





HOKKAIDO UNIVERSITY Graduate School of Biomedical Science and Engineering Guidebook for the Master's and Doctoral Programs 2022

**Q** Search

#### | Inquiries ⊣

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# HOKKAIDO UNIVERSITY

# Graduate School of **Biomedical Science** and Engineering

Guidebook for the Master's and Doctoral Programs

2022







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# Goals of the Graduate School of **Biomedical Science and Engineering**

The Graduate School of Biomedical Science and Engineering features a new disciplinary direction integrating the biomedical science and engineering fields, aiming to apply the development of science and engineering to medical science, under the four basic principles adhered to by Hokkaido University: Frontier Spirit, Global Perspectives, All-round Education, and Practical Learning.

Biomedical Science and Engineering is a new field that aims to elucidate biological phenomena, overcome diseases, and promote the health of humans by utilizing knowledge and technology obtained in science and engineering.

#### Our Educational Goals Include Training for the Following Professionals:

- Professionals who will contribute to the sustainable development of human society with high-level specialty knowledge and an outstanding ethical perspective
- Professionals who will accommodate advances and internationalization in developing medical technology and equipment with extensive knowledge and strong research abilities

### To Achieve Our Educational Goals.

### We Have Established the Following Two Courses:

Quantum Biomedical Science and Engineering Course offering an opportunity to acquire a thorough knowledge as needed to apply basic radiation physics developed from quantum mechanics to medical science

### Molecular Biomedical Science and Engineering Course

offering an opportunity to acquire a thorough knowledge as needed to apply science and engineering to in vivo molecules in medical science

In both courses, you can expect an innovative integrated education for the basic knowledge and skills in the fields of science and engineering as well as a basic education in medicine and medical ethics, systematically provided by all the members of the graduate school faculty.

## Our Ideas for What Kind of Students We Wish to Enroll

We expect to enroll students who have strong interests in and curiosity about "biomedical science and engineering" as well as in the fields that form the basics of the courses (science, engineering, and medicine) and who are equipped with the solid educational foundations required for studies here. The students are also assumed to have aspirations to sincerely devote themselves to research by utilizing the knowledge and skills they acquire here, and work to contribute to the sustainable development of human society as specialists in biomedical science and engineering.

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Message from the Dean



Dean of the Graduate School of Biomedical Science and Engineering **KUGE** Yuii

Biomedical science and engineering is an academic discipline to elucidate life phenomena, overcome diseases, and improve human health by utilizing the knowledge and technology of science and engineering in medicine. The Graduate School of Biomedical Science and Engineering at Hokkaido University was established on April 1, 2017 with the aim of developing professionals capable of practicing biomedical science and engineering. The graduate school is comprised of (1) the Quantum Biomedical Science and Engineering Course to develop professionals who can apply specialized knowledge and skills of radiotherapy and particle beam therapy and related medical equipment to medicine, and (2) the Molecular Biomedical Science and Engineering Course to develop professionals who can apply specialized knowledge and skills of analysis and diagnostic imaging of in vivo molecular behavior to medicine

Medical progress can only be achieved by combining not only the results of medical research but also the results of various studies in science, engineering and other fields with the development of science and technology. Needless to say, radiology requires engineering research and the development of radiodiagnosis and radiotherapy equipment. Nuclear medicine diagnostic imaging, including PET examinations, also requires engineering research on diagnostic imaging equipment as well as many physical and chemical studies such as nuclear physics/chemistry related to the production of radionuclides and synthetic chemistry/pharmacy related to the production of radiopharmaceuticals. Faculty members in a variety of research fields, including not only medical fields specializing in radiology but also science fields specializing in nuclear physics, molecular biology, radiobiology and pharmaceutical science, and engineering fields specializing

Organizational Chart of the Graduate School of Biomedical Science and Engineering

Graduate School of **Biomedical Science and Engineering** Dean of the Graduate School of **Biomedical Science and Engineering** 

Division of **Biomedical Science** and Engineering



HOKKAIDO UNIVERSITY

Vice-dean

Faculty



in radiodiagnosis and radiotherapy equipment are involved in the educational and research activities at this graduate school. I believe this is the best environment for engaging in biomedical science and engineering education and research, which is focused on utilizing the knowledge and skills of science and engineering in medicine to elucidate life phenomena, overcome diseases, and improve human health.

I hope students who have studied biomedical science and engineering at this graduate school will play a leading role in Japan and the world as well as contribute to society and medical care through research on cutting-edge science and engineering applied to medicine, and development research of new medical technology and equipment. We look forward to your continued support and encouragement.

# FEATURES OF THE GRADUATE SCHOOL OF BIOMEDICAL SCIENCE AND ENGINEERING

In the Graduate School of Biomedical Science and Engineering, we have established two courses to meet student interests and the needs of their future careers: The Quantum Biomedical Science and Engineering Course to acquire the in-depth comprehensive knowledge required to apply the basic radiation physics developed through quantum mechanics to medical science, and the Molecular Biomedical Science and Engineering Course to acquire the in-depth knowledge required to apply science and engineering to in vivo molecules in medical science. These courses are offered with unique curricula exclusive to our school.

# **Interdisciplinary Subjects** / Course Work

- Lectures in interdisciplinary subjects for medicine, science, and engineering where students will acquire the basic knowledge and skills of these fields, in addition to a basic knowledge of medical science and medical ethics
- Productive course work for students with diverse backgrounds to complete the learning tasks systematically, ranging across multiple subject areas

# Support System for **International Students**

- At the Graduate School of Biomedical Science and Engineering, courses are provided in English in principle if international students attend the courses. Students can complete their programs only in English.
- Special selection for international students is conducted using Skype for those who have difficulty in visiting Japan for an entrance exam. (See p.9)

## Methods of Education and Research for Career Development

- Customized opportunities for all students to be provided with individualized research support through the collaboration of the staff of the science, engineering, and medical faculties
- Hokkaido University Hospital in-house training in subjects for medical professionals and medical engineers who will play active roles in medical settings as medical physicists
- Subject curricula designed to train technical experts able to conduct research and development of medical equipment, including the guality control aspects, through actual innovative development of medical equipment in collaboration with industry



Subjects where students can acquire comprehensive medical-related industry-academia-government relevant knowledge, where it differs from standard science, engineering, and biology. This includes the historical background to biomedical science and engineering, the importance of statistics grounded in the diversity of life, medical economics, and medical administration including the development of medical eauipment

# Developing Specialized Personnel with High Ethical Standards

• The subjects we offer will develop high ethical standards and provide the ethical knowledge required, including the basics of medical ethics, guidelines for clinical research and conflicts of interest, knowledge which is required for "research related to human beings" when conducting research and development of medical technology and medical equipment



# in medical physics and radiation biology in

universities and other relevant organizations

**Global Perspectives** • World leading intensive lectures for education cooperation with internationally renowned



Message from a Student

#### Wishing to Become a Medical Physicist

I learned about the profession of radiotherapy specialist, "medical physicist", through a lecture in my undergraduate studies. Having been interested in radiation therapy, I thought it would be the profession for me, and enrolled in the Graduate School of Biomedical Science and Engineering, which offers a medical physicist program. This program encompasses a variety of studies, included diagnostic imaging, radiation physics, and processes for developing medical devices. Studies in the program were challenging and interesting because of the difficulty and because I had opportunities to interact with students from different fields. With the support of others around me, I realized my longed-for dream and passed the examination for medical physicist. To become a medical physicist, I also need clinical experience, and I plan to gain this experience in a doctoral program.

In the master's course. I proposed improvements to Auto-Planning, which automatically optimizes the radiation treatment planning, and quantitative goals for the treatment planning. With this study we can improve the quality and efficiency of treatment planning.

For the future, I wish to engage in clinical work as a medical physicist to be able to perform high quality radiation treatment

April 1 2017

Establishment of the Graduate School of Biomedical Science and Engineering, Hokkaido University



Real-time-image Gated Proton Therapy

# 2014

Completion of construction of the Hokkaido University Hospital Proton Beam Therapy Center

Establishment of GI-CoRE (Global Institution for Collaborative Research and Education), a faculty organization under the direct leadership of the president of Hokkaido University

#### April 1 2020

Internalized the Global Station for Quantum Medical Science and Engineering of GI-CoRE into the Global Center for Biomedical Science and Engineering, Faculty of Medicine



# Quantum Biomedical Science and Engineering course



Students are expected to acquire a thorough knowledge of quantum biomedical science and engineering, which is necessary to be able to apply basic radiation physics knowledge developed from quantum mechanics to medical science, as well as specialized knowledge and skills in radiation therapy, particle therapy, and novel medical equipment related to these therapies. The training in this course will enable students to conduct international research, and play leading roles in the development of novel medical equipment and technology related to radiation and particle therapies.

#### Particle Beams for Biomedical Science and Engineering

#### **Radiation Oncology**



SHIRATO Hiroki. HASHIMOTO Takavuki. Associate Profes



KOBASHI Keiji, NISHIOKA Kentaro, Specially Appointed Associate Assistant Professor Professor

Radiotherapy is characterized by the possibility of preserving the original functions of the living body and by maintaining the patient's ability to function through the induction of the disappearance of neoplasms/tumors, unlike surgery which treats cancer by the removal of organs/tissues from the body. X-ray radiotherapies and particle beam therapies with charged particles achieve treatment by utilizing the physical characteristics of these rays by means of state-of-the-art scientific/engineering technology. The 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 a 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 how to deal with body and organ movements that result from respiration, cardiac beating, peristalsis, etc. This

laboratory aims to cultivate talented students who are capable of contributing to improvements in disease cure rates and quality of life (QOL) for patients with cancer and other diseases through research on technologies dealing with the motion of organs during radiotherapy, research on particle beam therapies and the development of new medical technology, as well as cultivating globally active researchers and educators on these topics.



Faculty Members of Department of Radiation Medical Science and Engineering

Highlighted Keywords innovative radiation therapy, medical physics for radiation therapy, image-guided, real-time tumor monitoring system

#### **Radiation Medical Physics**



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

TAKAO Seishin.





technology/devices capable of reducing adverse events 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



Hokkaido University Hospital Proton Beam Therapy Cente

P Highlighted Keywords

particle therapy, real-time tumor-tracking technique, image guidance technique

medical physics and engineers for medical device development.

### Radiation for Biomedical Science and Engineering

#### Medical Applied Basic Physics



In medical fields, such as radiation therapy and particle therapy, a deep understanding of natural science, especially physics, can play an important role to solve problems and to develop new technologies. For example, the systematic study of nuclear reaction probabilities (cross sections) is required to accurately estimate necessary amounts of medical radioactive isotopes (RI) while minimiz-

ing unnecessary by-products. We focus particularly on charged-particle induced reactions using accelerators. and experimentally measure production cross sections of such RI. We train specialists to conduct research for the public from the physics point of view and to obtain new knowledge

Metal foil used as target in experiments

#### P Highlighted Keywords radioisotope, nuclear reaction, activation cross section

required for medical fields.

#### Medical Physics and Engineering



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 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

### P Highlighted Keywords

#### **Clinical Medical Physics**



SUZUKI Ryusuke,



Highlighted Keywords

TAMURA Masaya,

through experiments, simulation, etc. at our laboratory, followed by translational research in collaboration with the industry, towards the goal of acquiring research capabilities leading to development of medical devices. 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.



Cross section of 169 Tm(d, 2n) 169 Yb

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



Radiation therapy system, real-time tumor monitoring system

dosimetry, radiation treatment planning devices, research and development of new algorithm, quality assurance technology

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 while adhering to the medical ethics. To this end, students will carry out research in areas closer to a hospital, and confirm the ideas arising from such research



Badiation therapy device and medical physics staff Hokkaido University Hospital



# Molecular Biomedical Science and Engineering course



#### **Biomedical Imaging**

#### Medical Image Analysis



and so on aimed at precisely collecting medical information from such visual data. Regarding tumor images, research is made on estimation of tumor malignancy and volume, estimation of the periphery of lesions, estimation of appropriate range of irradiation, correction of artifacts on images arising from respiratory motions and cardiac beats, and so on. Regarding images of myocardium and brain, compartment model analysis is carried out on serial dynamic images following a dose of contrast material or radioisotope for the purpose of quantitative evaluation of ischemic lesions and quantitative analysis of tissue blood flow, oxygen consumption, etc. Artificial Intelligence technology with deep learning is also adopted for analyzing medical image data. Talents capable of developing programs for achievement of these goals will be

This laboratory involves research on computerized processing

of images yielded from nuclear medicine tests (PET, SPECT (Single Photon Emission Computed Tomography)), CT, MRI



Discussion about quantitative analysis for blood flow and oxygen consumption in tissue

Highlighted Keywords medical image analysis, nuclear medicine examination, compartment model analysis, deep learning

radiation sensitizers.

#### Integrated Molecular Imaging

cultivated.

Assistant Profess



KUGE Yuji,

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 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. In addition, through these research and development activities, this unit will quide students to acquire necessary knowledge/skill systematically so that they can contribute to healthcare and society.



Prof. Kuge and Assistant Prof. Mizuno in front of PET·SPECT·CT for animal

P Highlighted Keywords

molecular imaging diagnostics, molecular probe design, molecular probe synthesis technology

#### **Biomedical Imaging**

#### Biomarker Imaging Science



Significant efforts have been/ are being paid to achieve "Personalized Medicine". Non- or less invasive imaging techniques such as MRI and CT are extensively used in selection of treatment methods, treatment planning and prediction/assessment of responses to treatment. This laboratory is carrying out researches that target at the development of high resolution and precision imaging diagnostics - which (i) pose little burden on patients, (ii) enable noninvasive detection of early subtle changes of the living body, and (iii) reflect not only morphological information but also the information on physiological changes of the body at cellular/molecular level. Education on normal radiologic anatomy and diagnostic radiology making use of these imaging techniques will also be provided.

P Highlighted Keywords biomarker imaging science, high precision imaging diagnostics, CT, MRI

#### **Biology for Biomedical Science and Engineering**

Assistant Professo

#### Molecular Oncology



YASUDA Motoaki Associate Professor

Correct understanding of the mechanism for carcinogenesis at the molecular level is necessary for sufficient control of cancer, the leading cause of death among Japanese people. Such understanding is indispensable for development of new cancer diagnosis/treatment methods. In recent years, thorough analysis of RNA including non-coding RNA has been advanced after the end of genome project, and the diverse relationships between carcinogenesis and RNA have been revealed increasingly. At this laboratory, new mechanisms for carcinogenesis are explored on the basis of molecular biological analysis covering RNA, viruses, etc., and systematical education/research, ranging from basics to applied one, will be provided concerning development of new cancer diagnosis/treatment methods making use of the findings from such exploration

## P Highlighted Keywords

### molecular biological analysis, development of new methods of diagnosis and therapies to deal with cancer

#### Molecular and Cellular Dynamics Research



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.

P Highlighted Keywords

cancer invasion and metastasis, vesicle trafficking, extracellular microenvironment, cell-cell interaction, cellular metabolism, radiation biology







Molecular biological analysis of RNA and RNA-binding protein in cancer cells

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



Cancer research using cell and animal models

#### Overview of the Program

#### Master's Program

Standard length: two years Long-Term Study: Working students may take up to four years, paying tuition for two years only.

#### Completion requirements

- study in the graduate school for at least two years
- having earned at least 30 assigned credits
- having received the required research instruction, master's thesis accepted, and passing an examination

#### Degree awarded

Master's degree (in Biomedical Science and Engineering)

#### Notes (Master's and Doctoral Programs)

#### Scholarship information

The graduate school does not have its own scholarship program. If you wish to apply for Japanese Government Scholarship for Overseas Research Students, inform the graduate school accordingly. For more information on the system, refer to the website below:

Japanese Government Scholarship for Overseas Research Students (Ministry of Education, Culture, Sports, Science and Technology website) http://www.mext.go.jp/a\_menu/koutou/ryugaku/06032818.htm

### **Doctoral Program**

- Standard length: three years Long-Term Study: Working students may take up to six years, paying tuition for three years only.
- Completion requirements • study in the graduate school for at least three years • having earned at least 10 assigned credits
  - having received the required research instruction, doctoral thesis accepted, and passing an examination (at least one basic
  - research paper as the first author accepted or published in an English-language journal)
- Degree awarded Doctor (in Biomedical Science and Engineering)

## \_\_\_\_\_

#### Educational programs

In addition to the regular curriculum, the graduate school provides the Medical Physics Educational Program (including the Rare/Pediatric Cancer Biomedical Science and Engineering Program) and the Medical Device Development Program (only master's program). A diploma is granted to those who have completed the programs (See p.11).



#### [Examination Process Flowchart]



- \* Finding a faculty member who hosts international students
- a desired faculty member

written by the faculty member carefully.)

2) Contact the graduate school

Send your Curriculum Vitae and previous studies as well as details of your desired research, study plan and faculty member to the Student Affairs Office of the Graduate School of Biomedical Science and Engineering by e-mail (d-tanto@med.hokudai.ac.jp). Please visit the website below to get the form of Curriculum Vitae.

URL: https://www.med.hokudai.ac.jp/en/bme/international-students/index.html

Note: For further details, please make sure to check the application guidelines on the website below https://www.med.hokudai.ac.jp/en/bme/admissions/index.html

1) Using Details of Laboratories and List of Faculty on the Graduate School of Biomedical Science and Engineering website for reference to search for (A mismatch between the research of the faculty member and the desired research of the student sometimes occurs. Check the website and papers





# Medical Physics Educational Program

#### What is a Medical Physicist?

A medical physicist in Japan is a medical professional who contributes to medical care from the standpoint of a specialist in medical physics by ensuring that medical care involving radiation is properly performed. In radiotherapy, medical physicists optimize treatment plans working with physicians, and conduct quality control and verification of the actual medical application working in concert with physicians, clinical radiological technologists, and radiotherapy quality control specialists. Medical physicists also confirm the accuracy of the position and doses administered to the patient body, ensuring that they are within the clinically required range, and that the treatment is performed as prescribed by the physicians. They also engage in medical physics research and development related to radiotherapy. For matters related to diagnosis and nuclear medicine, they work with physicians, ensure the maintenance of a clear balance between effectiveness and safety of diagnoses, and conduct quality control and verification of the diagnostic apparatus and images, working in concert with the clinical radiological technologists. They also engage in medical physics research related to diagnostic radiology.

1,371 medical physicists (as of December 2,2021) and 79 therapeutic medical physicists (as of April 1,2022) have been certified in Japan by the Japanese Board for Medical Physicist Qualification, and they are actively working in various fields including education, research, clinical settings, and research and development in industry.

#### About the Program

This has been accredited as a medical physics education course that meets lecture/clinical standards complying with the education curriculum guidelines set by the Japanese Board for Medical Physicist Qualification (JBMP). Those who have completed this course are given preferential treatment in gaining certification as a medical physicist.

The program includes the Master's Program, the Combined Master's and Doctoral Program and the Doctoral Program. The medical physicist examination is conducted in Japanese.

For more information about the curriculum, please refer to this page

(https://www.med.hokudai.ac.jp/en/bme/medical-physicists.html) on our website. And for further information about medical physicist examinations and accreditation as a medical physicist, please refer to the website of the JBMP (http://www.jbmp.org/english/).

#### Medical Device Development Program (Master's program only)

This program aims to train scientists who will be engaged in research and development mainly on diagnostic and therapeutic equipment using radiation. With the educational curriculum designed for acquiring advanced engineering knowledge, students must learn basic subjects related to the characteristics and functions of the human body as well as subjects related to biomedical engineering such as the influence of radiation on the human body, this knowledge is necessary for research and development of medical equipment. Students also have to learn applied subjects related to designing medical equipment, and handling of medical images and information. A "Certificate of Completion of the Medical Device Development Program" will be awarded to successful students

Please contact the academic affairs section of the graduate school (d-tanto@med.hokudai.ac.ip) for detailed information about the program.



# Message from a Certified Medical Physicist To Those Aspiring to Become Medical Physicists

I entered the doctoral program at the Graduate School of Medicine, Hokkaido University in 2016, the year before the Graduate School of Biomedical Science and Engineering was established. The curriculum of the Medical Physics Educational Program covers the content of the medical physicist certification exam, and I received ample training in clinical practice, especially quality control and assurance. I was also able to do medical physicist work related to real-time tumor-tracking and proton beam therapy, which are unique features of Hokkaido University. Such experience was not only helpful to prepare for the medical physicist certification exam, but also provided many insights for my own research

I completed the doctoral program in 2020 and am currently working in research and development of diagnostic medical devices at a company. Although my specialty within the field of medical physics has changed from radiation therapy to diagnostic imaging, the knowledge and experience I have gained through the Medical Physics Educational Program is used in many aspects of my daily work.



in March 2020 KWON Jihun





Message from an International Student

Don't overlook present opportunities and miss out on future success

I am enrolled in the doctoral program of the Graduate School of Biomedical Science and Engineering at Hokkaido University in Japan, which is one of the advanced countries in nuclear energy, industry, technology, and engineering in the world.

In recent years, radioisotopes and radioactive materials have been widely applied in nuclear medicine for both diagnosis and therapy. The main processes whereby medical radioisotopes and radioactive materials are produced, are through neutron activation, nuclear fission, charged particle-induced reactions, and radionuclide generators. Our research team focuses on the measurement of nuclear reaction cross-section (probability) in the production of medical radioisotopes using charged particle-induced reactions in cyclotrons. Our results contribute to expand the nuclear reaction database for optimization of the production routes of medical isotopes.

I realize that this program is of invaluable importance for my future career. I can truly recommend the Graduate School of Biomedical Science and Engineering at Hokkaido University as a key to professional knowledge, skills, one's future career, and success.

# Messages from the Former / Graduated Students



Design Division 3, Sony LSI Design Inc March 2020 graduate of Master's FUKUDA Shunsuke

#### Understanding the Joy of Manufacturing

I was interested in developing medical devices when I majored in radiation during undergraduate school, so I went on to the Graduate School of Biomedical Science and Engineering. My research theme during graduate school was the development of PET equipment that can be attached to radiotherapy equipment. In PET equipment, signal processing is performed by HW to process a large amount of radiation event information instantly, and my research activities focused on the design of signal processing circuits. I was able to work on this theme for two years and I believe this was a very valuable experience.

While I encountered numerous issues in design and development, that experience helped me expand the scope of my job search, which led to my current occupation as a circuit design engineer.

In my graduate school life, I learned the joy of manufacturing and was able to expand my job search options. I think this kind of experience is one of the appeals of the Graduate School of Biomedical Science and Technology.



Staff of the Medical Physics Educational Program SUZUKI Ryusuke (Specialized in Clinical Medical Physics / Medical Physicist

#### Number of International Students (Data as of March 1, 2022)

Distribution by Country/Region			
Area	Country/Region	Number	
Asia 6 students(75%)	China	4	
	Mongolia	1	
	Thailand	1	
Africa 2 student (25%)	Nigeria	1	
	Ghana	1	
TOTAL		8	

#### International Student Numbers by Graduate Program ( ):number of female students included

Master's Program	Doctoral Program
3(0)	5(0)

#### Methods of Financial Support

Japanese government	0
Self-Supported	8
TOTAL	8



#### Attractiveness of Fusion of Different Fields

I received my master's and doctoral degrees from the Graduate School of Biomedical Science and Engineering. Here I studied the mechanisms of cancer cell resistance to radiation at the molecular level. It was fulfilling to make discoveries that lead to further discoveries. I wish to remain at the university and contribute to advances in medicine through cell biological research.

The strength of this graduate school is that experts in the diverse fields from both biological and physical sciences collaborate to solve medical problems, and opinions can also be exchanged with those engaged in both basic and applied clinical research. Professors at the Graduate School of Biomedical Science and Engineering are enthusiastic about both education and research, and support students to cultivate expertise in their field, learn to conduct research, and obtain communication skills while working hard in a favorable environment. If you are interested, please feel free to visit the laboratory and see the research content, feel the atmosphere, and get to know the personalities of the members.









3 Faculty of Science, Main Bldg. (Medical Applied Basic Physics)





(Biomarker Imaging Science)





