants, and in the admission procedures. For those admitted to Osaka University, personal information will also be used for academic-related matters (keeping academic and registration records), for student support matters (health care management, school fee exemptions and applications for scholarships, career support, etc.), and for school fee management.
- (2) The information obtained from the entrance examination such as grade statistics and analysis will be used for research on admission methods.

## 9. Security Export Control

At Osaka University, Security Export Control is conducted in accordance with the “Foreign Exchange and Foreign Trade Act” for the purpose of maintaining the peace and security of Japan and the international community. Applicants who fall under the conditions set out in said regulations may not be able to enroll in their desired course or program or carry out research activities.

## 10. Note

- (1) Applicants are recommended to become well acquainted with the Japanese language, culture, customs, among others. Knowledge of Japanese is useful for daily life.
- (2) Preliminary candidates for the MEXT Scholarship will be requested to additionally submit the “Application Documents for MEXT Scholarship” after the initial screening of application documents as well as interview/examination conducted by Osaka University. Prescribed application forms will be sent to the preliminary candidates by e-mail by the end of February 2021.
- (3) The MEXT Scholarship shall be provided in accordance with the rules set forth by the Japanese Government.
- (4) If a grantee desires to advance to a Doctoral course from a Master’s course, he/she may have the term of his/her scholarship extended upon a successful examination by MEXT and Osaka University, provided that he/she has made outstanding academic achievement that meets certain criteria. Refer to Appendix for Admission 2021, 4. EXTENSION OF PERIOD OF SCHOLARSHIP.

## 11. Requests for Application Forms

Application forms are to be downloaded from the website: <http://osku.jp/r0592>

For any matters concerning admission, please contact the Graduate Students Section via email:

Graduate Students Section  
Graduate School of Engineering Science, Osaka University  
1-3, Machikaneyama, Toyonaka, Osaka 560-8531 JAPAN  
Email: [ki-daigakuin@office.osaka-u.ac.jp](mailto:ki-daigakuin@office.osaka-u.ac.jp)

# Appendix for Admission 2021

## 1. PERIOD OF SCHOLARSHIP

Regardless of the date of arrival, the scholarship period shall be the necessary period for the completion of the regular program of the respective courses. Students repeating a year will not be granted.

## 2. SCHOLARSHIP BENEFITS

(1) **Allowance:** The amount listed below shall be paid depending on the course enrolled in. Due to the situation of the Japanese Government's budget, the amount of payment may be subject to change each fiscal year. The scholarship shall be cancelled if a grantee is absent from the university for an extended period.

a) Regular students enrolled in master's courses: 147,000 yen per month.

b) Regular students enrolled in doctoral courses: 148,000 yen per month.

(2) **Education fees:** Fees for the application, entrance and tuition at Osaka University will be exempted. The application fee will not be exempted if the grantees cannot proceed to the master's or doctoral course or cannot be admitted by the university.

### (3) Transportation Expenses

a) **Transportation to Japan:** MEXT provides an economy-class airline ticket for the flight from the international airport closest to the grantee's residence (in principle, the country of nationality) to the first international airport that the grantee flies into when he/she arrives in Japan.

b) **Transportation from Japan:** MEXT, in principle, shall provide an economy-class airline ticket from Kansai International Airport to the international airport (in principle, in the country of nationality) nearest to the returning grantee's residence to grantees graduating Osaka University and returning to the home country by the end of the final month of the period of scholarship designated by MEXT.

Note 1: The grantee shall bear at his/her own expense all costs related to domestic travel from the grantee's residence to the nearest international airport, airport taxes, airport usage fees, special taxes necessary for travel, travel expenses within Japan (including airline transit costs), travel insurance expenses, carry-on luggage or unaccompanied baggage expenses, etc. This is the same for when the grantee returns to his/her home country.

Note 2: If a grantee returns to the home country before the end of period of scholarship due to personal circumstances, or reasons stated in "3. SUSPENSION OF PAYMENT OF SCHOLARSHIP", MEXT will not pay for the returning travel expenses.

Note 3: If a grantee continues to stay in Japan after the scholarship period has ended in cases such as being employed in Japan, he/she will not be paid travel expenses for a temporary return.

## 3. SUSPENSION OF PAYMENT OF SCHOLARSHIP

Payment of the scholarship will be stopped for the reasons given below. Should any of the following reasons apply, the grantee may be ordered to return a part of, or all of, the scholarship paid up to that time. Payment of the scholarship may also be stopped during the period up to the decision on the disposition of the matter.

(1) A grantee is determined to have made a false statement on his/her application.

(2) A grantee violates any article of his/her pledge to the Minister of Education, Culture, Sports, Science and Technology.

(3) A grantee violates any Japanese laws and is sentenced and imprisoned for an indefinite period or for a period exceeding 1 year.

(4) A grantee is suspended from his/her university or preparatory educational institution or receives other punishment, or is removed from enrollment; in accordance with school regulations of the accepting institution.

(5) It has been determined that it will be impossible for a grantee to complete the course within the standard time period because of poor academic grades or suspension or absence from the university.

(6) A grantee came to Japan without newly acquiring the "Student" residence status, or changed his/her residence status to one other than "Student".

- (7) A grantee has received another scholarship (excluding those specified for research expenditures) .
- (8) A grantee proceeds to a more advanced level of education without receiving approval for an extension of the period of the scholarship.
- (9) A grantee has quit Osaka University or has transferred to another graduate school.
- (10) A grantee's yearly academic coefficient at each point in time is less than 2.30.

#### **4. EXTENSION OF PERIOD OF SCHOLARSHIP**

If a grantee desires to proceed to a doctoral course from a Master's course, he/she may have the term of his/her scholarship extended upon a successful examination by MEXT and Osaka University and provided that he/she has made outstanding academic achievement that meets certain criteria. This will be implemented according to the proceeding of the program, provided that there are cases where the scholarship extension may be applied for the 2021 Master's Course students who subsequently wish to continue studying in the Doctoral Course.

#### **5. NATIONALITY**

Applicants must have the nationality of a country that has diplomatic relations with Japan. An applicant who has Japanese nationality at the time of application is not eligible. However, persons with dual nationality who hold Japanese nationality and whose place of residence at the time of application is outside of Japan are eligible to apply as long as they choose the nationality of the other country and renounce their Japanese nationality by the date of their arrival in Japan.



## Department of Materials Engineering Science

| Division                          | Area                                          | Research Group                                                                                                                                        | Keywords                                                                                                                                                                                                                                                                                                                                                 | Professor                                             |
|-----------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>Materials Physics</b>          | Electron Correlation Physics                  | Theoretical Research Group of Strongly Correlated Systems                                                                                             | Topological insulators and superconductors, Exotic superconductors, Strongly correlated electron systems, Quantum magnetism, Quantum criticality, Mathematical physics                                                                                                                                                                                   | Prof. FUJIMOTO Satoshi                                |
|                                   |                                               | Experimental Research Group for Spectroscopy of Correlated Materials                                                                                  | Polarization-dependent bulk-sensitive photoelectron spectroscopy ( hard X-ray and extremely low-energy excitation), Bulk-sensitive soft x-ray angle-resolved photoemission and their dichroism                                                                                                                                                           | Prof. SEKIYAMA Akira                                  |
|                                   |                                               | Experimental Research Group for Electron-correlated Matter Science                                                                                    | Exotic superconductors, Topological superconductors, Quantum critical systems, Multipolar systems, Strongly correlated electron systems, Angle-resolved thermal-transport/thermodynamic measurements under extreme conditions                                                                                                                            | Prof. IZAWA Koichi                                    |
|                                   | Quantum Physics of Nanoscale Materials        | Quantum Information and Quantum Optics Group                                                                                                          | Quantum information processing, Entanglement manipulation, Quantum optics, Atom Optics, Optomechanics                                                                                                                                                                                                                                                    | Prof. Takashi Yamamoto                                |
|                                   |                                               | Group for Exploration of Functional Materials                                                                                                         | Magnetism, Ferroelectricity, Correlated electron systems, Oxides, Crystal growth                                                                                                                                                                                                                                                                         | Prof. Shintaro Ishiwata                               |
|                                   |                                               | Experimental Research Group for Nanoscience                                                                                                           | Nanostructures, Spintronics                                                                                                                                                                                                                                                                                                                              | Prof. SUZUKI Yoshishige                               |
|                                   | Quantum Materials Physics                     | Interface Quantum Science                                                                                                                             | Spintronics, Flexible Spintronics, Advanced magnetic engineering, Control of magnetism, Functional quantum interface                                                                                                                                                                                                                                     | Prof. Daichi Chiba                                    |
| Condensed Matter Theory           |                                               | First-principles calculation, Condensed matter theory, Materials prediction and design, Magnetism, Ferroelectricity, Superconductivity, Multiferroics | Prof. OGUCHI Tamio                                                                                                                                                                                                                                                                                                                                       |                                                       |
| <b>Chemistry</b>                  | Synthetic Chemistry                           | Synthetic Organic Chemistry Group                                                                                                                     | Environmentally benign process for molecular transformations, Simulation of enzymatic functions with metallo- and organocatalysts, Creation of functional organometallics                                                                                                                                                                                | Prof. NAOTA Takeshi                                   |
|                                   |                                               | Physical Organic Chemistry Group                                                                                                                      | Reaction Development, Mechanistic Analysis, Functional Molecule Synthesis, Structure-Property Evaluation, Catalytic Reaction, Asymmetric Catalysis                                                                                                                                                                                                       | Prof. SHINTANI Ryo                                    |
|                                   |                                               | Molecular Assembly Chemistry Group                                                                                                                    | Supramolecular chemistry, Crystal engineering, Functional crystalline material, Porous organic framework, Carbon dioxide absorbent, Hydrogen bond                                                                                                                                                                                                        | Prof. HISAKI Ichiro                                   |
|                                   | Molecular Organization Chemistry              | Surface Chemistry Group                                                                                                                               | Energy Conversion, Electrode Interfaces, Ionic Liquid Interfacial Chemistry, Catalytic Reaction Mechanism, Chemical Sensor, Interfaces of Electrochemical Devices                                                                                                                                                                                        | Prof. FUKUI Ken-ichi                                  |
|                                   |                                               | Biological Chemistry Group                                                                                                                            | Nucleic acids chemistry, Chemical synthesis of oligonucleotides, DNA damage, DNA repair, Biomolecular recognition, Protein–nucleic acid interactions                                                                                                                                                                                                     | Prof. IWAI Shigenori                                  |
|                                   | Solar Energy Chemistry                        | Solar Energy Conversion                                                                                                                               | Artificial Photosynthesis; Natural Photosynthesis; Light-to-chemical energy conversion; Photofunctional materials; Electrocatalytic reactions; Next-generation secondary batteries                                                                                                                                                                       | Prof. NAKANISHI Shuji                                 |
| <b>Chemical Engineering</b>       | Chemical Reaction Engineering                 | Nanoreaction Engineering Group                                                                                                                        | Chemical reaction engineering, porous materials, inorganic membranes, liquid crystals                                                                                                                                                                                                                                                                    | Prof. NISHIYAMA Norikazu                              |
|                                   |                                               | Quantum Chemical Engineering group                                                                                                                    | Quantum nonlinear optics, Materials-oriented quantum chemistry, Open-shell molecular systems, Quantum dynamics                                                                                                                                                                                                                                           | Prof. NAKANO Masayoshi                                |
|                                   |                                               | Design of High-Performance Catalyst Group                                                                                                             | Catalytic chemistry, Catalyst design, Green chemistry, Environmentally-benign catalytic process, Green organic synthesis, Inorganic crystallites, Nanocluster, Highly ordered multicomponent catalyst                                                                                                                                                    | Prof. MIZUGAKI Tomoo                                  |
|                                   | Environment and Energy System                 | Transport Phenomena Control Group                                                                                                                     | Control of Heat and Mass Transfer, Liquid-Liquid Interface, Phase Change, Computational Fluid Dynamics                                                                                                                                                                                                                                                   | Prof. OKANO Yasunori                                  |
|                                   |                                               | Molecular-Aggregate Chemical Engineering Group                                                                                                        | Soft Self-Organizing System, Distribution of Molecule at Mesoscale, Amphiphilic Molecule, Ionic Liquid, Molecular Simulation, Solution Theory                                                                                                                                                                                                            | Prof. MATUBAYASI Nobuyuki                             |
|                                   | Bioprocess Engineering                        | Bio-Inspired Chemical Engineering Group                                                                                                               | Bio-Inspired Chemical Engineering, Self-Assemblies, Engineering Science of Liposome, Molecular Recognition, Artificial Enzyme, Bioseparation                                                                                                                                                                                                             | Prof. UMAKOSHI Hiroshi                                |
|                                   |                                               | Biochemical Materials Engineering Group                                                                                                               | Biomedical, Biomaterial, Tissue fabrication, Hydrogel, Soft matter, Biochemical engineering                                                                                                                                                                                                                                                              | Prof. SAKAI Shinji                                    |
| Solar Energy Chemistry            | Environmental Photochemical Engineering Group | Photocatalysts, Highly Selective Transformation of Organic Compounds, Artificial Photosynthesis, Photoluminescent Molecular Devices and Sensors       | Prof. HIRAI Takayuki                                                                                                                                                                                                                                                                                                                                     |                                                       |
| <b>Frontier Materials Science</b> | Frontier Materials                            | Molecular Architectonics Research Group                                                                                                               | Experimental and Theoretical Studies on Molecular-based and Molecular-scale Electronics, Spintronics and Thermoelectronics, and on Novel Molecular Architectures utilizing Fluctuations towards Brain-like Devices                                                                                                                                       | Prof. TADA Hirokazu                                   |
|                                   |                                               | Organometallic Chemistry Group                                                                                                                        | Design and Synthesis of Homogeneous Molecular Catalysts, Organometallic Complexes, Metal Nanoclusters, Chiral Complexes, and Molecular Devices                                                                                                                                                                                                           | Prof. MASHIMA Kazushi                                 |
|                                   |                                               | Theory Group of Advanced Materials Science                                                                                                            | Microscopic theory of light-matter interaction, Photo-functional design with nano-materials, Optical manipulation of nanostructures, Theory of nonlinear optical response of solids (Elucidation and prediction of new phase of matters under extreme conditions, The first-principles calculations and its development based on the quantum simulation) | Prof. ISHIHARA Hajime (Assoc. Prof. KUSAKABE Ko-ichi) |
|                                   | Dynamics of Nanoscale Materials               | Experimental Research Group for Coherence of Nanoscale Materials                                                                                      | Optical properties of semiconductor ultrathin films and nanoparticles, and strongly-correlated electron systems, Nonlinear laser spectroscopy, Ultrafast time-resolved spectroscopy, THz spectroscopy, SEM-cathodoluminescence, Optical fabrication and manipulation of nanoparticles                                                                    | Prof. ASHIDA Masaaki                                  |
|                                   |                                               | Experimental Research Group for Fluctuation Dynamics in Condensed Phase                                                                               | photochemistry, photofunctional molecule, three-dimensional three-pulse photon echo, ultrafast detection of photochemical reactions, laser-control of chemical reactions, time-resolved microscopy, single-molecule measurement, biomolecular fluctuation                                                                                                | Prof. MIYASAKA Hiroshi                                |
|                                   | Quantum Science in Extreme Conditions         | Experimental Research Group for Materials Science in Extreme Conditions                                                                               | Material science at extreme conditions; Superconductivity, magnetism, structural phase transitions, new material and new function                                                                                                                                                                                                                        | Prof. SHIMIZU Katsuya                                 |
|                                   |                                               | Experimental Research Group for Materials Engineering Science in Nano-structure                                                                       | Nano-fabrication of solids and semiconductors, Hetero-structure of oxides, Nano-materials device, Electronics of functional oxides                                                                                                                                                                                                                       | Prof. TANAKA Hidekazu                                 |

## Department of Mechanical Science and Bioengineering

| Division                      | Area                                    | Research Group                                  | Keywords                                                                                                                                                                                                                                                                                                                                                                                                                                               | Professor                    |
|-------------------------------|-----------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Nonlinear Mechanics</b>    | Mechanics of Fluids and Thermo-fluids   | Thermal Engineering and Science Group           | Subcritical transition to turbulence, Fully developed turbulence, Flow control, Heat transfer enhancement, Drag reduction                                                                                                                                                                                                                                                                                                                              | Prof. KAWAHARA Genta         |
|                               |                                         | Fluid Mechanics Group                           | Science and technology of nonlinear phenomena in fluid mechanics, Transport and mixing, Turbulent flows, Granular flows, Flows of complex fluids, Interfacial flows                                                                                                                                                                                                                                                                                    | Prof. GOTO Susumu            |
|                               | Mechanics of Solid Materials            | Structure and strength of materials group       | Dynamic evaluation of hydrogen embrittlement of metals, Material properties of hydrogen energy materials, Development of new materials by means of impact compression, Development of nano-diamond composites, Biomimetics of plants structure                                                                                                                                                                                                         |                              |
|                               |                                         | Solid Mechanics Group                           | Theory of elasticity, Isogeometric analysis, Multiscale analysis, Mechanics of defects in solid, Large scale computation, Structure optimization, Resonant ultrasound spectroscopy, Gas sensor, Dynamics of colloidal materials                                                                                                                                                                                                                        | Prof. TARUMI Ryuichi         |
| <b>Mechanical Engineering</b> | Propulsion Engineering                  | Molecular Fluid Dynamics Group                  | Control and analysis of nanoparticle flow dynamics by optical pressure and optical vortex, Development of micro-machined artificial auditory sensory epithelium using AI, Molecular fluid sciences of single-molecule measurement technology, Integration of Deep Learning to intelligent flow measurement and simulation                                                                                                                              | Prof. KAWANO Satoyuki        |
|                               |                                         | Fluids Engineering Group                        | Multiphase Flows, Cavitating Flows, Flow Control, Numerical Scheme and Algorithm, High Performance Computing, Optical Measurements                                                                                                                                                                                                                                                                                                                     | Prof. SUGIYAMA Kazuyasu      |
|                               | Mechano-informatics                     | Human Motor Control and Human Enhancement Group | Computer assisted surgery, Medical robotics, Endoscopic surgery assistance, Skilled and coordinated movements, Functional electrical stimulation, Neurorehabilitation, Sports science, Human enhancement technology                                                                                                                                                                                                                                    | Prof. NISHIKAWA Atsushi      |
|                               |                                         | Theoretical Solid Mechanics Group               | Multiscale-multiphysics modeling for the deformation, fracture, corrosion, and friction behaviors of materials, Prediction and design of the mechanical properties of materials, Electronic and atomistic simulation, Micro-Meso-Macro-mechanics, Machine learning, Structural materials with high strength and ductility, High-entropy alloys, Materials with mille-feuille structures, Nanostructured materials, Amorphous materials, Nano-materials | Prof. OGATA Shigenobu        |
| <b>Bioengineering</b>         | Biomechanical Science                   | Biomechanics Group                              | Biomechanics of cells, tissues, and organs, Functional adaptation and remodeling, Computational biomechanics, Biofluid dynamics, Biomechanical Imaging, Biomolecular dynamics                                                                                                                                                                                                                                                                          | Prof. WADA Shigeo            |
|                               |                                         | Mechanical and Bioengineering Systems Group     | Biomechanical System Modeling, Biomechanical Simulation, Orthopaedic/Dental Biomechanics, Musculo-Skeletal Dynamics, Rehabilitation Engineering, Welfare Engineering, Assistive Technology, Adaptive Structures and Systems, Optimum/Adaptive Structural Design, Smart System Design                                                                                                                                                                   | Prof. TANAKA Masao           |
|                               |                                         | BioMedical Engineering                          | Medical Device, Artificial Organs, Biosensing, Bioinformation Monitoring, Biomaterials, Medical Imaging                                                                                                                                                                                                                                                                                                                                                | Guest Prof. TSUKIYA Tomonori |
|                               | Biophysical Engineering                 | Bio-Dynamics Group                              | Human motor control, Posture and Gait, Neuro-mechanics, Neuro-rehabilitation, Neuro-engineering, Biomedical Engineering, Computational Neuroscience, Systems Physiology, Biosignal processing, Nonlinear dynamical system theory and its application to physiology and medicine                                                                                                                                                                        | Prof. NOMURA Taishin         |
|                               |                                         | Biological Physics and Data Science Group       | Biological statistical physics, Nonlinear time series analysis and its application to biosignals, Biomedical big-data analysis, Healthcare cyber-physical system.                                                                                                                                                                                                                                                                                      | Prof. KIYONO Ken             |
|                               | Biomedical and Biophysical Measurements | Molecular BioMeasurement Group                  | Cellular adaptation to mechanical environment, Physical/biochemical properties of cells and subcellular components, Bioengineering-based drug repositioning, Cell biomechanics/biophysics and mechanobiology, Soft matter physics, Microfluidics                                                                                                                                                                                                       | Prof. DEGUCHI Shinji         |
|                               |                                         | Bioimaging Group                                | Smart Sensing, Presentation, Multipurpose Display, VR/AR, Computer Vision, SLAM, Image Measurement, Sensory Information Processing, Mechatronics, Functional Material, Digital Fabrication, Soft Mechanism, Food Design                                                                                                                                                                                                                                | Prof. OSHIRO Osamu           |

## Department of Systems Innovation

| Division                                        | Area                                     | Research Group                                                                                                                         | Keywords                                                                                                                                                                                                                                                                | Professor                |
|-------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Advanced Electronics and Optical Science</b> | Solid State Electronics                  | Nanoelectronics Group                                                                                                                  | Nitride semiconductor materials, Memristor, Group-IV semiconductor materials, AI electronics, Synchrotron radiation nanobeam X-ray diffraction, Scanning probe microscopy, Transmission electron microscopy, Quantum beam nanofabrication, First principles calculation | Prof. SAKAI Akira        |
|                                                 |                                          | Nanostructure Physics Group                                                                                                            | Nanostructure physics, Low-dimensional structures / Superlattices, Thermoelectric conversion, Phonon engineering, Group-IV semiconductor materials, Transparent oxide materials, Molecular beam epitaxy                                                                 | Prof. NAKAMURA Yoshiaki  |
|                                                 |                                          | Nano-scale Physics & Device Group                                                                                                      | Semiconductor spintronics, Low-temperature MBE, Metal/Semiconductor interface, Semiconductor/Oxide interface, Interfacial multiferroics                                                                                                                                 | Prof. HAMAYA Kohei       |
|                                                 | Advanced Quantum Devices and Electronics | Quantum Computing Group                                                                                                                | Quantum computer, Quantum algorithm, Quantum complexity theory, Quantum error correction, Fault-tolerant quantum computing, Quantum machine learning, Quantum information theory, Quantum dynamics                                                                      | Prof. FUJII Keisuke      |
|                                                 |                                          | Advanced Quantum Information Device Group                                                                                              | Quantum measurement and sensing, Ultra high-sensitivity MRI/NMR, Room temperature hyper polarization, Quantum sensitive coding, Quantum information experiment                                                                                                          | Prof. KITAGAWA Masahiro  |
|                                                 | Optical Electronics                      | Microwave Photonics Group                                                                                                              | Artificial metamaterials, Transformation optics, Invisibility cloaks, Left-handed materials, Photonics crystals, Plasmonic devices, Microwaves, Wireless communications                                                                                                 | Prof. SANADA Atsushi     |
|                                                 |                                          | Information Photonics Group                                                                                                            | Millimeter- and terahertz-wave photonics, Nano-structure photonics, Metamaterials, Ultrafast electronics, Photonic signal processing and measurement, Communication systems                                                                                             | Prof. NAGATSUMA Tadao    |
|                                                 |                                          | Quantum Electronics Group                                                                                                              | Laser cooling, Quantum information, Quantum optics, Ion trap, Laser stabilization, Frequency standard                                                                                                                                                                   | Prof. MUKAIYAMA Takashi  |
| Advanced Electronics Under Extreme Conditions   | Advanced Electronics Group               | Atom technology, Nanobiology, Nanoelectronics, Scanning Probe Microscopy, Medical Engineering, Nanometer analysis and characterization | Prof. ABE Masayuki                                                                                                                                                                                                                                                      |                          |
| <b>Systems Science and Applied Informatics</b>  | System Theory                            | Adaptive Robotics Group                                                                                                                | Soft Robotics, Embodied Artificial Intelligence, Bio-mimetic Robotics, Bio-Robotics, Muscular-skeletal Robots, Humanoid Robots                                                                                                                                          | Prof. HOSODA Koh         |
|                                                 |                                          | Systems Analysis Group                                                                                                                 | Signals and Systems Analysis, Adaptive System, Speech Intelligibility, Active Noise Cancellation, Image Understanding and Restoration, Feature Extraction and Classification                                                                                            | Prof. IIGUNI Youji       |
|                                                 | Intelligent Systems                      | Robot Learning Group                                                                                                                   | AIxRobotics, Machine Learning, Symbol Emergence in Robotics, Developmental Cognitive Robotics, Domestic Service Robots, Emotional Intelligence, Haptic Intelligence, Child-Robot Interaction                                                                            | Prof. NAGAI Takayuki     |
|                                                 |                                          | Intelligent Robotics Group                                                                                                             | Human-Robot Interaction, Android Science, Communication robots, Learning and cognitive developmental Robot, Bio-mimetic system, Intelligent sensor network, Pattern recognition, Brain-Machine Interface                                                                | Prof. ISHIGURO Hiroshi   |
|                                                 |                                          | Pattern Measurement Group                                                                                                              | Computer Vision, Visual Media, Olfactory Media, Virtual Reality, Augmented/Mixed Reality, Intelligent Sensing, Human Activity Sensing, Sensor Fusion, Digital Archive, Human Interface, Human Augmentation                                                              | Prof. SATO Kosuke        |
|                                                 |                                          | Robotic Manipulation Research Group                                                                                                    | Robot Manipulator, Motion Planning, Assembly, Human-Computer Interaction, Social Computing, Augmented Reality                                                                                                                                                           | Prof. HARADA Kensuke     |
| <b>Mathematical Science</b>                     | Mathematical Modelling                   | Differential Equation Group                                                                                                            | Nonlinear partial differential equations, Variational methods, Singularity formation, Mathematical fluid dynamics, Mathematical sciences                                                                                                                                | Prof. KOBAYASHI Takayuki |
|                                                 |                                          | Applied Analysis Group                                                                                                                 | Mathematical models of phenomena, Nonlinear analysis, Nonlinear differential equations, Variational methods, Dynamical systems, Blow-up analysis, Mathematical physics, Critical phenomena                                                                              | Prof. ISHIWATA Michinori |
|                                                 | Statistical Science                      | Statistical Analysis Group                                                                                                             | Sparse Estimation, Bayesian Networks, Machine Learning, Information Theory, Bioinformatics, Bayes Statistics, Information Geometry, Quantum Tomography                                                                                                                  | Prof. SUZUKI Joe         |
|                                                 |                                          | Statistical Science Group                                                                                                              | Multivariate analysis, Structural equation modeling, Statistical causal inference, information loss, time series analysis, model selection                                                                                                                              | Prof. KANO Yutaka        |
| <b>Mathematical Science for Social Systems</b>  | Mathematical and Statistical Finance     | Research Group of Statistical Inference                                                                                                | Statistical inference for stochastic processes, High frequency data analysis, Actuarial mathematics, Monte Carlo methods, Bayesian Statistics, Mathematical statistics, Fractional Brownian motion                                                                      | Prof. UCHIDA Masayuki    |
|                                                 |                                          | Research Group of Mathematical Modeling in Finance                                                                                     | Dynamic utility maximization, Stochastic optimal control, Differential game, Dynamic programming equation, Insurance mathematics, Levy processes, Quantitative risk management                                                                                          | Prof. SEKINE Jun         |
|                                                 |                                          | Research Group of Stochastic Analysis                                                                                                  | Stochastic integration, Stochastic differential equations, Fractional Brownian motion, Rough path analysis, Mathematical Finance, Quantitative Finance, Computational Finance, Financial engineering                                                                    | Prof. FUKASAWA Masaaki   |
|                                                 | Theoretical Systems Science              | Research Group of Complex Systems                                                                                                      | System theory, Formal method, Discrete event system, Hybrid system, Cyber-physical system, Deep learning, Model-based machine learning, Reinforcement learning                                                                                                          | Prof. USHIO Toshimitsu   |
|                                                 |                                          | Research Group of Systems Optimization and Decision Making                                                                             | Decision making, Systems optimization, Multiple criteria decision aiding, Fuzzy logic, Management of uncertainty, Data mining, Soft Computing, Rule induction                                                                                                           | Prof. INUIGUCHI Masahiro |



# Special Program of “Engineering Science 21<sup>st</sup> Century”

## Master’s and Doctoral Courses in English

### Study Contents

The Graduate School of Engineering Science aims to acquire a strong international reputation through increased exchange of students and researchers, and in joint research projects. For this objective, the Graduate School of Engineering Science has decided to offer a new interdisciplinary program in which all lectures, as well as all instructions and supervision in research-related activities and seminars, are given in English. The students are not required to learn Japanese to join this program. In this program, globally recognized and highly qualified graduates are expected to be educated under the guiding principles of the Graduate School of Engineering Science: integrating science and technology.

### Outline and Features of the Program

- 1) The aim of this program is to develop human resources with high level, creative and flexible problem-solving ability. This is achieved through multi- and interdisciplinary research training, seminars, and lectures, given by prominent professors in their respective fields.
- 2) Students are guided and supervised in English.
- 3) Students can select one of the **eleven “Divisions”** of the Graduate School of Engineering Science (see **Table 1**), for their research study for a Master’s or Doctoral Degree. Students will be required to choose one professor as their supervisor.
- 4) The opportunity for an internship at a prominent Japanese company or research organization will be provided in order to increase the knowledge and experience of cutting-edge technologies. This internship will allow international students to become discerning and well-balanced scientists, with a deeper understanding of the Japanese society. The internship will also meet the requirements of those international students who wish to have practical experience in industry.
- 5) The program also provides the opportunity to enhance interactions between Japanese and international students. The program will improve the international awareness of Japanese students, as well as deepen international students’ understanding of the Japanese society. This will also meet the demands of those Japanese students who want to work in the global environment.

### Course Requirements

- 1) **Master’s Course students** are required to obtain 30 credits, as given in **Table 2**. The list of lectures given in English is shown in **Table 3**.
- 2) **Doctoral Course students** are required to obtain 12 credits in “Advanced/Special Research I to VI” for each division as well as to take “Research Training for Doctor's Thesis” with no credit.

**Table 1. Departments and Divisions of the Graduate School of Engineering Science**

## **Department of Materials Engineering Science**

### **Division of Materials Physics**

- Area of Electron Correlation Physics
- Area of Quantum Physics of Nanoscale Materials
- Area of Quantum Materials Physics

### **Division of Chemistry**

- Area of Synthetic Chemistry
- Area of Molecular Organization Chemistry
- Area of Solar Energy Chemistry

### **Division of Chemical Engineering**

- Area of Chemical Reaction Engineering
- Area of Environment and Energy System
- Area of Bioprocess Engineering
- Area of Solar Energy Chemistry

### **Division of Frontier Materials Science**

- Area of Frontier Materials
- Area of Dynamics of Nanoscale Materials
- Area of Quantum Science in Extreme Conditions

## **Department of Mechanical Science and Bioengineering**

### **Division of Nonlinear Mechanics**

- Area of Mechanics of Fluids and Thermo-fluids
- Area of Mechanics of Solid Materials

### **Division of Mechanical Engineering**

- Area of Propulsion Engineering
- Area of Mechano-informatics

### **Division of Bioengineering**

- Area of Biomechanical Science
- Area of Biophysical Engineering
- Area of Biomedical and Biophysical Measurements

## **Department of Systems Innovation**

### **Division of Advanced Electronics and Optical Science**

- Area of Solid State Electronics
- Area of Advanced Quantum Devices and Electronics
- Area of Optical Electronics
- Area of Advanced Electronics Under Extreme Conditions

### **Division of Systems Science and Applied Informatics**

- Area of System Theory
- Area of Intelligent Systems

### **Division of Mathematical Science**

- Area of Mathematical Modelling
- Area of Statistical Science

### **Division of Mathematical Science for Social Systems**

- Area of Mathematical and Statistical Finance
- Area of Theoretical Systems Science

**Table 2. Requirements for Master's Course**

| Category                       | Number of Credits |
|--------------------------------|-------------------|
| Lectures                       | 18                |
| Seminar I~IV in each division  | 4                 |
| Research I~IV in each division | 8                 |

**Table 3. List of lectures of Master's Course**

○=Annual classes    \* =Biennial classes

| Lectures                                                            | Credits |
|---------------------------------------------------------------------|---------|
| Solid State Spectroscopy                                            | 2(○)    |
| Science and Engineering of Correlated Electron Materials            | 2(○)    |
| Introduction to magnetism and spintronics                           | 2(○)    |
| Advanced magnetism and spintronics                                  | 2(○)    |
| Properties of Materials                                             | 2(○)    |
| Bio-Inspired Chemical Engineering                                   | 2(○)    |
| Molecular Nanotechnology                                            | 2(○)    |
| Theoretical Materials Science                                       | 2(○)    |
| Photophysics of Nanoscale Materials                                 | 2(○)    |
| Frontier of Nano-scale Materials                                    | 2(○)    |
| International Exchange Lecture on Nanoscience and Nanoengineering A | 1(○)    |
| International Exchange Lecture on Nanoscience and Nanoengineering B | 1(○)    |
| International Exchange Lecture on Nanoscience and Nanoengineering C | 1(○)    |
| Turbulence Dynamics                                                 | 2(*)    |
| Advanced Fluid Mechanics                                            | 2(*)    |
| Advanced Experimental Mechanics                                     | 2(*)    |
| Vibrations and Waves                                                | 2(*)    |
| Topics in Multiphase Flow Engineering                               | 2(*)    |
| Topics on Robotics                                                  | 2(*)    |
| Stability Analysis of Dynamical Systems                             | 2(*)    |
| Advanced Theoretical Solid Mechanics                                | 2(*)    |
| Advanced Computational Mechanics                                    | 2(*)    |
| Biomechanics                                                        | 2(*)    |
| Theory of Optimum Design and Synthesis                              | 2(*)    |
| Biomechanism                                                        | 2(*)    |
| Biomedical data science                                             | 2(*)    |
| Biosystem Engineering                                               | 2(○)    |
| Engineering in biology and medicine                                 | 2(*)    |
| Medical Virtual Reality                                             | 2(*)    |

| Lectures                                    | Credits |
|---------------------------------------------|---------|
| Quantum Information Science                 | 2(*)    |
| Advanced Optoelectronics                    | 2(○)    |
| Systems and Control Theory                  | 2(*)    |
| Adaptive Systems Theory                     | 2(*)    |
| Signal Analysis Theory                      | 2(*)    |
| Theory of Systems Analysis                  | 2(*)    |
| Applied Robotics                            | 2(*)    |
| Intelligent Robotics                        | 2(*)    |
| Mixed Reality Systems                       | 2(*)    |
| Advanced Robot Systems                      | 2(*)    |
| Imaging Systems                             | 2(*)    |
| Database Systems                            | 2(*)    |
| Communication Robot                         | 2(*)    |
| Intelligent Learning System                 | 2(*)    |
| Topics in Mathematical Sciences 1           | 1(*)    |
| Topics in Mathematical Sciences 2           | 1(*)    |
| Topics in Mathematical Sciences 3           | 1(*)    |
| Topics in Mathematical Sciences 4           | 1(*)    |
| Topics in Mathematical Statistics 1         | 1(*)    |
| Topics in Mathematical Statistics 2         | 1(*)    |
| Topics in Mathematical Statistics 3         | 1(*)    |
| Topics in Mathematical Statistics 4         | 1(*)    |
| Data Science and Case Studies I             | 2(○)    |
| Nonlinear System Theory                     | 2(○)    |
| Systems Optimization and Analysis           | 2(*)    |
| Intelligent Mathematical Programming System | 2(*)    |
| Introduction to Engineering Science         | 2(○)    |
| Advanced Physical Chemistry                 | 2(○)    |
| Advanced Organic Chemistry                  | 2(○)    |
| Advanced Chemistry for Material Science     | 2(*)    |
| Material Process Engineering                | 2(*)    |
| Biochemical Materials Engineering           | 2(*)    |
| Solid State Devices                         | 2(○)    |
| Opto- and Quantum Electronics               | 2(○)    |
| Advanced Mathematical Science A             | 2(○)    |
| Advanced Mathematical Science B             | 2(○)    |
| Advanced Mathematical Science C             | 2(○)    |
| Engineering Science Research Internship 1   | 1(○)    |
| Engineering Science Research Internship 2   | 2(○)    |



# Graduate School of Engineering Science

## OSAKA UNIVERSITY

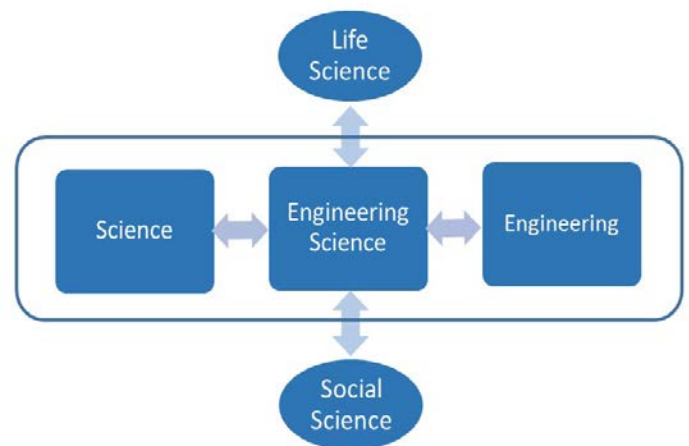
### 1. Message from the Dean

Welcome to the Graduate School of Engineering Science/School of Engineering Science, Osaka University

As we well know, science and engineering had developed tremendously during the 20th century, so that subsequently our lives have been changed and improved drastically. The extension and formalization of the fundamental disciplines and their applications to manufacturing played an important role of the developments. We believe that fusing together as well as developing the fundamental disciplines are necessary steps toward continuing to contribute to developments in the future. In addition, we incorporate the fruits from humanity and social science research with those from science and engineering in order to create true culture of the human being.

Since the foundation of the School of Engineering Science in 1961, we have continuously created interdisciplinary research fields congruent with social needs and have made a great contribution to the academy and industry through research and education. Osaka University offers great and unique opportunities of education and research in the wide range of the fields of basic science, engineering science and manufacturing. In addition, our graduate school attempts to connect life science with the engineering science and further progress toward the integration of arts and science, which includes financial engineering and insurance, robotics and data science.

In the School of Engineering Science, which has ten courses, we have organized a characteristic curriculum for each course to provide a deep knowledge of basic subjects, such as mathematics, physics, chemistry, biology and informatics, as well as major important subjects related to the courses. Our education also develops wider viewpoints and flexibility. In the Graduate School, with eleven divisions, we provide higher-level professional education and perform fusion research with the different areas. We attempt to produce graduates who have a firm specialty and the potential to pursue research and development in areas beyond their acquired specialty.



Dean  
Graduate School of Engineering Science,  
Osaka University

*Yutaka Kano*

### 2. Outline of the Graduate School of Engineering Science

In the modern world, progress in technology is founded on the achievements in science, and these advances must be supported by continually developing technology. Technology and science are thus tightly knit together. The necessity of reflecting on this situation in research and education, particularly at Osaka University which is located in a major industrial area, was emphasized by Dr. Kenjiro Shoda while he was president of the university. Plans were laid out by Dr. Shoda to establish a new school for this purpose, rather than to extend the School of Science and School of Engineering which had their own separate aims. Through his efforts and those of former university President Dr. Shiro Akabori, together with support from the industry in and

outside of Osaka, the School of Engineering Science came into existence in April 1961, and the Graduate School of Engineering Science was opened in April 1964.

The School and Graduate School are unique in name and character in Japan. Their purpose is to develop scientists with a keen interest in practical technology and engineers with a firm grasp of the basic sciences, who may use their expertise to develop new technology.

In April 1997, the departments of the Graduate School of Engineering Science were reorganized by restructuring the old departments into four departments: "Physical Science", "Chemical Science and Engineering", "Systems and Human Science", and "Informatics and Mathematical Science".

In April 2002, some groups in "Systems and Human Science" and "Informatics and Mathematical Science" moved to the newly founded graduate schools of Osaka University: Information Science and Technology, and Frontier Bioscience. They play important roles in education and research of these new areas.

In April 2003, Graduate School of Engineering Science was reorganized in order to create new research fields in the multi- and inter-disciplinary areas. The new Graduate School of Engineering Science has three departments: "Department of Materials Engineering Science" dealing with physical and chemical materials from a unified view point of materials science, "Department of Mechanical Science and Bioengineering" dealing with mechanical science and bioengineering from the view point of applied mechanics, and "Department of Systems Innovation" dealing with electronics, systems and mathematics from the view point of system creation.

### 3. Historical Sketch

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>School/Graduate School of Engineering Science<br/>Established in</p> <p>1961 — Department of Mechanical Engineering<br/>Department of Chemistry<br/>Department of Electrical Engineering<br/>Common Chairs (Mathematical Science)</p> <p>1962 — Department of Control Engineering<br/>Department of Material Physics</p> <p>1963 — Department of Chemical Engineering</p> <p>1964 — Graduate School of Engineering Science<br/>Mathematical Science Course<br/>Physical Science Course<br/>Chemical Science Course</p> <p>1967 — Department of Biophysical Engineering</p> <p>1970 — Department of Information and Computer Sciences</p> <p>1992 — Department of Systems Engineering<br/>(reorganized from Department of Control Engineering)</p> <p>1996 — Department of Chemical Science and Engineering<br/>(reorganized from Department of Chemistry and<br/>Department of Chemical Engineering)<br/>Department of Information and Computer Sciences<br/>(reorganized from Department of Information and<br/>Computer Science and Common Chairs (Mathematical Science))<br/>Graduate School of Engineering Science was<br/>reorganized as follows:</p> | <p>Department of Chemical Science and Engineering<br/>Department of Informatics and Mathematical Science</p> <p>1997 — Department of Electronics and Materials Physics<br/>(reorganized from Department of Electrical<br/>Engineering and Department of Material Physics)<br/>Department of Systems Science<br/>(reorganized from Department of Mechanical<br/>Engineering, Department of Systems Science and<br/>Department of Biophysical Engineering)<br/>Graduate School of Engineering Science was<br/>reorganized as follows:<br/>Department of Physical Science<br/>Department of Systems and Human Science</p> <p>2002 — Graduate School of Information Science and Technology<br/>Graduate School of Frontier Bioscience</p> <p>2003 — Graduate School was reorganized as follows<br/>Department of Materials Engineering Science<br/>Department of Mechanical Science and Bioengineering<br/>Department of Systems Innovation</p> <p>2014 — Center for Science and Technology under Extreme<br/>Conditions<br/>Center for Promotion of Advanced Interdisciplinary<br/>Research</p> <p>2016 — Center for Spintronics Research Network</p> <p>2017 — Center for Industry-University Collaboration</p> |
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# Special Program of “Engineering Science 21<sup>st</sup> Century” In English Graduate School of Engineering Science, Osaka University

