Dream
Machine
Tohoku University

Web Page
http://www.mech.tohoku.ac.jp/e/

Department of
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Mechanical Engineering

Tohoku University

Sendai, JAPAN

TOHOKU
UNIVERSITY

2016.03

Introduction

Welcome to the Division of Mechanical Engineering, Tohoku University. Our division has been contributing to the human society by generating advanced academic knowledge and technologies, in particular, on the academic and industrial fields of energy system, manufacturing, mechanics, robotics, aerospace engineering, precision engineering, medical engineering, micro and nano-scale materials and devices and so on. You will learn the basic theories and technologies for structural design, selection of materials, design of production technologies, evaluation of characteristics and reliability of structures and materials, and so on. In addition, you are going to learn the basic procedure of the creation of new values : idea, interest, investigation, insight, and innovation, through the research and specific studies on mechanical engineering. Let's make great efforts for our safe and comfortable future!

Established in 1919
Treasures accumulated over 100 years.

100 Laboratories
Span a wide-range of research fields.

1,820
Total number of students in mechanical engineering division.

1/10
International students ratio

6:1
Student — Faculty
Students are well cared by sufficient faculties.

87%
Undergraduate students have advanced into graduate schools.

1,000,000 population
Sendai city : A metropolitan in northern Japan.

25 Countries
Students come from all over the world.

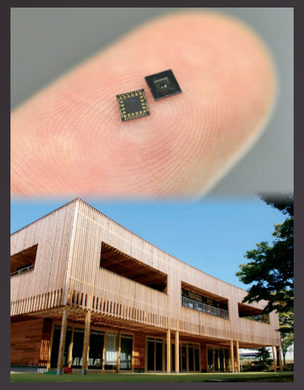
Keisuke Sawada
Professor, Chairman
Department of Aerospace Engineering

Activity

With abundance of achievement and success over past years,
all faculties and students in the Division of Mechanical Engineering are continuing
to be at the forefront of various innovative engineering fields,
aiming reaching a new height of excellence.

Span a wide-range of research fields.

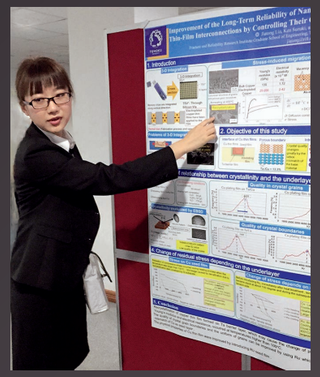
From nano scale materials, fine objects, to the environment and the space, a vast academic area provides infinite possibilities of study.



Touching cutting-edge researches through undergraduate program.

Following the Tohoku University's principles and tradition, students are conducting advanced researches using the state-of-the-art theories and facilities.

Active on the stage of scientific world.



A lot of students win it in an international society

A lot of students presented the international conferences and won various presentation awards.

Receiving a prize and activity in the international competition

Students challenged various international student competitions with excellent accomplishments.

Learning from world leading researchers.

Many our professors hold the important positions
in the internationalacademic societies.

Kazuhiro Kosuge
Professor, Tohoku University
IEEE Division X Director (2015-2016)
IEEE Robotics and Automation Society President(2010-2011)

Staff

I myself was once an international student here at Tohoku University's Division of Mechanical Engineering. Back then, as is the case today, the Division already offered a fantastic environment. From space engineering to nanotechnology, my own field, we have numerous labs. If you come here, you won't even feel like a foreign student and will fit right in our superb campus.

Gao Wei
Professor, Tohoku University
Nano-Metrology and Control, Nanotechnology
Department of Nanomechanics,
Graduate School of Engineering

Shahrukh Akhtar M

Major : Mechanical Systems and Design
Year : Undergraduate, 4th year
Lab : Micro-Nanomechanical Architectonics Lab.
Home country : Pakistan

Tohoku ranks within the world's top hundred institutes, according to the QS ranking, and within Japan's top five. My lab professor is very supportive and his room is always open for us. And Sendai is convenient and people are helpful. Life is very comfortable. So for those who are considering coming to Tohoku University,
I have this to say: Definitely come!

Wenchao Gu

Major : Applied Information Science
Year : Master's 1st year
Lab : Human-Robot Informatics Lab.
Home country : China

In Tohoku we get to experience many kinds of culture and freely explore our academic field, with kind guidance from professors. I am enjoying my time here. My advice to prospective international students is: It's a very good opportunity, so don't worry too much, just come! After Tohoku, I want to go to the United States for further research, maybe in software.

John Walker

Major : Aerospace Engineering
Year : Master's 3rd year
Lab : Space Exploration Lab.
Home country : Canada

The aerospace program in Japan is very high-tech and respected. At Tohoku University, there are many professors who have experience on Japan Aerospace Exploration Agency (JAXA) and other space projects and who can give professional advice. My most satisfying moment to date is when our own lunar rovers won the interim Terrestrial Milestone Prize in the Google Lunar X Prize competition.

Sirinda Khurewattanakul

Major : System Robotics
Year : Master's, 1st year
Lab : System Robotics Lab.
Home country : Thailand

To study in Japan was always my dream and the engineering course offered in English motivated me to come to Tohoku University. I am now studying how a robotic hand grasps a target object and developing an algorithm to plan for optimal grasp. After I finish my master's program at Tohoku, I plan on working in Japan as an engineer.

The present and the future of international students making a step forward in their careers at Tohoku University

Théo Dammaretz

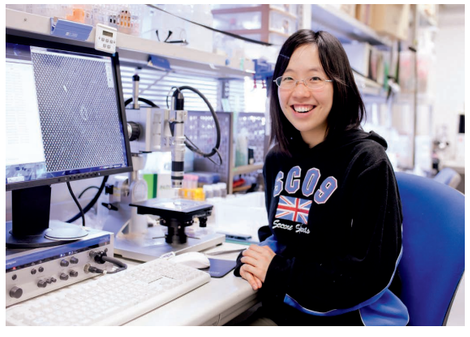
Major : Engineering / Robotics
Exchange students
Lab : Molecular Robotics Lab.
Home country : France

I wanted to study robotics among the world's best.
Tohoku University is a rich melting pot,
of experience and intelligence, and an amazing environment.
So don't think, just come here, it's awesome!

Lailatul Shahirah Mohd Saat

Major : Aerospace Engineering
Year : Undergraduate, 3rd year
Lab : Computational Aerodynamics Lab.
Home country : Malaysia

I enjoy a lot of things here.
The change in lifestyle between my country and Japan is refreshing.
And I am glad to be able to study in this university.



Li-Jiun Chen

Major : Mechanical Engineering (Biorobotics)
Year : Master's, 2nd year
Lab : Biomicromachine Engineering Lab.
Home country : New Zealand

All the professors and lab members are super nice and friendly, which is why I think I enjoy the university a lot. Sendai is also a very nice city.

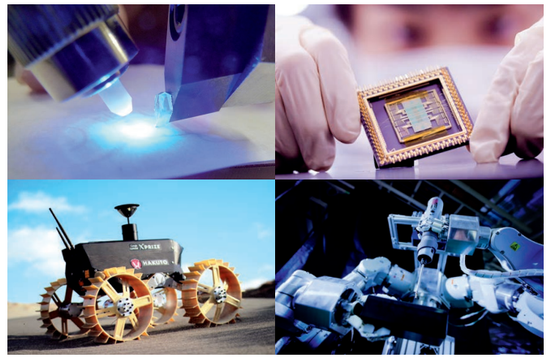
Sergey Bolotov

Major : Mechanical Engineering, Precise Machining
Year : Doctorate, 3rd year
Lab : Nano-Precision Mechanical Fabrication Lab.
Home country : Russia

This university has a very free atmosphere.
Here you are encouraged to think for yourself : that's the Tohoku style.
Also, Sendai is a fun city. You get to relax now and then.

Division of Mechanical Engineering Overview

The Division of Mechanical Engineering, Tohoku University has been heading for the new creation of smart energy and intelligent systems for sustainable and nature-friendly society. Our academic base consists of the integration of the conventional mechanical, materials, control and aerospace engineering with mechanical science, quantum science, life science and social science. All the students should open up a new field based on their new skills of multi-physics and engineering obtained from the interactive learning with the world-leading professors and colleagues from all over the world.



Undergraduate

Department of Mechanical and Aerospace Engineering

- Mechanical Systems Engineering
- Finemechanics
- Aerospace Engineering
- Quantum Science and Energy Engineering
- Robotics
- Environment and Energy Engineering
- Mechanical / Biomedical Engineering
- IMAC-U

Closely Related Organizations in Tohoku University

- Institute of Fluid Science (IFS)
- Institute of Multidisciplinary Research for AdvanceMaterials (IMRAM)
- Information Synergy Center
- Institute for Materials Research (IMR)
- Cyclotron and Radioisotope Center (CYRIC)
- Center for Interdisciplinary Research
- New Industry Creation Hatchery Center (NICHe)

Graduate

Graduate School of Engineering

- Department of Mechanical Systems Engineering
- Department of Finemechanics
- Department of Aerospace Engineering
- Department of Quantum Science and Energy Engineering
- Department of Robotics
- Fracture and Reliability Research Institute (FRRI)
- IMAC-G

- Department of Management Science and Technology

Graduate School of Information Sciences

- Department of Computer and Mathematical Sciences
- Department of syestem Information Sciences
- Department of Applied Information

Graduate School of Environmental studies

Graduate School of Biomedical Engineering

International Mechanical and Aerospace Engineering Course

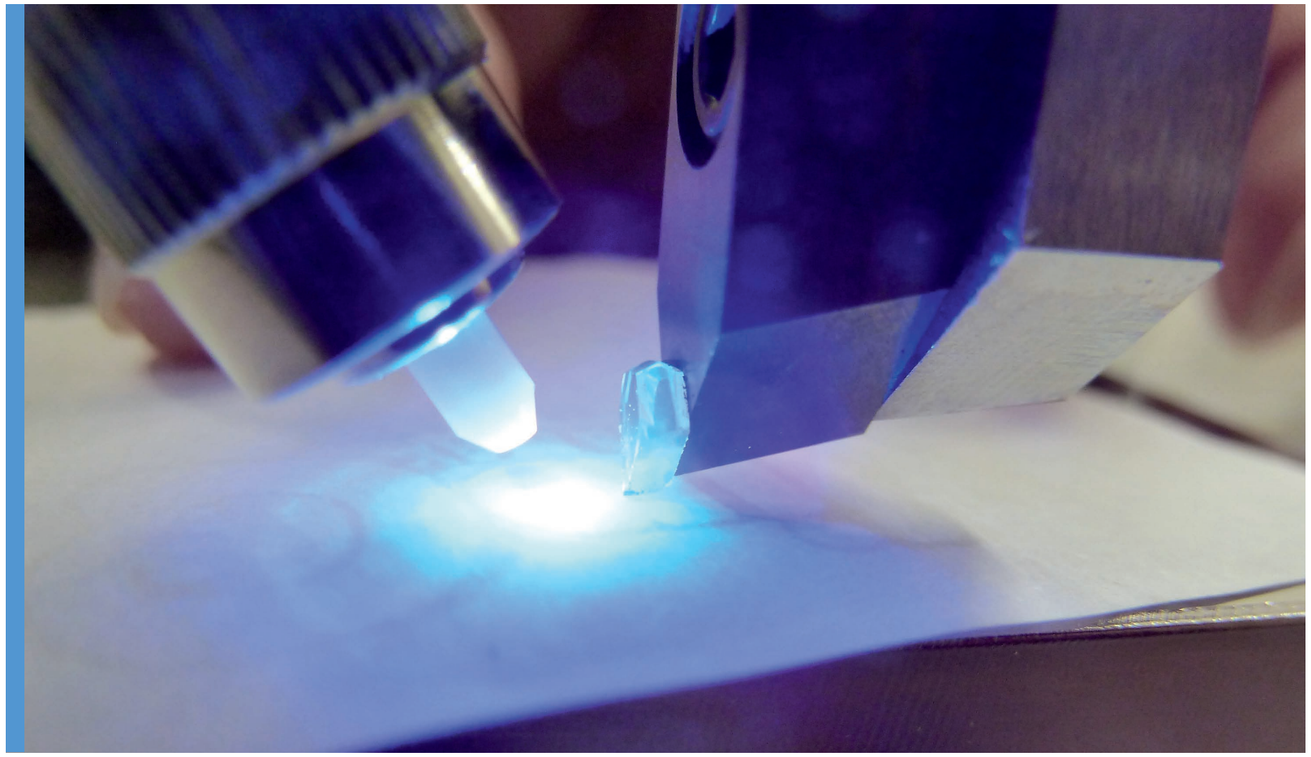
Degree Program taught in English

IMAC-U & IMAC-G

Offering Fundamental and Cutting-edge knowledge

IMAC-U was established in the Department of Mechanical and Aerospace Engineering in School of Engineering at Tohoku University. It consists of more than 100 laboratories covering a wide range study fields from fluid dynamics, thermal engineering, materials engineering, nanotechnologies, aerospace engineering, robotics, biomedical engineering, information science, quantum science and energy, to environmental study. Students are provided a world-class educational and research environment to study mechanics engineering and foster the international awareness.

The first Commencement ceremony of the October 2011 enrollment IMAC-U was held on March 25, 2015.



Department of
Mechanical Systems Engineering

The Department of Mechanical Systems Engineering is dedicated to research of development of mechanical system and new materials based on the surface and interface processing by nano-scale machining technologies; more environmentally friendly energy systems; fluid systems such as solar energy, hydrogen energy, and hydraulic power; and research on energy conversion systems using acoustic waves.

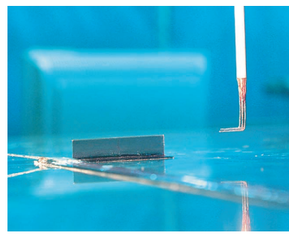
Laboratories

- **Functional Systems Engineering**
  Nano-Precision Mechanical Fabrication / Tribology and Nanointerface Engineering / Micro-Nanomechanical Architectonics
- **Energy Systems Engineering**
  Renewable Energy Conversion Engineering / Fluid Mechanics / Control of Heat Transfer

[Cooperative Laboratories]

Strength and Reliability for Advanced Energy and Environmental Materials (FRRI) / New Energy Systems Science(FRRI) / Electromagnetic Functional Flow Dynamics(IFS) / Heat Transfer Control(IFS) / Advanced Fluid Machinery Systems(IFS) / Energy Dynamics(IFS) / System Energy Maintenance(IFS) / Biological Nanoscale Reactive Flow(IFS) / Solid State Ionic Devices(IMRAM)

FRRI : Fracture and Reliability Research Institute
IFS : Institute of Fluid Science
IMRAM : Institute of Multidisciplinary Research for Advanced Materials

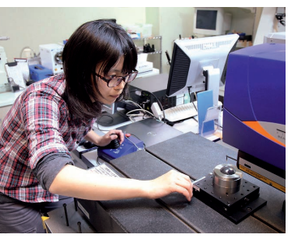


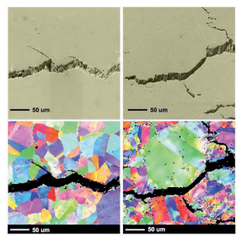
Department of
Finemechanics

The Department of Finemechanics has been committed to the research and development of innovative micro/nanotechnology ; precision manufacturing and sensing for mechanical systems, developments of materials and micro/nano systems integrated with micro/nanotechnology, and creation of micro/nano biomechanical/biological systems. Achievements are currently being applied to many engineering fields.

Laboratories

- **Materials Physics and Engineering**
  Intelligent Sensing of Materials / Intelligent Systems Engineering
- **Nanomechanics**
  Mechanics of Materials System / Precision Nanometrology / Optomechanics
- **Biomechanics**
  Biomechanical Engineering / Biological Flow Studies

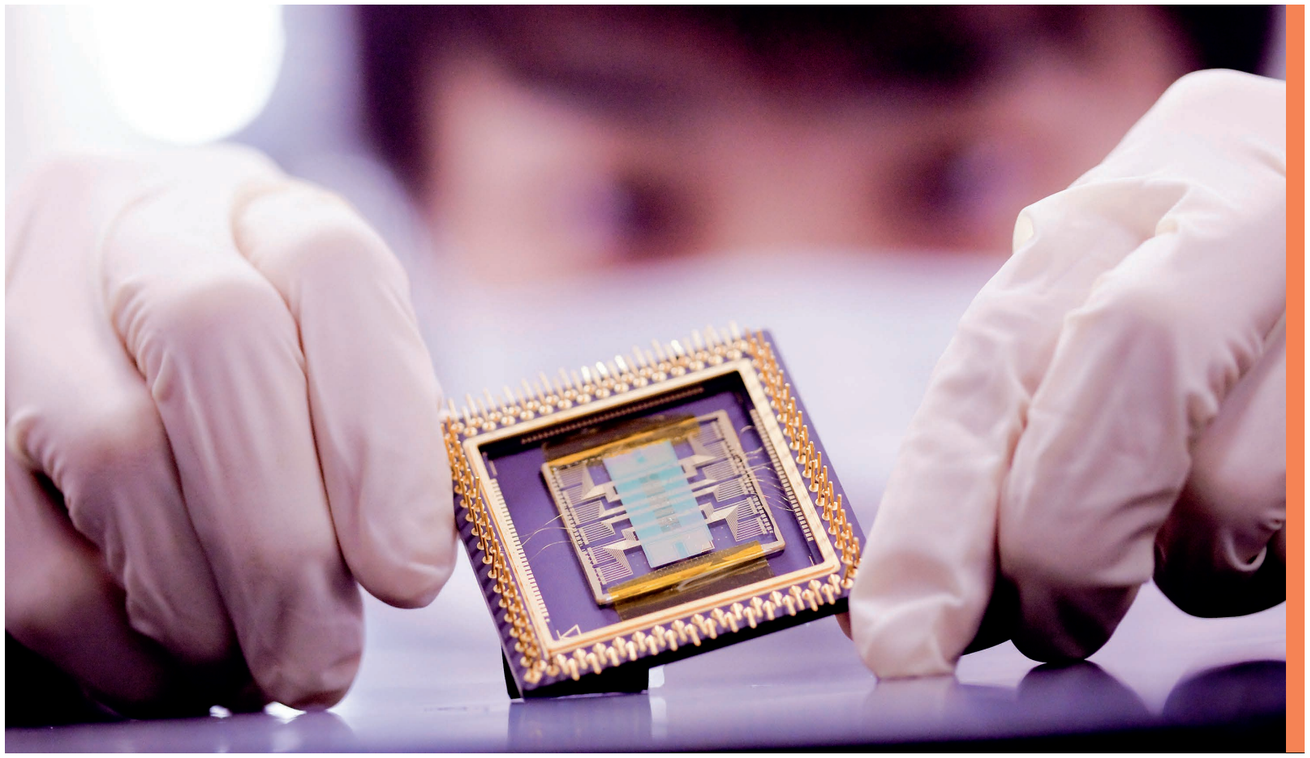


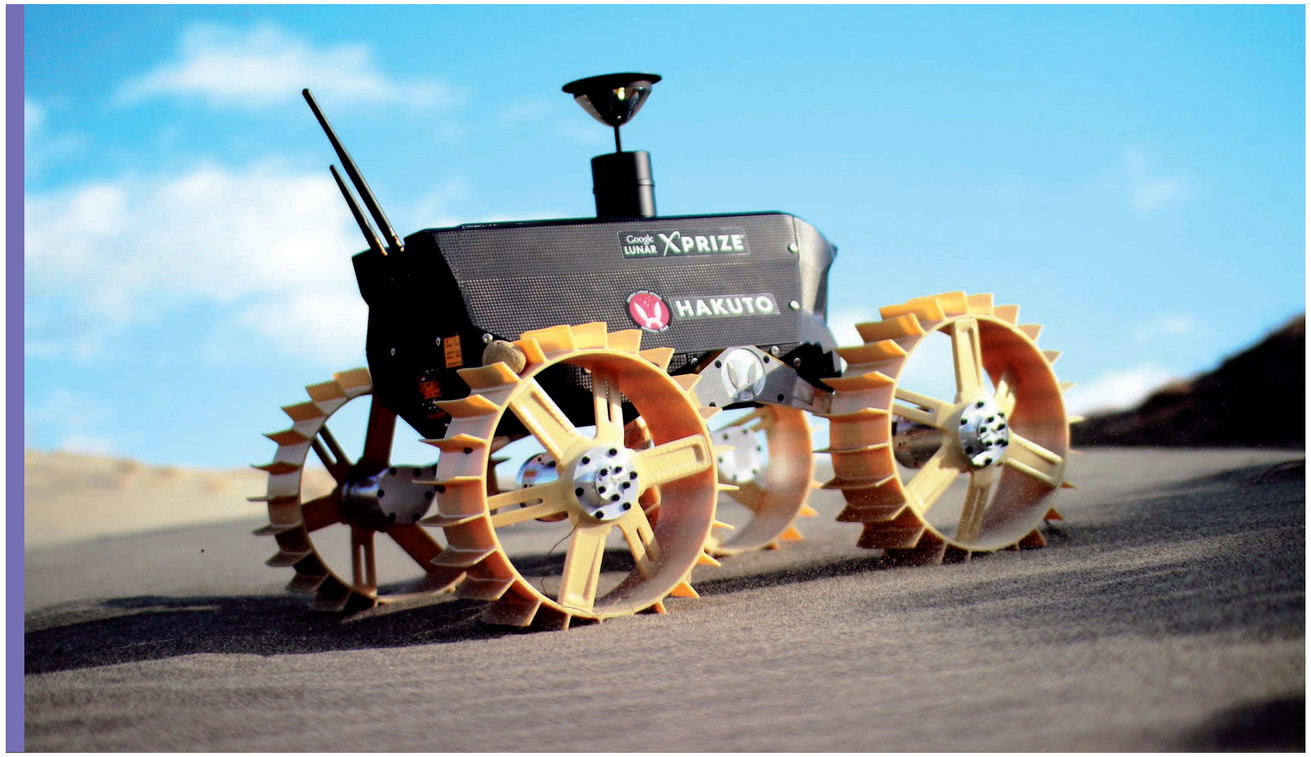


[Cooperative Laboratories]

Design and Evaluation of Function and Reliability of Materials(FRRI) / Advanced Electric Power Research(FRRI) / Nondestructive Monitoring and Evaluation of Damages of Materials(FRRI) / Theoretical Flow Dynamics(IFS) / Non-Equilibrium Molecular Gas Flow(IFS) / Molecular Heat Transfer(IFS) / Quantum Nanoscale Flow Systems(IFS) / Green Nanotechnology(IFS) / Integrated Simulation Biomedical Engineering(IFS) / Biomedical Flow Dynamics(IFS) / Molecular Composite Flow(IFS) / Surface Analyses by Electron and Photon Probes(IMRAM)

FRRI : Fracture and Reliability Research Institute
IFS : Institute of Fluid Science
IMRAM : Institute of Multidisciplinary Research for Advanced Materials





Department of Aerospace Engineering

Aerospace vehicles and rockets boast of the beauty that only sophisticated mega-systems have. There are certain machines whose design itself is science: for instance, interplanetary probes which enter the atmosphere at ultra high speeds, and space robots which explore faraway cosmic spaces. The research and development of aerospace vehicles are accumulated draws youths with ambitious dreams for the future.

Laboratories

- **Aeronautical Engineering**
  Aerodynamics Design / Computational Aerodynamics /
  Smart Systems for Materials and Structures / Experimental Aerodynamics
- **Astronautical Engineering**
  Space Structures / Propulsion Engineering / Space Exploration

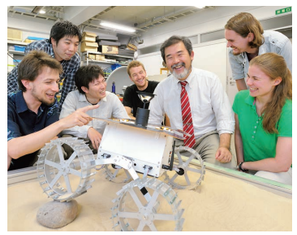
[Collaborative Laboratories]

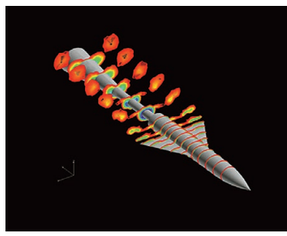
Next Generation Space Transportation Systems(JAXA)

[Cooperative Laboratories]

Aerospace Fluid Engineering(IFS) / Visual Informatics(IFS) /
High Speed Reacting Flow(IFS) / Cryogenic Flow(IFS) /
Complex Shock Wave(IFS) / Spacecraft Thermal and Fluids Systems(IFS) /
Field Robotics (NIChe)

JAXA : Japan Aerospace eXploration Agency
IFS : Institute of Fluid Science
NIChe : New Industry Creation Hatchery Center





Department of Robotics

For the creation of robots, the integration of varieties of technologies, such as mechanics, electronics and software, is required. Department of Robotics has two major research fields of Robot Systems and Nanosystem. Robot Systems laboratories are creating new types of robots and their control technology. Nanosystem laboratories are developing sensors, network devices, biomolecular systems etc. to build a smarter robotic systems and society.

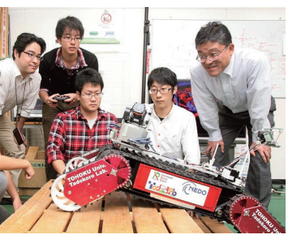
Laboratories

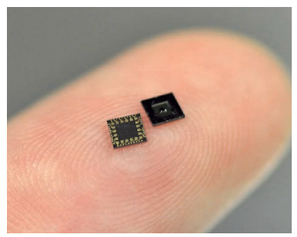
- **Robot System**
  System Robotics / Design of Intelligent Machines /
  Intelligent Mechatronics / Space Machines
- **Nanosystem**
  Smart System Integration / Molecular Robotics /
  Informative Nanosystems

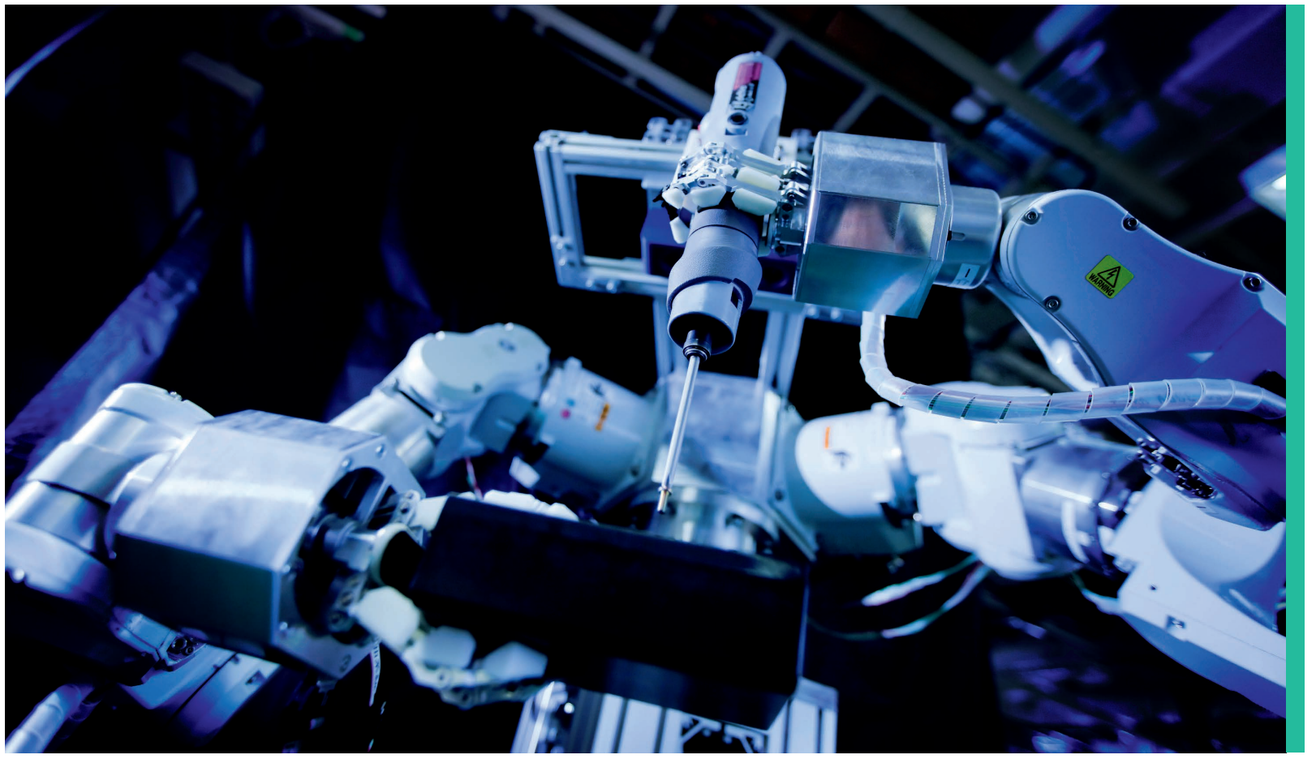
[Cooperative Laboratories]

Image Analysis (IS) / Human-Robot Informatics (IS) /
Intelligent Control System (IS) / Medical Welfare Engineering (ME) /
Medical Nanosystem Engineering (ME) /

IS : Graduate School of Information Sciences
ME : Graduate School of Biomedical Engineering







Department of
Quantum Science and Energy Engineering

http://www.qse.tohoku.ac.jp/english/

Students in this Department attain a deep understanding of the electrons, atomic nuclei and atoms making up matter at the quantum level, learn about their interaction with matter, and study quantum-level phenomena and the applications of them to such areas as medical diagnosis and development of new materials. They also study the principles and mechanisms of fission reactors and fusion reactors for controlling and making effective use of the energy produced by nuclear reactions. The studies therefore combine multiple disciplines, in a comprehensive program going from quantum phenomena to their applications.

Research fields

- Quantum Phenomena
- Nuclear Energy
- Fusion Reactor
- Radiation Applications
- Medical Diagnosis

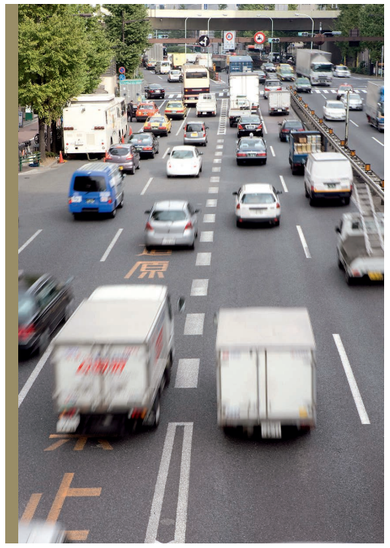
Graduate School of
Environmental Studies

http://www.kankyo.tohoku.ac.jp/en/index.html

This department is developing highly specialized research in order to resolve the largest issues facing humans in the 21st century: the problems of environment and energy. To achieve this, we strive to foster excellent students who have wide-ranging collective strengths, and conduct research and education on environmental science as an integrated science.

Research fields

- Humanity•Region
- Economics•Policy•Lifestyle
- Energy
- Recycle
- Materials
- Process
- Biotechnology•Biological devices
- Water•Geosphere
- Environmental Measurement•Evaluation



Department of
Management Science and Technology

http://www.eng.tohoku.ac.jp/english/academics/studies/graduate/mst.html

The MS&T has a strong focus on Sustainable Development Goals. In particular, Goal 7 of ensure access to affordable, reliable, sustainable and modern energy for all, and Goal 11 of make cities and human settlements inclusive, safe, resilient and sustainable are the specific targets in the department. Our mission is to give advanced solutions to contemporary society applying modeling, simulation and spatial data management.

Research fields

- Energy system design
- Environmental management
- Sustainable city design
- Transport planning
- Spatial data management

Graduate School of
Information Sciences

http://www.is.tohoku.ac.jp/index-e.html

This department studies information sciences in an interdisciplinary manner, particularly in conjunction with mechanical engineering, to expand the frontiers of science and engineering. The main themes of research include robotics, artificial intelligence, ultra-high speed information processing, computational fluid dynamics etc. We provide a high-level of education for those who want to transcend the field of mechanical engineering to be world-leading, interdisciplinary professionals.

Research fields

- Robotics
- Computer vision
- High-performance computing
- Computational fluid dynamics

Graduate School of
Biomedical Engineering

http://www.bme.tohoku.ac.jp/english/

This department strives to realize an affluent society based on a broad perspective on and deep knowledge of the integrated fields of medicine and engineering. The department provides a high-level of specialized education in order to foster students who can think for themselves, pursue research, and have the creativity and advanced research skills needed to develop and solidify science and technology within the areas of health and welfare.

Research fields

- Biomechanics
- Bio-interface Engineering
- Biomedical Devices
- Biofluid Control
- Medical Welfare Engineering