This *English translation* is provided for the *information purpose only*.

# Application Guidelines for Doctoral Program in Biomedical Science and Engineering

## Special Selection for International Applicants

## October 2026 Enrollment

Graduate School of Biomedical Science and Engineering,
Hokkaido University

# Admission Policy

## Philosophy

Contribute to the realization of a healthy, long-lived society by promoting research on the development of new medical technologies utilizing cutting-edge science and engineering and by developing individuals who can pursue that research.

## Educational Goals

Under the four basic philosophies of Hokkaido University (Frontier Spirit, Global Perspectives, All-round Education and Practical Learning), the Graduate School of Biomedical Science and Engineering aims to cultivate individuals who possess advanced expertise, broad perspectives and a strong sense of ethics, who are able to contribute to the sustainable development of society as specialists in biomedical science and engineering, who possess outstanding knowledge and excellent research abilities, and who are able to meet the demand for sophistication and globalization regarding various issues related to medical technology, medical device development and the like.

## Desired Students

(1) Knowledge, skills, interest and motivation

- Desired students are those who are inquisitive and strongly interested in biomedical science and engineering and their underlying disciplines (science, engineering and medicine), and who have academic and research abilities necessary for these studies
- Desired students are those who are willing to contribute to the sustainable development of society as specialists in biomedical science and engineering by earnestly engaging in research utilizing the acquired knowledge and technology

(2) Thinking, judgment and expressive abilities

- Desired students are those with scientific thinking, ethics and logical thinking

(3) Openness to learning independently in collaboration with various people

- Desired students are those who are willing to work independently on research that helps the development of new medical technology in collaboration with people from various fields

What to learn before admission

For people with experience as full-time workers in society

Professional knowledge and skills related to medical care or science and engineering, practical leadership, and English skills sufficient for one to obtain internationally accepted information

For people without experience as full-time workers in society

Professional knowledge and skills related to biomedical science and engineering or medicine, science and engineering, practical leadership, and English skills sufficient for one to obtain internationally accepted information

## Basic Policy for Entrant Selection

(1) General entrance examination and entrance examination for working students

Entrants are selected based on the following:

- Paper on a given topic, specialized examination, external English proficiency test, and statement of purpose and research plan for knowledge and skills
- Specialized examination and statement of purpose and research plan for interest and motivation
- Paper on a given topic, specialized examination, and statement of purpose and research plan for thinking, judgment and expressive abilities
- Specialized examination for openness to learning independently in collaboration with various people

(2) Special selection for international students

Entrants are selected based on the following:

- Oral examination, external English proficiency test, and statement of purpose for knowledge and skills
- Oral examination and statement of purpose for interest and motivation
- Oral examination, and statement of purpose for thinking, judgment and expressive abilities
- Oral examination for openness to learning independently in collaboration with various people

| Entrance exam classification | Knowledge, skills, interest and motivation | | Thinking, judgment and expressive abilities | | Openness to learning independently in collaboration with various people | |
|---|---|---|---|---|---|---|
| General entrance examination and entrance examination for working students | ◎ | Paper on a given topic<br>Specialized examination<br>External English proficiency test<br>Statement of purpose and research plan | ◎ | Paper on a given topic<br>Specialized examination<br>Statement of purpose and research plan | ○ | Specialized examination |
| Special selection for international students | ◎ | Oral examination<br>External English proficiency test<br>Statement of purpose | ◎ | Oral examination<br>Statement of purpose | ○ | Oral examination |

The mark ◎ indicates elements that are particularly important, and the mark ○ indicates elements that are important.

# Application Guidelines to Doctoral Program
# Special Selection for International Applicants
# (For enrollment October 2026 )

## 1. Major and Number of Students Admitted

Biomedical Science and Engineering: a few students

## 2. Qualifications of Applicants

Those who cannot arrive in Japan during the date of examination designated by Graduate School of Biomedical Science and Engineering, Hokkaido University and those who can obtain consent from the prospective supervisor prior to application. Applicants must satisfy either of the following requirements:

(1) Those who have been awarded or are expected to be awarded a master's degree or professional degree outside Japan by September 2026.

(2) Those who have completed the course of the United Nations University (hereinafter called "UNU") founded on the basis of the United Nations General Assembly resolution dated 11 December 1972 and stipulated in Article 1 Paragraph 2 of Act on Special Measures Incidental to Enforcement of the "Agreement between the United Nations and Japan regarding the Headquarters of the United Nations University" (Act No. 72, 1976) and have acquired master's degree or any other degree equivalent to master's degree or are expected to acquire master's degree or any other degree equivalent to master's degree by September 2026.

(3) Those who have completed an educational course at an overseas school, an educational institution which falls into the specification of above the UNU, have passed the examination or assessment stipulated in No. 16-2 of the Standards for the Establishment of the Graduate Schools, and have been certified as possessing academic ability equivalent to or greater than master graduates or are expected to be certified as possessing academic ability equivalent to or greater than master graduates by September 2026.

(4) Those who have been engaged in research at university, research institute or the like for 2 years or more after completion of a 16-year school educational course in a foreign country and deemed by our graduate school as having academic ability equivalent to or greater than master graduates on the basis of the outcome of the research and so on. (See Note.)

(5) Those who deemed by our graduate school under individual qualification review as possessing academic ability equivalent to or greater than master graduates or individuals possessing a professional degree and will be 24 years of age or older before 30 September 2026. (See Note.)

**Note:** Those who apply under Qualifications of Applicants (4) or (5), must undergo Qualification Review. Refer to "3. (6) Qualification Review" for further information.

## 3. Application Procedure

### (1) How to Apply

Applicants have to access the website designated by the prospective supervisor. The website will be notified to only applicants who can obtain consent from the prospective supervisor. Applicants have to send the original application documents listed in the following (3) Application Documents 1-8 to Student Affairs Office by post.

### (2) Application Period

**Online Registration:**

From 10:00 (Japan Standard Time), Wednesday, 10 June 2026 to 17:00 (Japan Standard Time), Friday, 12 June 2026

**Submission Deadline of Application Documents**:

17:00 (Japan Standard Time), Monday, 22 June 2026

Original application documents must arrive at Student Affairs Office by post.

**(3) Application Documents**

| | | |
|---|---|---|
| 1 | Application Form and Curriculum Vitae | Access the website and fill in your information. Print them out on A4 size paper. (210mm x 297mm) |
| 2 | Three Photo ID Card | Access the website, fill in your information, and print it out on three A4 size papers. Paste your photograph (full-face, applicant's name printed on the back, 4cm x 3cm) taken within 3 months before (2) Submission Deadline of Application Documents in the space provided. |
| 3 | Academic Transcripts | Must be issued by the university or college. |
| 4 | Statement of Purpose | Download from the website. Explain the following 3 points in English (800 words.): 1. Past Research Activities, 2. The motive for the application and 3. Future Goals. |
| 5 | Certificate of (expected) Graduation or Completion | Must be issued by a university/college president or Dean.<br>(For graduates, be sure that the certificate includes information on your degree).<br>*Those who graduated or will graduate from a university in China (excluding Taiwan, Hong Kong and Macau) must submit the following documents in addition to a Certificate of (Expected) Graduation (Completion) .<br>Graduates:<br>a. Online Verification Report of Higher Education Qualification Certificate（教育部学历证书电子注册备案表）<br>b. Certified copies of your Graduation Diploma（毕业证书）and Degree Diploma（学位证书）that has been authorized by your university/college<br>Expected Graduates :<br>a. Online Verification Report of Student Record（教育部学籍在线验证报告）<br>Obtain documents "a" above by requesting it at "中国高等教育学历证书查询": http://www.chsi.com.cn/xlcx/bgys.jsp.<br>Also be sure that there are 15 or more days left until the expiration date of the online verification at the time of its submission. |
| 6 | Score Sheet of External English proficiency test*<br>* It is preferable that you have earned a score of<br>69 or higher on the TOEFL-iBT,<br>521 or higher on the TOEFL-ITP ,<br>600 or higher on the TOEIC ,<br>5.5 or higher on the IELTS band score. | The original score sheet of one of the following (1) to (5). (score of the test you took after September 2024)<br>(1) TOEFL-iBT(*Test Taker Score Report and online submission)<br>(2) TOEFL-ITP (Level 2 and Digital Test unacceptable)<br>(3) TOEIC Listening & Reading Test (Bridge and S&W unacceptable)<br>For the TOEIC Listening & Reading Test submit the original score sheet or a printed PDF version of the digital official certificate.<br>(4) TOEIC-IP (Online unacceptable)<br>(5) IELTS (Academic Module)<br><br>*How to Submit (1)<br>Print a color copy of the PDF version of the Test Taker Score Report from the My TOEFL Home webpage. Submit this along with your other application materials when submitting your application documents. Additionally, please select the DI code listed below in My TOEFL Home to send your scores to our graduate school.<br>DI Code: G201 (Hokkaido University Graduate School of Biomedical Science and Engineering) |
| 7 | Copy of Passport | The page which your photo and passport number are shown. |
| 8 | (If applicable)<br>Consent to Transfer and Process Personal Data | Applicants from EEA must confirm the Handling of Personal Information on page 8-9 and submit their consent. The form will be sent by the prospective supervisor via e-mail. |

Other documents may be designated by Graduate School of Biomedical Science and Engineering, Hokkaido University and required to submit later as needed.

**(4) Payment of Examination Fee**

Follow the on-screen instructions after completing website registration, and pay the examination fee (JPY 30,000) by credit cards or Pay-easy. Please note that applicants have to pay transaction fee (JPY 500) besides examination fee (JPY 30,000).

Payment of examination fee is not required for applicants who wish to enroll on a Japanese Government (Monbukagakusho: MEXT) Scholarship, a Chinese Government (China Scholarship Council: CSC) Scholarship, or a Hokkaido University President's Fellowship.

Those who apply under 2. Qualifications of Applicants (4) or (5), must pay the examination fee after qualification review.

Examination fee is non-refundable unless:

1) The application was not made.
2) Application documents were not accepted due to the documents being incomplete.
3) Double-payments were made.

Please acknowledge that it takes considerable time for processing refund.

Please keep the receipt, as it is required when claiming the refund to Student Affairs Office.

**(5) Important Notice**

1) Online registration, payment of examination fee, and submission of application documents by post must be completed by (2) Submission Deadline of Application Documents.
2) Printers and Email address are required for online registration.
3) Application documents submitted will not be returned.
4) Application documents should be sent to Student Affairs Office by safe and reliable methods such as Express Mail Service (EMS). Late arrival due to postal accident will not be accepted.

**(6) Qualification Review**

Those who apply under 2. Qualifications of Applicants Qualification (4) or (5), must undergo individual qualification review. Applicants have to contact the prospective supervisor by email. Applicants have to send the original 2) Application Documents for Qualification Review 1-7 to Student Affairs Office by post.

**1) Application Period for Qualification Review**

**Submission Deadline of Application Documents for Qualification Review:**

17:00 (Japan Standard Time), Friday, 22 May 2026

Original application documents for qualification review must arrive at Student Affairs Office by post.

**2) Application Documents for Qualification Review**

| | | |
|---|---|---|
| 1 | Application Form for Qualification Review | Sent by the prospective supervisor by email. Fill in your information. Print them out on A4 size paper. Paste your photograph in the space provided. (Full-face, applicant's name printed on back, 4cm x 3cm, taken within 3 months before 1) Submission Deadline of Application Documents for Qualification Review.) |
| 2 | Academic Transcripts | Must be issued by the university or college. |

| | | |
|---|---|---|
| 3 | Certificate of (expected) Graduation or Completion | Must be issued by a university/college president or Dean.<br>(For graduates, be sure that the certificate includes information on your degree).<br>*Those who graduated or will graduate from a university in China (excluding Taiwan, Hong Kong and Macau) must submit the following documents in addition to a Certificate of (Expected) Graduation (Completion) .<br>Graduates:<br>a. Online Verification Report of Higher Education Qualification Certificate（教育部学历证书电子注册备案表）<br>b. Certified copies of your Graduation Diploma（毕业证书）and Degree Diploma（学位证书）that has been authorized by your university/college<br>Expected Graduates :<br>a. Online Verification Report of Student Record（教育部学籍在线验证报告）<br>Obtain documents "a" above by requesting it at "中国高等教育学历证书查询" : http://www.chsi.com.cn/xlcx/bgys.jsp.<br>Also be sure that there are 15 or more days left until the expiration date of the online verification at the time of its submission. |
| 4 | Score Sheet of External English proficiency test*<br>* It is preferable that you have earned a score of<br>69 or higher on the TOEFL-iBT,<br>521 or higher on the TOEFL-ITP ,<br>600 or higher on the TOEIC ,<br>5.5 or higher on the IELTS band score. | The original score sheet of one of the following (1) to (5). (score of the test you took after September 2024)<br>(1) TOEFL-iBT(*Test Taker Score Report and online submission)<br>(2) TOEFL-ITP (Level 2 and Digital Test unacceptable)<br>(3) TOEIC Listening & Reading Test (Bridge and S&W unacceptable)<br>For the TOEIC Listening & Reading Test submit the original score sheet or a printed PDF version of the digital official certificate.<br>(4) TOEIC-IP (Online unacceptable)<br>(5) IELTS (Academic Module)<br><br>*How to Submit (1)<br>Print a color copy of the PDF version of the Test Taker Score Report from the My TOEFL Home webpage. Submit this along with your other application materials when submitting your application documents. Additionally, please select the DI code listed below in My TOEFL Home to send your scores to our graduate school.<br>DI Code: G201 (Hokkaido University Graduate School of Biomedical Science and Engineering) |
| 5 | Copy of Passport | The page which your photo and passport number are shown. |
| 6 | (If applicable)<br>Consent to Transfer and Process Personal Data | Applicants from EEA must confirm the Handling of Personal Information on page 8-9 and submit their consent. The form will be sent by the prospective supervisor via e-mail. |
| 7 | Others | i) Those who apply under 2. Qualifications of Applicants (4)<br>Certificate of research experience issued by the enrolled university or research institute.<br>ii) Those who apply under 2. Qualifications of Applicants (5)<br>1. Research proposal. (800 words in English.)<br>2. Letter of Recommendation issued by supervisors or mentors of the enrolled university or research institute. (Free format.)<br>3. Certificates of academic ability equivalent to or greater than master's degree, or statement of academic achievements. (Such as scientific papers, books, and reports.)<br>iii) Other documents may be designated by the prospective supervisor as needed. |

**3) Announcement of Results for Qualification Review**

Results for qualification review will be notified to applicants by email by Monday, 8 June 2026.

After qualification review, eligible applicants have to see (1) How to Apply, and do necessary procedures. Applicants have to send the original Application Documents (3) 1) Application Form and Curriculum Vitae, 2) Photo ID Card, and 4) Statement of Purpose to Student Affairs Office by post.

**(7) Application Documents should be submitted to:**

Student Affairs Office,
Graduate School of Biomedical Science and Engineering, Hokkaido University
Kita 15 Nishi 7, Kita-Ku, Sapporo, 060-8638 JAPAN
Phone: +81-(0)11-706-5523
Email: d-tanto@med.hokudai.ac.jp

## 4. Selection Procedure

Admission shall be determined individually based on the comprehensive evaluation of online interview (Zoom interview), and application documents submitted. Online interview will be held in English or Japanese. Applicants must prepare equipment such as a web camera and the proper network environment for online interview **by 5. Examination Date and Time**.

## 5. Examination Date and Time

Designated date between Tuesday, 30 June 2026, and Monday, 6 July 2026. Detailed examination date and time will be notified to applicants by the prospective supervisor by email.

## 6. Announcement of Acceptance

A Letter of Acceptance will be sent to each successful applicant by email at 10:00 (Japan Standard Time) on Friday, 17 July 2026. And the original letter of acceptance will also be sent by post. Any inquiry by telephone or other source concerning examination result will not be accepted.

## 7. Enrollment Procedure

**(1) Registration Period**

From 9:00 (Japan Standard Time), Monday, 7 September 2026 to 17:00 (Japan Standard Time), Friday, 11 September 2026, on weekdays

**(2) Enrollment and Tuition Fees**

1) Enrollment Fee: JPY 282,000 (estimate)

Please note that it is not required for those who is granted a Japanese Government (Monbukagakusho: MEXT) Scholarship, a Chinese Government (China Scholarship Council: CSC) Scholarship, or a Hokkaido University President's Fellowship.

2) Tuition Fee: JPY 267,900 per half year (JPY 535,800 per year) (estimate)

Tuition of the first period should be paid using the bank remittance form sent from Graduate School of Biomedical Science and Engineering, Hokkaido University in middle of November 2026.

If the fee is revised, the new one will be adapted accordingly.

Payments of enrollment and tuition fees could be exempted or postponed. Further information will be included in the notification of enrollment procedure.

## 8. Important Notice

**(1)** Before filling in a column of the preferred field on the application for enrollment in 3. (3) 1) Application Form and Curriculum Vitae, refer to "Organization and main research contents at Graduate School of Biomedical Science and Engineering" and the following URL
https://www.med.hokudai.ac.jp/en/bme/laboratory-nav/course.html and consult your prospective supervisor about research contents and plan.

**(2)** Incomplete application documents and/or lack of documents will not be processed.

**(3)** Submitted documents are considered final and revision after submission will not be accepted.

**(4)** Enrollment may be cancelled at any time, should submitted documents be found to contain false information.

**(5)** Application documents must arrive at Student Affairs Office by post. Consider postal service situation and send early enough to be arrived. Late arrival after 3. (2) Submission Deadline of Application Documents will not be accepted.

**(6)** Any inquiry regarding examination and enrollment should be sent by email.

**(7)** Notes to foreign applicants the following

1) About your visa and residential status

Studying at Hokkaido University as an international student requires you to obtain a 'Student' visa. Please note in advance that the 'Certificate of Eligibility (COE)' needed for a 'Student' visa application may take more than 3 months to be issued after its application. Please refer to our university website https://intl-student-handbook.oia.hokudai.ac.jp/en/preparation-en/visa-en

2) About Security Export Control

(a) Hokkaido University conducts strict screenings on exporting goods and providing skills (including incoming international students) by establishing 'Hokkaido University Security Export Control Regulations (北海道大学安全保障輸出管理規程)' based on 'Foreign Exchange and Foreign Trade Act (外国為替及び外国貿易法)'.

(b) In case you are subject to our regulations, you may be restricted from learning or researching your desired fields of education.

(c) For further details of regulations regarding Security Export Control, please refer to the Ministry of Economy, Trade and Industry website: https://www.meti.go.jp/policy/anpo/

## 9. Handling of Personal Information

(1) All personal information collected by Hokkaido University will be completely protected in compliance with the Act on the Protection of Personal Information Held by Independent Administrative Agencies, and the EU General Data Protection Regulation (GDPR) pursuant to the Hokkaido University Regulations on Personal Information Management.

(2) Your name, address, and other personal information you provide to the university through application and individual admissions screening processes will be used solely for ① enrollee selection (application processing and the screening process), ② the announcement of exam results, ③ admission procedures, ④ surveys and research on enrollee selection methods, and ⑤ other related processes.

(3) The personal information in section (2) above will also be used after enrollment, only for those who pass the exam, for processes related to ① academic affairs (registration, academic guidance), ② student support services (health management, scholarship applications, dorm admission selection, welfare services, etc.), ③ job search support services, ④ tuition, ⑤ use of the university library, ⑥ use of information education facilities, ⑦ confirming your safety and communication in a disaster or emergency situation, and ⑧ public relations (distributing newsletters, information on events, etc.).

(4) Personal information contained in exam results will be used to conduct surveys and research on enrollee selection methods.

(5) For recruiting purposes, when we receive a request for information from the Hokkaido University Frontier Foundation (Kita 8 Nishi 5, Kita-ku, Sapporo, Hokkaido; Tel: +81-(0)11-706-2017) or Hokkaido University Athletic Union (Kita 17, Nishi 7, Kita-ku, Sapporo, Hokkaido; Tel: +81-(0)11-716-4815), the only personal information listed in section (2) will be provided for use within the scope of that organization's activities.

(6) The personal information set forth in (2) will be retained for five years from the next academic year of our acquirement.

(7) The university shall use Article 6, Paragraph 1 (a) of the EU GDPR as the basis for handling personal information and obtaining consent to use it. Personal information will only be used for the purpose for which consent has been given, except when required by laws and regulations.

(8) The consent set forth in (7) may be revoked at any time. However, this does not affect the legal handling of personal information before consent was revoked.

(9) Individuals who provide personal information may make the following requests to the university based on the EU GDPR and related laws and regulations:

① Disclosure of personal information, ② Correction of personal information, ③ Erasure of personal information, ④ Limitation of the handling of personal information, ⑤ Objection to the handling of personal information, ⑥ Transfer of personal information to other service providers

(10) If you have provided personal information within the European Economic Area, you may file an objection to a supervisory authority in accordance with Article 51, Paragraph 1 of the EU GDPR if you are dissatisfied with the university's handling of your personal information, etc.

(11) Some of the processes in (2)－(5) mentioned above may be outsourced by the university to a contracted service provider (hereinafter referred to as "contractor"). All or some of the personal information provided by applicants may be provided to the contractor only as needed to perform the tasks for which it has been contracted.

(12) This university is subject to Japan's Law for the Protection of Personal Information Retained by Independent Administrative Institutions, but not subject to adequacy decisions by the European Commission.

May 2026

Student Affairs Office,
Graduate School of Biomedical Science and Engineering, Hokkaido University
Kita 15 Nishi 7, Kita-Ku, Sapporo, 060-8638, JAPAN
Phone: +81-(0)11-706-5523

**Organization and main research contents at Graduate School of Biomedical Science and Engineering, Hokkaido University**

**Quantum Biomedical Science and Engineering Course**

| **Department: Particle Beams for Biomedical Science and Engineering** | | |
|---|---|---|
| 1 | Laboratory | **Radiation Oncology** |
| | Instructor | HASHIMOTO Takayuki, Professor<br>KOBASHI Keiji, Lecturer<br>NISHIOKA Kentaro, Assistant Professor |
| | Outline | Radiotherapy can be characterized by the possibility of preserving the function originally possessed by the living body and maintaining the function of individual patients through induction of disappearance of neoplasm/tumor, unlike surgical treatment which treats cancer by removing organs/tissues out of the body. Radiotherapy with X-ray and particle beam therapy with charged particles achieve treatment through utilization of the physical characteristics of these rays in medicine by means of scientific/engineering technology. Development of more practically useful and effective devices and therapeutic techniques will be enabled if we view and discuss the frontier technology of engineering and science on the basis of deep understanding of human body structure/function and medical/physiological viewpoints, focusing for example on dose concentration for the purpose of tumor control, dose reduction to normal tissues/organs to minimize adverse reactions and dealing with body and organ movements that always change their location under the influence of respiration, cardiac beating, peristalsis, etc. This laboratory is aimed at cultivating talents capable of contributing to improvement in disease curing rate and QOL (quality of life) of patients with cancer and other diseases through research on technology dealing with motion of organs during radiotherapy, research on particle beam therapy and development of new medical technology, as well as cultivating globally active researchers and educators on these topics. |
| 2 | Laboratory | **Radiation Medical Physics** |
| | Instructor | TAKAO Seishin, Associate Professor<br>YOKOKAWA Kohei, Assistant Professor |
| | Outline | Following recent improvement in the outcome of treatment thanks to advances in medical/scientific/engineering technology, the need to radiotherapy has been increasing remarkably. Among others, particle beam therapy, which applies accelerators to healthcare, is receiving much expectation as a means of minimizing the patient's physical stress through achieving dose concentration on the target cancer. Recently, the use of image guiding technology has made it possible to provide treatment in a way tailored to the patient's motions during treatment, morphological changes of the tumor, bioreactions and other factors. This laboratory is aimed at utilization of the technology of science/engineering (radiation physics, quantum beam applied engineering, image engineering, etc.) to healthcare. Specifically, in collaboration with the Hokkaido University Hospital Proton Beam Therapy Center, this laboratory will engage in development of irradiation technology/devices capable of reducing adverse reactions and improving therapeutic efficacy, development of image guiding technology incorporating detailed information about patient's motions and tumor's morphological changes, development of dose calculation/optimization techniques for realization of high precision treatment, and comprehensive education/research through links of medicine, science and engineering (verification of therapeutic efficacy, taking into account also the cellular level reactions, etc.). Through these activities, this laboratory will cultivate researchers of medical physics and engineers for medical device development. |
| **Department: Radiation for Biomedical Science and Engineering** | | |
| 3 | Laboratory | **Medical Applied Basic Physics** |
| | Instructor | AIKAWA Masayuki, Professor |
| | Outline | In medical fields, such as radiation therapy and particle therapy, a basic understanding of natural science, especially physics, can play an important role to solve problems and develop new technologies. For example, it is necessary to investigate probabilities (cross sections) of nuclear reactions systematically to accurately estimate the necessary amount of radioactive isotopes (RI) for medical care while minimizing unnecessary by-products. We focus particularly on charged-particle induced reactions, and experimentally measure production cross sections of the RI for medical use. In this manner, we train specialists to obtain new knowledge for medical care from the viewpoints of basic physics. |
| 4 | Laboratory | **Medical Physics and Engineering** |
| | Instructor | ISHIKAWA Masayori, Professor |
| | Outline | Although medical physics is an indispensable element for radiotherapy, it seems to be less mature in Japan than in other countries. In the United States, leading the world in terms of radiotherapy, each facility providing radiotherapy has medical physicists, who is in charge of quality control of radiotherapy and development of new radiotherapy techniques. In Japan, there is no sufficient environment for such active roles of medical physicists. Radiation measurement is a core |

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| | | technology not only for radiotherapy, but also diagnostic radiology and nuclear medicine. Expertise education on these topics is an element indispensable for cultivation of researchers in the field of medical physics and engineers engaged in development of radiotherapy devices. This laboratory will cultivate researchers and engineers capable of contributing to healthcare through development of clinically useful technologies, in collaboration with the Hokkaido University Hospital. |
| 5 | Laboratory | **Clinical Medical Physics** |
| | Instructor | SUZUKI Ryusuke, Assistant Professor<br>TAMURA Masaya, Assistant Professor<br>KANEHIRA Takahiro, Assistant Professor |
| | Outline | New discovery for the next generation can be achieved if problems with clinical practice are viewed as research seeds and attempts are made to find solution to such problems through utilization of the knowledge/skills of science and engineering. To this end, students will carry out research in areas closer to a hospital and check the ideas arising from such research through experiments, simulation, etc. at our laboratory, towards the goal of acquiring research capabilities leading to future radiotherapy and development of medical devices. In this laboratory, treatment plan quality for radiation therapy, research for effect of organ motion on radiotherapy, adaptive radiation therapy and other topics will be conducted as educational and research activities. In addition, development of novel technique and algorithm for real-time image guided radiation therapy will also be conducted. During the course of such activities, students acquire the capabilities needed for medical physicists. In this way, talents capable of contributing to the society will be cultivated. |

**Molecular Biomedical Science and Engineering Course**

| **Department: Biomedical Imaging** | | |
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| 6 | Laboratory | **Medical Image Analysis** |
| | Instructor | WAGATSUMA Kei, Associate Professor |
| | Outline | Nuclear medicine is a field of study that involves the administration of radiopharmaceuticals to the human body, the detection of the radiation emitted from within using imaging devices, and the acquisition of information on organ and tissue function and metabolism in the form of images and numerical data for diagnostic and therapeutic applications. In the field of medical imaging analysis, our research focuses on single photon emission computed tomography (SPECT) and positron emission tomography (PET) imaging in nuclear medicine. We employ advanced image reconstruction techniques, image processing methods, and AI-based deep learning technologies to generate high-quality images that enhance diagnostic accuracy, as well as to improve quantification in numerical data analysis. We have recently been advancing research on the standardization of amyloid and tau PET imaging, which serve as biomarkers for dementia, as well as the clinical application of state-of-the-art semiconductor PET and SPECT devices. As part of our commitment to nurturing the next generation of professionals, we are dedicated to training medical technologists and researchers who are proficient in nuclear medicine technology, as well as in image processing and analysis techniques. |
| 7 | Laboratory | **Integrated Molecular Imaging**<br>Note: Only Assistant Professor Mizuno is accepting new students enrolling in October 2026 |
| | Instructor | KUGE Yuji, Professor<br>MIZUNO Yuki, Assistant Professor |
| | Outline | For realization of diagnostic molecular imaging, it is indispensable to develop a probe (molecular probe) for conversion of molecular information of the living body into measurable signals. This laboratory is aimed at developing clinically applicable molecular imaging technology through research of new molecular probes, i.e., through exploration of functional molecules, designing of probes, development of probe synthesis technology and synthesis devices, and translational research using experimental disease models for clinical application. This laboratory is also actively conducting research on linking diagnostic molecular imaging technology to accurate treatment, that is, precision medicine and theranostics. Through these research and development activities, this unit will guide students to acquire necessary knowledge/skill systematically so that they can contribute to healthcare and society. |
| 8 | Laboratory | **Biomarker Imaging Science** |
| | Instructor | THA Khin Khin, Associate Professor |
| | Outline | In recent years, personalized medicine, which aims to provide the most effective treatment for each patient, has become increasingly important. Non- or minimally invasive imaging methods, such as MRI and CT, play a central role in treatment selection, planning, and evaluation of response and prognosis. Conventional image interpretation, however, has relied mainly on morphology, and establishing quantitative indicators that objectively and biologically capture disease mechanisms and predict outcomes remains a key challenge.<br>Our laboratory focuses on central nervous system disorders, using advanced quantitative MRI to |

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| | | discover and validate imaging biomarkers that reflect subtle structural and functional changes in vivo. In collaboration with clinical departments, we identify quantitative imaging biomarkers useful for diagnosis, disease mechanism elucidation, and prediction of treatment response and prognosis, while assessing their biological validity, reproducibility, and interpretability. We also study healthy participants to evaluate age- and diurnal-related variability and build normative reference datasets, providing a baseline for interpreting pathological changes.Education integrates traditional image reading with quantitative perspectives, training students to understand medical imaging comprehensively as a medical science |
| **Department: Biology for Biomedical Science and Engineering** | | |
| 9 | Laboratory | **Molecular Oncology**<br>Note: The laboratory name is scheduled to be changed in April 2027 |
| | Instructor | MATSUI Yuichiro, Associate Professor |
| | Outline | This research field is based on molecular biology and biomaterials engineering and focuses on interdisciplinary biomedical science and engineering aimed at tissue regeneration and disease control in the oral and maxillofacial region. In particular, the research targets defects of the jawbone and oral tissues associated with oral tumors, with the goal of regenerating bone and periodontal tissues lost as a result of tumor treatment. Through fundamental studies on biomaterial design, surface modification, regulation of cellular responses, and the development of materials with infection-control functions, we seek to elucidate the interactions between biological systems and materials. Molecular-level insights obtained from these studies are translated into the development of novel biomaterials and therapeutic technologies, thereby promoting translational research. Through these research activities, we aim to contribute to the advancement of next-generation regenerative medicine and to foster researchers and highly skilled medical professionals capable of advancing cutting-edge medical technologies. |
| 10 | Laboratory | **Molecular and Cellular Dynamics Research** |
| | Instructor | ONODERA Yasuhito, Associate Professor |
| | Outline | Radiation therapy is commonly used for treatment of cancer as one of the three major treatment modalities. However, as the underlying mechanisms for malignant properties of cancer cells are diverse and variable, the radiation effects and its molecular mechanisms on tumor and surrounding normal tissues still remain elusive. We have been investigating mechanisms inducing/suppressing the cell death in cancer cells, and the resulting unfavorable effects in tumors, which take place under the environmental stresses induced by therapy including radiation and also by cancer cells themselves. We especially focus on the roles of the three-dimensional cell/tissue structures, extracellular microenvironment, cell-cell communication and cellular metabolism, using the experimental techniques of biochemistry, molecular biology, cell biology and synthetic biology. Through the research and education program, we train students to be world-leading scientists and educators with great expertise in cancer research and experimental techniques. |