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東京大学工学部
FACULTY OF ENGINEERING
THE UNIVERSITY OF TOKYO

Editor's Note

What did you think of the Classes at FOE? The current COVID-19 situation requires that some classes be held online. We reported on classes just the way they have always been held so that everyone can look forward to this kind of brilliant classes when they are once again available when the COVID-19 situation has returned to normal and face-to-face classes can be held. Seminars and creative engineering projects have left me strongly feeling that not only are FOE students being taught, but they are also being trained to capably work with their hands to actively produce output. Hopefully this brochure has sparked your interest in the diverse scope of classes offered at the UTokyo Faculty of Engineering.

This issue is the first brochure to be published after reorganization. The effort required to actually edit the brochure has intensified my respect for our outstanding predecessors. I offer my sincere appreciation to the professors and students who were interviewed and all those involved in the production of this brochure. With the addition of new staff members, the Winter Edition will be delivered with an even more powerful appearance! Please be sure to check out our Archived Issues and the constantly evolving Ttime Web!

Please share your feedback!

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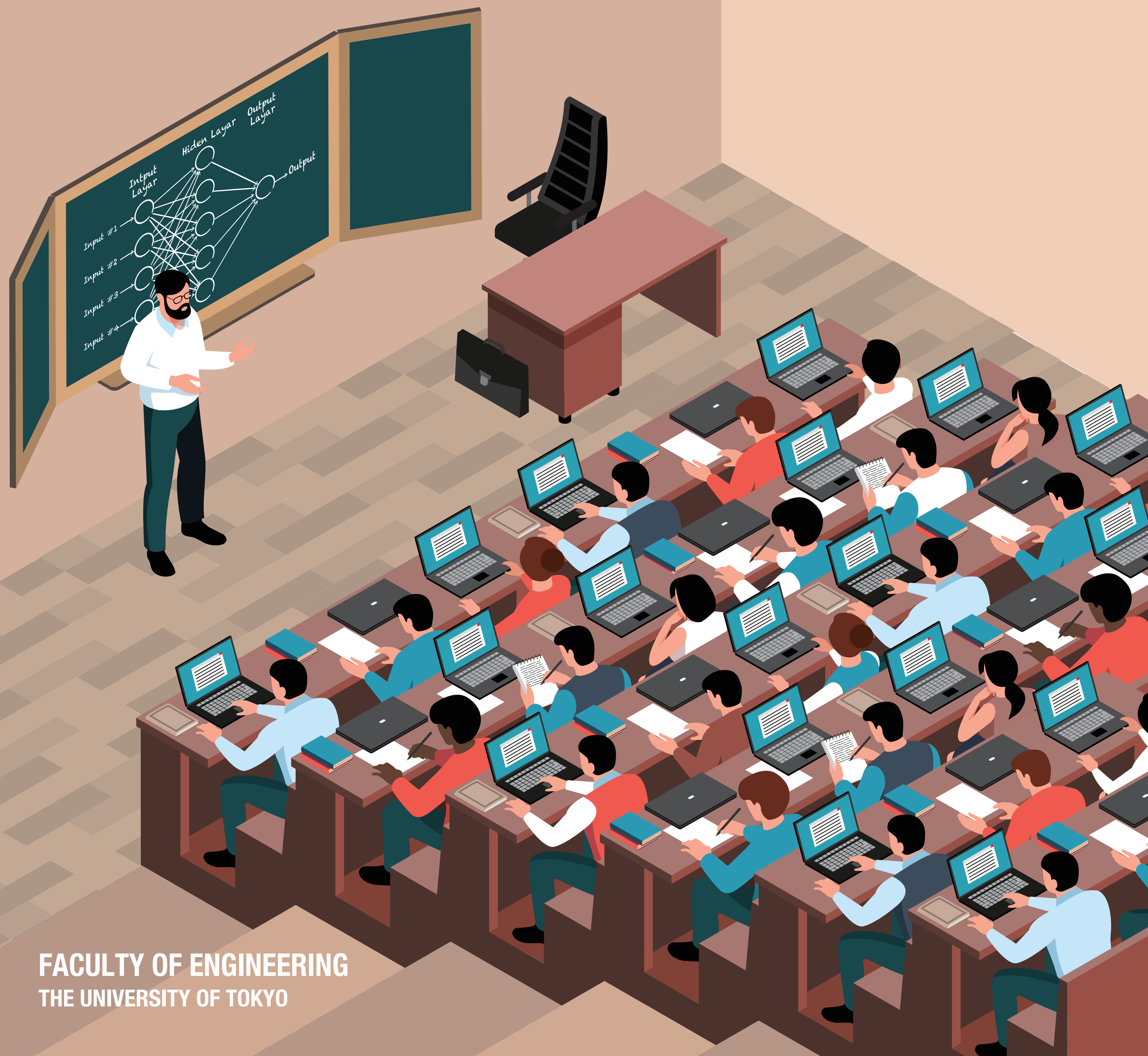
Student-edited UTokyo Faculty of Engineering PR Brochure

SUMMER 2021

Ttime!

Classes at FOE



FACULTY OF ENGINEERING
THE UNIVERSITY OF TOKYO

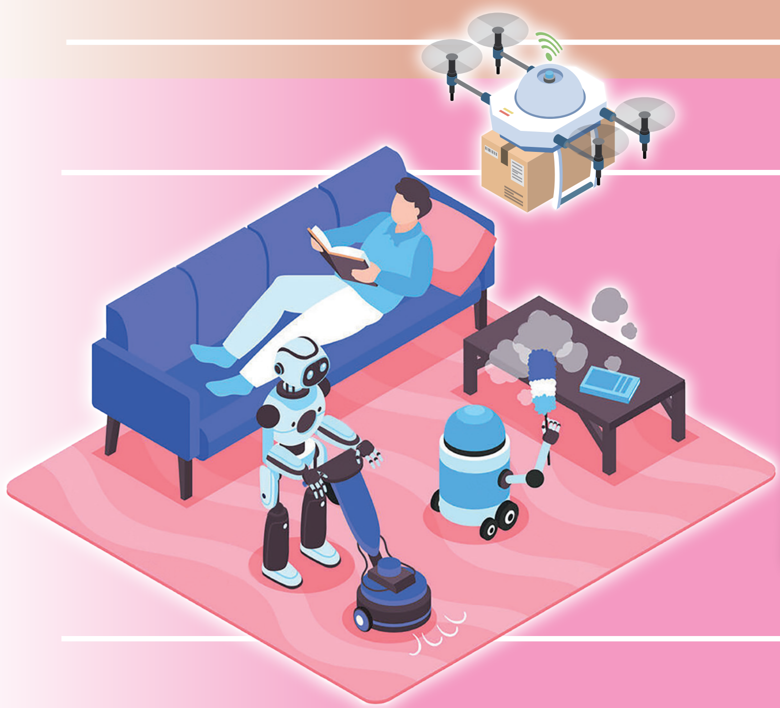
Classes at FOE

The theme for this Summer Edition is Classes at FOE. The UTokyo Faculty of Engineering offers a variety of classes in each department. Among those, we introduce three class styles: classroom lectures, seminars, and creative engineering projects. In classroom lectures, a style likely familiar to high school and Komaba students, teachers stand at a podium to present lectures. It also focuses on the research carried out by teachers, and how that relates to class content. In seminars, students leverage their classroom knowledge to conduct hands-on experiments and practical hands-on learning exercises. Seminars are a class style that better reflects the characteristics of each department. Creative engineering projects offer more practical hands-on learning than seminars do, and these classes are able to foster creative thinking abilities crossing departmental boundaries.

We are hopeful that the wealth of interesting classes, and above all the quality of knowledge to be gained, offered by the UTokyo Faculty of Engineering will greatly encourage high school students who still have only a vague idea of what university classes are like, and Komaba students who are still undecided about where they should continue their higher education. Only a small selection of UTokyo Faculty of Engineering classes has been covered here. May this booklet also inspire your interest in other classes.

Classroom Lectures

Seminars



Creative Engineering Projects

History and Philosophy of Science and Technology

Professor Emeritus **Masaharu Oshima**

Department of Applied Chemistry, School of Engineering

Class Overview

As can be seen from the History and Philosophy of Science and Technology title, this class covers a very wide range of topics related to technology. Simply put, there is no need for prior knowledge, nor is it necessary to memorize the content. This is because the class teaches ways of thinking, as opposed to knowledge. Class content will be explained in two parts.
The first is the history of science and technology and the philosophy of technology. This covers the historical development of science and technology from ancient times to present day. We will also learn what technology is and how it has been viewed philosophically.
The second is how technology and society are related. This includes the fields of the management of technology (MOT), theoretical perspectives for science communication, and the ethics of technology. In the management of technology, students learn how to manage technology. In theoretical perspectives for science communication, how science and technology experts should interact with other people is given consideration. In the ethics of technology, why scientific and technological misconduct or fraud occurs is discussed and students learn how to prevent it.

Class Content Excerpt: History of Science and Technology

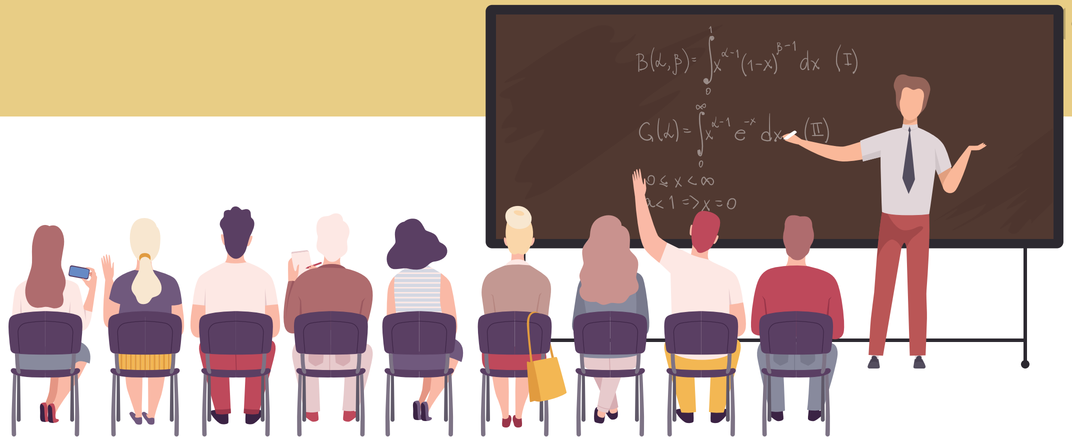
The history of science and technology is discussed in class with a focus on several questions. First, why were Homo sapiens the only ones to prosper? Europe was inhabited by Neanderthals about 300,000 years ago. Then, Homo sapiens appeared about 40,000 years ago. It is said that Homo sapiens' brains and bodies were smaller than those of the Neanderthals. However, Homo sapiens overcame the Neanderthals and spread throughout the world. Why did this result happen? The difference in communication skills between the two is thought to be the reason. While approximately 15 Neanderthals formed a group, the advanced Homo sapiens communication ability allowed them to form groups of approximately 150 people. This is how new knowledge and skills were able to be shared one after the other, and how their power as a group strengthened.
Another question addressed is why Europe dominated the world. Approximately 500 years ago during the Age of Exploration, Europe controlled countries all around the world. What was the 'cannon and sailing ship' technology that made this possible? Why did Europe, rather than China which also possessed advanced technology, rise to prominence? We also consider the relationship between technology and society as well as the view point of social structure. We also look at why the Industrial Revolution took place in England.
Let's also look at the current situation. IT companies including GAFA (Google, Amazon, Facebook, and Apple) and Alibaba currently dominate the world. Originally, these companies were venture businesses. Why, rather than in large enterprises, does innovation occur in newly established small companies and expand on a world-class scale? What brings an innovation-generating system into existence? These are analyzed from a technology management perspective.

Neanderthals and Homo sapiens

Race	Homo sapiens	Neanderthals
Arrival in Europe(Both originated in East Africa)	40,000 years ago to present day	300,000 to 40,000 years ago
Brain size	1,450 cc (efficient energy use)(Modern humans: 1350cc)Larger cerebellum proportion ⇒Superior memory and language skills (NIH report, USA)	1550 cc (massive energy consumption) Small cerebellum (Prof. Hagiwara, UTokyo)
Group formation capability	Maximum of 150 people; many children	Approximately 15 people
Body type (build, muscles)	Slender (energy saving) Can walk for long periods	Stout (requires 1.2 times the energy)
Language capability	High, cognitive revolution	Low
Hunting technique	Includes spear throwers (atlatl)	Spears (easily injured by prey)
Traits	Creativity; cognitive ability;symbolic behavior, can eat anything(inquisitive people survived); furprocessing (used bone needles to make clothing)	

Might differences between these two lead to male and female differences?

From the presentation materials



Why We Study

A variety of examples are used in History and Philosophy of Science and Technology when covering the history of technology and the relationship between technology and society. Then, why do we study this content? The reason is to get everyone to consider how to improve Japan through technology. Science and technology in Japan is in the world's top class. However, the fact is that it has not yet become world-best technology. I think the reason for this is that we have pursued superior technology without giving enough consideration to its relationship with society. That is to say, thinking about how technology can be used to improve the nation and society is important. Unfortunately there are numerous examples of 'successfully developing technology but failing in its wide adoption'. I hope young people studying technology will maintain this kind of perspective. To get students to put this into practice, I have them give in-class presentations on the theme of how technology can improve Japan.

So, what should we do?

1. Respond to technology and market changes
・Do not make the same mistakes Asia did 500 years ago

2. Prepare for the Fourth Industrial Revolution
・Understand and cope with the impact of disruptive innovation (all in the USA)

3. Overcome big company disease
・With an awareness that 'the more successful a company is, the more dangerous it is' create a corporate culture fostering entrepreneurial spirit and sharp innovation!
・Disruptive innovation in Japan through venture support and deregulation
・From self-sufficiency to open innovation

4. Domestic industry restructuring and overseas M&A (Mergers & Annexations)

Globalization; international collaborative systems, Fumiaki Sato, "*Nihon no Denki Sangyo Shippai no Kyokun*" [Lessons from Japan's Electric Industry Failures], Asahi Shimbun Publications, 2017

From the presentation materials

A Message to High School Students

I want to tell you that everything you learn in high school will be useful in the future. Since I was a science major, social subjects such as world history and geography, or subjects such as art and music were not used for my entrance examinations. However, I feel that these subjects have been very useful to me. For example, world history knowledge allows me to quickly make friends with people from all over the world when I talk to them at international conferences. When I went to Turkey, my talking about the first president of Turkey made the local people very happy. Similarly, my knowledge of art and music has also helped me. When I travel for international conferences, I always make an effort to visit museums in the city. As well, social programs organized for conferences sometimes take me to concerts. Studying art and music has allowed me to enjoy these arts more and enrich my life.

A Message to Komaba Students

As a Komaba student, I sometimes wished I could study my major subject as soon as possible. However, in hindsight, I now feel that the time I spent in my Junior Division general education class has become a great asset. Now I put the utmost importance in life on cultural accomplishments. Nothing takes the place of the joy in appreciating good artwork or music, reading a good book, or having a discussion with a good friend. I think that my ability to feel this joy comes from having decided as a Komaba student that I would read a book each week in an effort to improve my education. I hope that studying general education classes at Komaba allows you to build a foundation that will enrich your lives.

History and Philosophy of Science and Technology reference books

Written by Toki Kobayashi

Professor **Ryohei Kanzaki**

Kanzaki-Takahashi Laboratory, Intelligent Cooperative Systems
Research Center for Advanced Science and Technology

Neurons and Brain

Don't you think that biology is too detailed to memorize? Expand your perspective and enjoy thinking about the whole biological brain system in the Neurons and Brain course. We spoke with those in charge, Professor Ryohei Kanzaki and Associate Professor Hirokazu Takahashi.

Associate Professor **Hirokazu Takahashi**

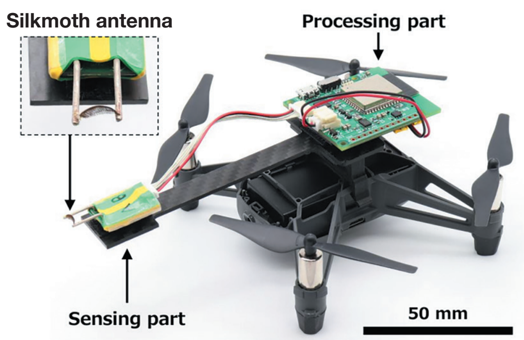
Department of Mechano-Informatics
Graduate School of Information Science and Technology

Course Content: What is Neuroethology?

Neuroethology is the study of how organisms acquire intelligence to adapt to their environment. This academic discipline also considers how mechanisms can be applied to engineering, linking biology and engineering. To live well in extremely complex and changing environments, organisms take in environmental information, process it in their brains and take action. This is the intelligence of living organisms. We tend to use our heads and think hard when trying to resolve engineering problems, but many times organisms actually come up with simple, unexpected resolutions. Although AI and machine learning are forms of intelligence, I would first of all like you to look at nature and study the cumulative intelligence that organisms have acquired over the last 3.8 billion years. To that end, the class focuses on the topics of the relationships between environments and organisms, and the overall system of organisms.

Related Research

Research on neuroethology, which links biology and engineering, helps to resolve issues that could not be worked out with engineering. For example, although engineering was for a long time unable to develop a high-performance odorant sensor, reproducing insect antennae mechanisms brought that device into existence. By genetically manipulating antennae, odorant sensors are able to respond to specific odors. Furthermore, recent information science and engineering developments have led to using a supercomputer to conduct research on reproducing an insect brain.



Drone equipped with a moth antenna as an odorant sensor
(Source: Terutsuki et al. (2021) Sensors and Acturators B)

Relationship between High School Studies and Class Content

The introduction of neuroethology research are on the high school biology textbooks as the environmental adaptation section. I hope this content helps you sense that the mechanisms enabling whole organisms to adapt to their environments are interesting. The field of biology is also related to a wide range of subjects studied in high school. For example, organism movement is related to physics, brain mechanisms are related to information sciences, and sensory organs are related to chemistry.

A Message to High School Students

I have three messages from a neuroethology perspective. Organisms are diverse. Each person has a highly individualized world. That is precisely why beginning with 'believing in your own world' allows you to think of other people. The second is 'to know and utilize your tokui-waza [personalized special skill] (individuality)'. Your personalized skill allows you to see your surroundings. Neuroethology research has progressed through the integration of professionals from differing academic disciplines such as biology, informatics, and engineering who make the best use of their individual strengths. Refining your skills and working with people who have different skills can create new value.
Finally, there is 'movement'. Movement allows your relationship with the environment to flow properly, and allows your brain to function correctly. Whenever you are worried, rather than closing yourself off in your own world, please try moving. Movement generates passion and you are bound to change.

Class Content: 'Reverse Engineering' of the Brain

In this class we try to understand the brain like a mechanical engineer would. When I was a college student, I couldn't understand biology textbooks that were written in English, so for a while I wondered what was so interesting about them. However, after learning machines dynamics and how they are controlled, when I picked up reading the textbooks once again and increased my understanding, I began to find the brain interesting. To begin with, even with the same brain can be understood in different ways depending on the perspective. So I decided to try to understand the brain as an engineer would. The way to do that is 'reverse engineering'※ of the brain. Simply expressed, you try to disassemble the brain like a machine. For example, if you take a radio apart, you can see the mechanisms for receiving radio waves and producing sound. Just like that, by breaking down the brain and examining its structure in various ways, we can discover how the brain works and infer why it works the way it does. The brain is amazing. The brain is a design solution for processing vast amounts of information in an energy-efficient mode.

※Reverse engineering: Disassembling a machine to understand how it works. When designing a machine or a thing, the first step is to decide what you want to make, then you think about how to make it, its mechanism and structure, and you draw a diagram; however since the procedure happens in reverse during disassembly, this is called reverse engineering.

Research Related to Class Content

I conduct diverse research projects related to the brain, and wondering what intelligence and cleverness are, I am studying the source of intelligence. For example, I am studying music and the brain. Part of this research was to play music to rodents and measure their brain activity. When the tempo of the music was changed or when they heard discordant harmony breaking into harmonic chords, surprisingly it was found that even rodent brains responded. Being involved in this kind of research makes me think that rather than humans creating music, it is the brain inherited from rodents that created music.

A Message to High School Students

React strongly, and understand in your own way. I was impressed when I first learned about DNA in a required basic biology course in high school. I still remember how impressed I was that such a mechanism transmits our genetic information. When studying for entrance exams, although making an effort to learn everything in great detail may be difficult, accumulate the basics one by one until you are able to understand, and cherish what you find interesting.

Written by Ayako Masuno

Aerodynamics 2

Professor **Kojiro Suzuki**

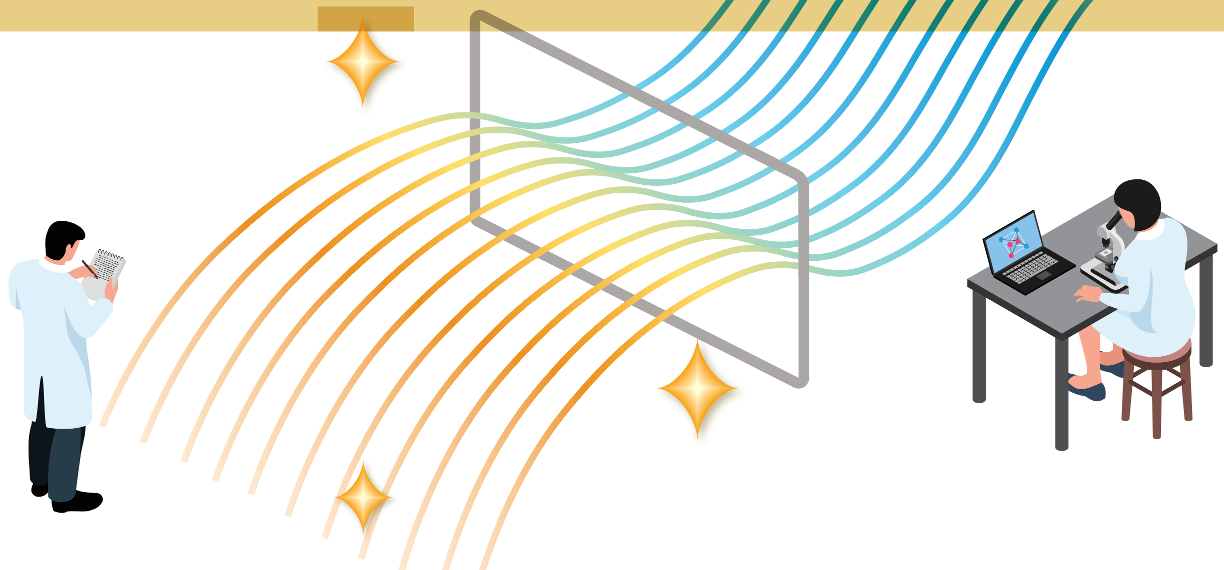
Department of Advanced Energy
Graduate School of Frontier Sciences
(Department of Aeronautics and Astronautics, FOE, part-time)

What is Aerodynamics 2?

Aerodynamics 2, as the name suggests, is a class on aerodynamics. This year-long class for third-year students is divided into classes A, B, C, and D, each of which corresponds with a term. I think the academic discipline for this class, aerodynamics, is rather difficult for students to adapt to. The reasons for this are not only because up until this class few opportunities exist to learn about aerodynamics in the normal education process, but also because aerodynamics deals with flow 'fields' that have no fixed substance. Therefore, the Aerodynamics 2 class aims to help students understand aerodynamics from a zero-based state without any prerequisite knowledge.

Content of Each Class

In the Aerodynamics 2A class held in Term S1, students focus on familiar phenomena such as whirlpools, modeling them one by one to grasp the essences shared among each of the phenomena. In this bottom-up approach, students intuitively learn the fundamentals of aerodynamics.
From the final part of A into the following B class we derive governing equations for fluids from conservation laws that universally hold, and confirm that these equations indeed explain the familiar phenomena. In contrast to the A class, a top-down approach is used in the B class to deepen the understanding of the fundamentals.
In the C class, we will primarily concentrate on the boundary layer flow that generates the friction drag on an aircraft. We will model boundary layer flow and discuss their properties from an engineering perspective.
In the D class, the final term of the class, everything learned so far is applied to computational fluid dynamics (CFD). One goal for this D class is for everyone to experience the excitement of their computer becoming a small wind tunnel experiment apparatus.

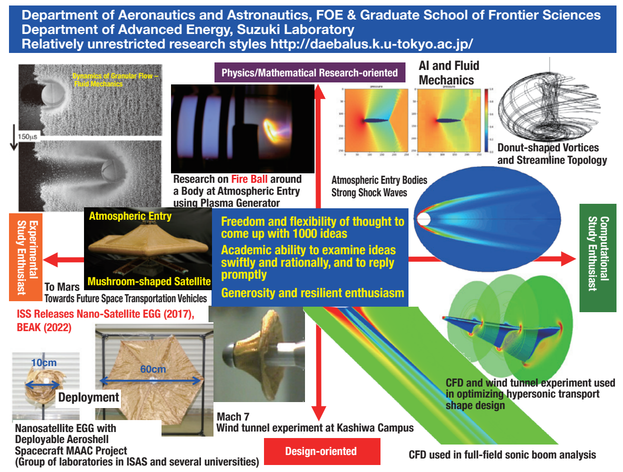


The Science of Fluids Concealed in Everyday Life

As we humans go about our lives, fluids are all around us. Whether it is the ordinary flow of water in the kitchen, the flow of water around river piers, or the whirling of fallen leaves in an eddy, the more we look in our daily lives for phenomena related to fluids, the more we find. Additionally, because fluid properties cause complex phenomena, many of the phenomena we notice are mysterious and unpredictable. I think trying to deduce the mechanisms behind these phenomena is very interesting. When I do that, I strongly sense that the world is full of interesting things.

Fluid Mechanics and Research

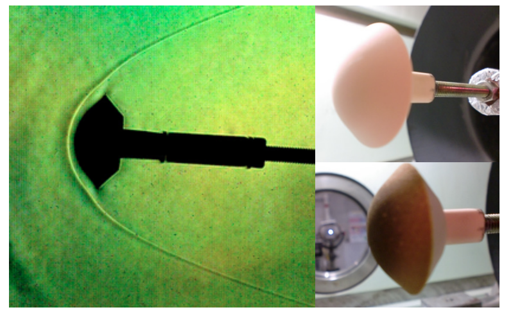
My laboratory deals with a wide range of research on aerodynamics. While some research emphasizes experiments, other research focuses on mathematical principles. Our research ranges from exploring the mathematical properties of fluid models to clarifying physical behaviors, such as the fluid mechanism that generates lift on airplane wings.
Furthermore, we also conduct research on design of objects in fluid flow. For instance, we are working on a new type of spacecraft that uses a deployable umbrella to decelerate during atmospheric entry, and we actually carried out an atmospheric entry experiment. Thus, that we are able to conduct research from diverse perspectives makes aerodynamics appealing.



Suzuki Laboratory explanation

A Message to High School and Junior Division Students

Aerodynamics is a discipline based on insights into natural phenomena. The reason is because with aerodynamics the behavior of natural phenomena is something that we can intuitively comprehend. So, there are no prerequisites for learning equations in order to comprehend aerodynamics. Your sense of natural phenomena is what will help you understand aerodynamics. Observing natural phenomena on a regular basis and sharpening that sense will help you understand aerodynamics. Above all, since observing and contemplating diverse complex phenomena are so interesting that they can make you attracted, I recommend it to everyone.



Kashiwa Campus Mach 7
Experimental simulation of flow around the Hayabusa capsule in hypersonic wind tunnel
Left: Shock wave visualization,
Right: (top) pre-test model, (bottom) post-test (burned by aerodynamic heating)

Access more information on the hypersonic wind tunnel homepage

An example of a wind tunnel experiment during a high school students' visit to the facility

Written by Isami Dainichi

Department of Aeronautics and Astronautics

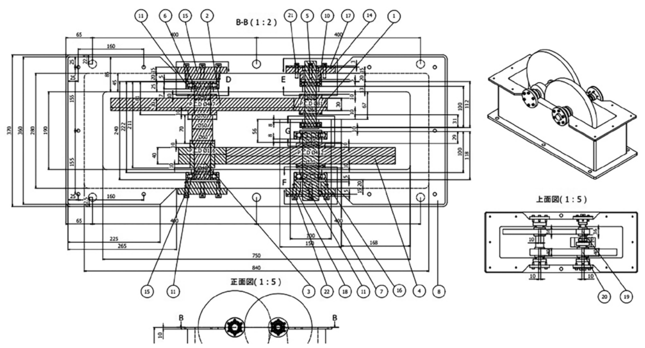
Shin Sakai

Fourth year undergraduate student
Department of Aeronautics and Astronautics, FOE

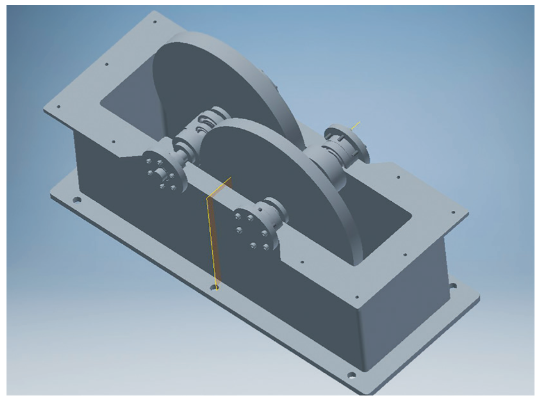
Aerospace Drawing 2･Drawing on Aerospace Propulsion

Aerospace Drawing 2 and Drawing on Aerospace Propulsion are compulsory seminars respectively taken in the first and second semesters of the third year.
First, in the Aerospace Drawing 2 seminar we learn about force transmission and safe component design through designing typical mechanical parts. Many students used CAD※1 when designing the parts. Among the things we learn in this seminar are what to pay attention to when designing mechanical parts, and what standards are useful to know.
Next, while drawing a single-cylinder※2 engine in the Drawing on Aerospace Propulsion seminar we deepen our understanding of the internal structure of an engine as well as our fundamental drafting knowledge. Students practice free-hand drafting and the teacher checks their drawings from time to time as deemed appropriate. In addition to the graduation thesis, the Department of Aeronautics and Astronautics requires a graduation design, and this seminar serves as a preliminary exercise for that graduation design project.
The most difficult part of both of these seminars was that prior to beginning I had no detailed knowledge about parts, engines, or CAD. For example, I had to figure out how to use the CAD system and identify the parts and lines in the drawings that were new to me. Yet, the good thing about these seminars is that studying them on my own improved my ability and I am grateful to have firsthand experience in the design stage of actual manufacturing. For most of the experiments conducted in the fourth year, the person conducting the experiment has to determine what experimental apparatus to use for the selected experiment, draw the plan, and order the apparatus from a manufacturer, and while designing the apparatus, rather than just transferring theory to the paper, visualizing the actual experimental process was a great experience for me.

※1 CAD: This term stands for Computer Aided Design, which is a computer tool used to support and improve the efficiency of design work formerly done by hand.
※2 Single-cylinder: This is an engine that has only one cylinder.



Drawing of a gear box



CAD

Short Course of Electrical Engineering Laboratory B

This laboratory class is an opportunity for students to acquire hands-on experience with electric circuits. This class runs for one-semester, and is divided into two halves. In the first half, we deepen our understanding of electric circuit properties and learned basic circuit design using hardware language to create various things utilizing electric circuits. In the second half, we were divided into groups and allowed to make whatever we wanted to make based upon everything we had learned during the first half. Our group made a strolling robot that followed a specified person. Other groups made a device that could play simple games and a radio controlled soccer robot. We had a hard time using unfamiliar tools in this laboratory class. For example, it took a while to get used to the hardware language that was used for part of the experiments because that differed quite a bit from the programming language we ordinarily use. On the other hand, I am happy to have been able to acquire practical crafting skills and electronic component knowledge.

Written by **Shuichiro Koga**

Department of Precision Engineering

Koji Tomofuji

Fourth year undergraduate student
Department of Precision Engineering, FOE

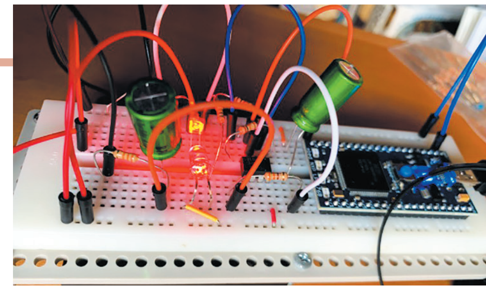
Please Tell Us About Department of Precision Engineering Seminars!

The Department of Precision Engineering offers five to six seminar classes a week for a year and a half, from the fall of the second year through the winter of the third year. Seminars are divided into design, basic, and hands-on exercises. In design seminars students learn how to use CAD (Computer Aided Design) software for designing and drawing on computers.
Students create crafts with ordinary materials such as paper and disposable chopsticks in basic seminars, so the classroom atmospheres resemble an elementary school arts and crafts classes. In hands-on exercise seminars, students make practical mechanisms and devices that are used in society. Since students work together on tasks, design and basic seminars in particular provide good opportunities to make friends with peers in the department.

What Seminar Impressed You the Most?

I made a pulse oximeter※ for class in a hands-on exercise seminar which left a great impression on me. Pulse oximeters are devices used in society in medical and healthcare settings, and merely seeing them used at first glance they appeared to be complicated and difficult to understand. However once I experienced making one myself, I was better able to understand the inner workings and came to think that it is a rather simple device.

※ Pulse oximeter: This is a device that uses light to measure heart rate and blood oxygen saturation.

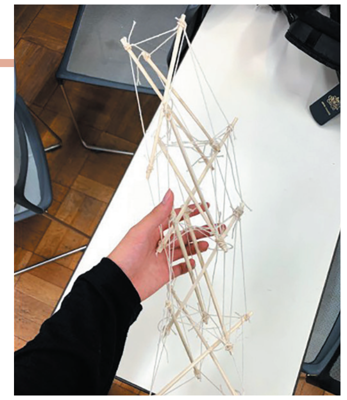


Pulse oximeter

Was There Anything in a Seminar that Didn't Go Well?

Almost everything went wrong (laughs). In one class in the basic seminar our instructions were, "Use paper and tape to make a regular polyhedron that rolls as easily as possible within the allotted amount of time." Increasing the number of faces makes it more like a sphere and it will roll more easily, but making too many faces takes too much effort to make and time will run out. I was too idealistic and couldn't finish in time (laughs). Other challenges included "Make a bridge with disposable wooden chopsticks and kite string, and make it strong enough to support several plastic bottles of water," and "Create a mechanism to roll a 500-yen coin smoothly out of a pop-up book," but more often than not, I failed.

Regular polyhedron



Bridge made with disposable wooden chopsticks and kite string

Please Share What You Learned from the Seminars

This is a fundamental philosophy of engineering, but I learned that not only is it important to achieve the goal, but at the same time to consider the effort and cost involved in achieving the goal. Just as working hard to make a regular polyhedron with too many faces will leave me out of time, since there is a trade-off between approaching my ideal and the costs required to do so, I have come to think in terms of striking a balance.

Written by **Koji Tokunaga**

Department of Information and Communication Engineering
Department of Electrical and Electronic Engineering

Ginshi Shimojima

Fourth year undergraduate student
Department of Information and Communication Engineering, FOE

OpenCV·GL Seminar

I took this seminar in the second semester of my third year. The content of the seminar was to learn how to use OpenCV and OpenGL, which are image and 3D graphics processing libraries※, and then to use them to create something of your own choice.
Inspired by a game I used to be obsessed by, I made a game I named the Brain Training Color Sorting Game. In this game, balls have to be dropped onto spots that are the same color. The top bar (red) is tilted by moving your face left and right while the lower two bars (light blue) are tilted by hand with a controller that has a built-in acceleration sensor.

※ Library: A collection of highly general-purpose programs in a reusable form.

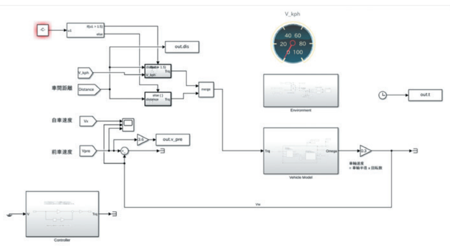
OpenGL is used for calculating the ball's elasticity and gravity, and OpenCV is used for calculations based on face recognition. We had a high degree of freedom in this seminar, and not only were we to incorporate what we had learned in the first half of the seminar, but also what we had learned in other classes, which made it tough to create the game. However, the hard work paid off as I was able to make the bars and balls on the screen move smoothly. At the presentation the fact that people in the same department were surprised and evaluated my work made me happy.

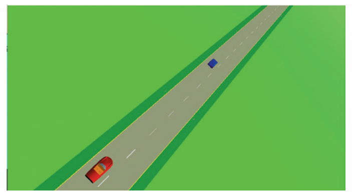
OpenCV·GL Seminar

Acceleration sensor

e2b Experiments

This is, roughly speaking, an experiment class about control. The most impressive thing about this experiment class was how generously the graduate student tutors supported us. In the first half of the class, graduate student tutors painstakingly taught us how to use MATLAB calculation software, and they prepared potential experiments to be carried out as developmental tasks in the second half of the class. Specifically, those included experiments on wireless power supply, drones, and experiencing controlling automatic driving. From among those, I selected the automated car control experiment. In it I attempted to simulate following a car in front of me while maintaining a proper distance. Although I had only just started learning about the field known as control in engineering, when I actually ran the simulator, I was surprised that MATLAB had made it possible for me to simulate precisely what I intended.
It should be noted that it is unusual for these experiments to be carried out in the first semester of the third year in that, like experiments held in the second semester, it is not based on a textbook, and students are allowed to select an experiment of their own to conduct. The final assignment for other experiments required submitting a final report, but since a presentation was allowed in lieu of the report for this experiment, I worked on my presentation. At that time, I had not been in the department for very long and since had not yet had a chance to speak in front of people in the department, I enjoyed this presentation.


e2b


e2b Experiments

Written by Shuichiro Koga

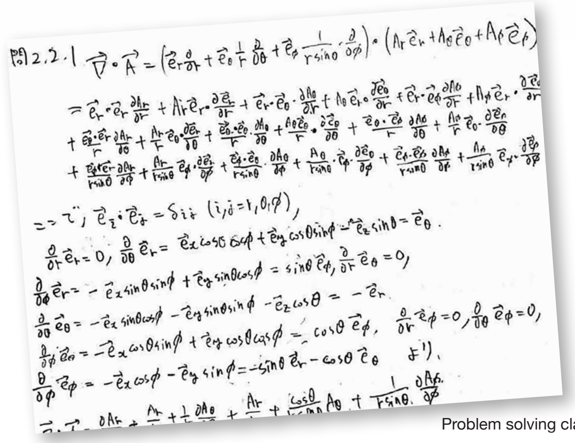
Department of Applied Physics

Hiroki Ogawa

Fourth year undergraduate student
Department of Applied Physics, FOE

What Kinds of Seminar Classes Does the Department of Applied Physics Offer?

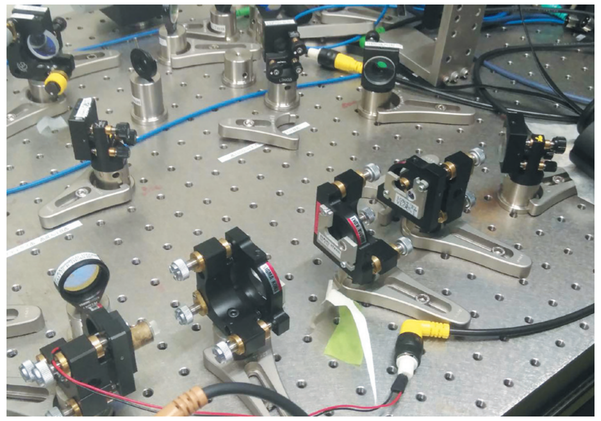
In addition to regular classroom lectures, the Department of Applied Physics (commonly called 'Bukkou') has problem solving classes and experiment classes. In problem solving classes, students solve physics problems before coming to class, and assigned students present their solutions to everyone. Since the Department of Applied Physics focuses not only on experiments but also on the study of theory, problem solving classes, in which students scratch out calculations by hand and develop their physics skills, are highly valued. Computing very long equations in the solutions is really hard work. Problem solving classes are rather like weight training for physics, and I think this kind of classwork is particularly unique to Bukkou (laughs).


Problem solving class notes

Please Tell Us About Your Experiment Classes

Experiment classes are held once a week and we have a full day of classes from morning to evening. Content ranges from basic experiments that allow us to reconfirm content learned in classroom lectures to highly specialized experiments conducted in Department of Applied Physics laboratories.
A particularly impressive experiment was one in which we observed a phenomenon called the 'optical rotation'※ of light. We used a detector to investigate what kind of change occurred to light when a laser beam was passed through an aqueous sugar solution and a quartz crystal that had a magnetic field applied to it. In this experiment, we needed to assemble a precise light trajectory inside the apparatus, and because the trajectory of the light would be distorted when a component was touched even slightly, making steady adjustments was really difficult work. Actually, this kind of light experiment apparatus is used in quantum computer research. After conducting this experiment, I came to feel that the most advanced research in physics is backed by humble and persistent work.

※ Optical rotation: This is a phenomenon in which the direction of light with a unidirectional orientation (linearly polarized light) rotates as it passes through a material.


Light experiment apparatus

What Did You Learn from the Seminar Classes?

The experiment classes have led me to fully realize that experiments do not always go as expected. In the previously described light experiment, the results we obtained at times differed from the theoretically assumed values, and explaining why that happened was difficult. After much discussion with the teacher, we ended up arguing that the cause might have been because the container for the water was dirty, but only the gods know the truth... (laughs).
Hoping to greatly impact future society, I am currently carrying out laboratory research on superconductivity. Although what I have learned in the experiment classes does not necessarily coincide with the research I will be doing in the future, I believe that having learned that experiments do not go as expected will undoubtedly be of use in my future research.

Written by Koji Tokunaga

Department of Mathematical Engineering and Information Physics

Shinichi Hemmi

Fourth year undergraduate student
Mathematical Information Engineering Course
Department of Mathematical Engineering and Information Physics, FOE

What Classes Does the Department Offer?

The Department of Mathematical Engineering and Information Physics offers around a total of 10 seminar classes. There are three major categories: those that require students to solve mathematical and physics practice problems to be presented in class; those that require students to implement data structures and algorithms in the C programming language; and those that require students to set up their own tasks based on a given theme, consider them, and write a report.

What are Examples of What You Worked on in Your Experiments?

Under the theme of graph centrality※ analysis, I chose Tokyo's rail network as my target, and implemented and analyzed graphs with Python. The urban rail network is viewed as a graph consisting of points (stations) and lines (routes), and by modeling it, graph theory methods can be applied to analyze the graph from multiple perspectives. In these graphs, quantified centrality can be seen as an indicator of, for example, the number of lines serving a station or the accessibility of other stations. Centrality graphs come in many different types, and one of these allows stations to be evaluated so that their 'centrality' scores will be higher when surrounding stations have higher centrality scores.

In another experiment, we simulated a physical phenomenon. The Chua circuit equation used here is difficult to analytically solve, and it behaves very differently depending on the initial values used. The equation of motion for a double pendulum is a classic example of this type of thing. To see what would happen with the equation for this circuit, several methods seeking approximate solutions were initially run through a computer. We then actually built a circuit and compared the current and voltage values obtained from the circuit experiment with the data from the preliminary computer calculations to verify that the results obtained from numerical solutions came close to the experimental results.

※ Graph centrality: This is an indicator of how central the nodes in a network are within a graph.

Fig. 1: Top degree centrality nodes, enlargement

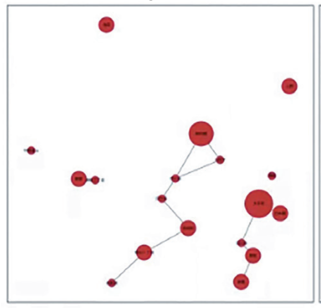


Fig. 2: Top degree centrality nodes, overview

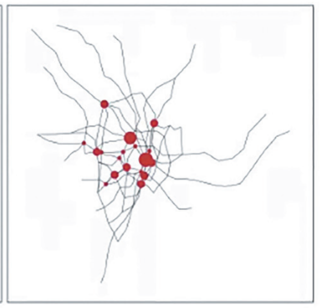


Fig. 3: Top closeness centrality nodes, enlargement

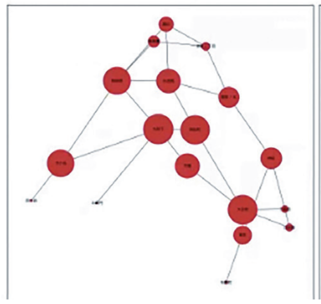
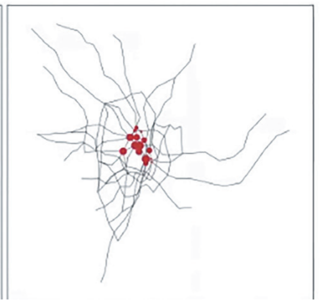


Fig. 4: Top closeness centrality nodes, overview



An urban rail network modeled with various methods of evaluation

What Did You Think of the Classes?

Seminar classes that gave me practice problems to solve taught me a lot not only because they helped me consolidate what I had learned in lecture classes, but the format of students presenting how problems were solved to one another in the seminar also allowed me to find out how other people think. In the experiment classes, we did a lot of programming, and implementing content we learned in classroom lectures in programs allowed us to improve our understanding of the mathematical structure of the event models behind the programs. In implementation, being exposed to various languages for different purposes, such as R for statistics and MATLAB for numerical analysis was a good experience. In addition, through the progression of posing my own hypothesis and problems and analyzing them with modeling, I think I was able to experience the essential part of 'mathematical information engineering', which reduces various events in society to mathematical models, and by handling them from an engineering standpoint, to apply these models to actual situations.

Written by **Yuki Tsuji**

Department of Materials Engineering

Ayano Nakamoto

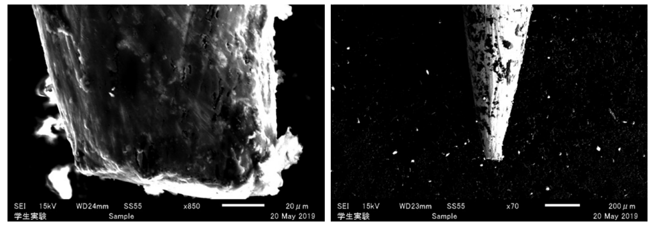
First year master's student
Department of Materials Engineering, SOE

Materials Engineering Experiments

In the Department of Materials Engineering, during the S semester and the A1 term in their third year of undergraduate studies, students conduct experiments two days a week, for a total of four periods. In addition to experiments related to materials, such as tensile tests, there are also experiments related to measurement, such as observing structure with an electron microscope and crystal structures with X-ray diffraction, as well as experiments related to biotechnology, such as synthesizing polymers and extracting DNA from E. coli. There are twelve themes for experiments that illustrate the breadth of Materials Engineering.

One of the most interesting experiments was machine tooling. In this exercise, each student made a small jack less than 10 cm high. We were given a drawing and a technical staff member helped us make the parts. We cut metals such as brass and duralumin to specific dimensions made cut screw holes with machine tools like milling machines for cutting flat surfaces and lathes for cutting cylindrical surfaces. I learned in class that brass is a soft metal, and I was surprised to find that brass was much easier to process than I had imagined. Experiencing the process of manufacturing and working with machine tools that I had never before used to process parts and complete a product was fun. Evaporating gold into a thin film in an experiment was another memorable experience. A gold wire was heated to a gaseous state which then through vacuum deposition adhered to a 1 cm square glass substrate positioned above it. The positions of the substrates were changed and an AFM (Atomic Force Microscope) was used to measure the thickness of the films. We examined the relationships between the film thicknesses and the substrate positions, measured electrical resistance, and compared them with theoretical values. In this experiment, I learned for the first time that, entirely different from its solid state, gold in its gaseous state turns a blue-ish green.

Even though I was not at first familiar with the equipment and programming used for any of the experiments, since in the end I was able to obtain excellent results and products, I felt a great sense of accomplishment after completing the experiments.



The tip of a safety pin observed with a SEM (Scanning Electron Microscope)

Practical Seminars for Materials Engineering

Third-year students electing to do so may go on a three-day factory tour during the summer and winter vacations. In many cases, Department of Materials Engineering alumni welcome you at the factories you visit. They have also allowed us to stay at company dormitories, and offered us opportunities to talk with employees over drinks during social gatherings following the tours.

As the Department of Materials Engineering, many of the companies we visited are related to materials, such as iron and steel companies, glass companies, printing and coating companies, as well as companies manufacturing medical materials and cosmetics. A particularly memorable experience was being shown the actual steel making process at a steel mill. The steel making process is studied in class, and being able to see it right before my eyes really deepened my understanding. In addition to this, we were also shown a clean room behind glass at a semiconductor factory, and saw how engines are assembled on a line at an automobile factory. Approximately five factories are visited in a period of three days. We walked around a lot and it was quite tiring (laughs), but I think the opportunity to be shown around company factories, which we are not usually allowed to see, was very valuable. Overnight stays were also good occasions for me to deepen friendships with department classmates.

At a factory on the tour

Written by **Akihiro Takeshita**

Department of Applied Chemistry
Department of Chemical System Engineering
Department of Chemistry and Biotechnology

Masaki Hirano

Fourth year undergraduate student
Department of Applied Chemistry, FOE

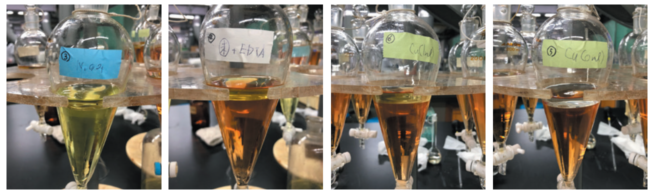
Analytical Chemistry Experiments

Lecture before the experiment

In the three-departmental fused discipline of Chemistry and Biotechnology (Department of Applied Chemistry, Department of Chemistry & Biotechnology, and Department of Chemical System Engineering), students are required to take six seminars and experiment classes in their third year of undergraduate study: chemical engineering experiments, computer chemistry exercises, genetic engineering experiments, physical chemistry experiments, analytical chemistry experiments, and organic chemistry experiments (department-specific requirements differ). I think the best part of the experiments is that you can actually confirm what you have learned in classroom lectures and deepen your understanding.

In one of those, analytical chemistry experiments, we are given unknown samples and use analytical instruments to investigate their identity and quantity. The photo on the right shows how we quantified the concentration of a small amount of copper ions in steel powder.

The two solvents of water and oil are in the separating funnels in the photo, and 'solvent extraction', which is the separation of substances in a liquid, was used to separate the substances in the liquid by taking advantage of solubility differences. First, various concentrations of copper ion solutions are prepared as samples. Since copper ions are insoluble in oil as they are, chelating agent coordination is used for copper ion extraction in the oil phase. We then use an analytical apparatus called a spectrophotometer to find out how the absorbance values change with the concentration of copper ions. By using that relationship, we can find the concentration of copper from the absorbance of the test specimen whose concentration we want to calculate. In this experiment, we were able to calculate the concentration to three significant figures, and that accuracy surprised us. We were required to consider our results and submit a report following the experiment, and if we forgot what happened during the experiment we would not be able to discuss the results. I felt that it was important to take notes about every detail of the experiment, no matter how small.



Solvent extraction

Exercises in Computer Chemistry

While they may be a little different from what we generally think of when we talk about chemistry experiments, like the ones mentioned above, some seminars also use computers.

Exercises in Computer Chemistry was a seminar in programming related to chemistry. Among those, I was particularly impressed by the exercise for writing a program for the Runge-Kutta method, which is a method to solve differential equations numerically. Using the process of wort fermentation in beer production as a subject, we used the program to calculate the mechanism of reactant and product amount increases and decreases over time. Until then, I had not been very interested in programming, but this exercise made reflecting mathematical equations in code interesting. Although the procedure for most experiments is predetermined, in this kind of exercise there was more than one way to work out problems, such as which programming language to use, which was a big difference from other experiments. It was also very interesting to be able to reproduce phenomena occurring in the natural world, such as chemical reactions, using equations (models) on paper or computers, and to be able to numerically evaluate and verify reproduced phenomena on the basis of those models. Through a wide range of experiments and exercises, I realized that I was interested in more theoretical content, and I think I was able to make use of this when I was choosing a laboratory.

Textbooks used for experiments

Program created in the seminar

Written by **Akihiro Takeshita**

Department of Systems Innovation

Taihei Matsumoto

Fourth year undergraduate student
Course C: Program for Social Innovation
Department of Systems Innovation, FOE

What Kinds of Seminar Classes Did Your Department Offer?

In the Department of Systems Innovation, the Innovation Introductory Project, Core Disciplinary Project I, and Applied Project I are compulsory seminars. In Course C, in the Introductory Project students learn and apply the basic systematic way of thinking for creative engineering called system design, and under the guidance of supervisors, they develop problem-solving skills to handle and deal with actual social issues in Core Disciplinary Project I and Application Project.

Please Tell Us What Each Project is About

In the Introductory Project, which is held in the second semester of the second year immediately after students decide to study in the Department of Systems Innovation, we started by creating an actual object through group work to design a wallet from cardboard. In the second half of the class, we were assigned the theme of 'creating something familiar with a function that makes people exercise', and our group made a pen case that unfolds into a dartboard.

In the first and second semesters of the third year, each student worked on a total of three projects under the supervision of a professor of their choice for the Fundamental Project and the Advanced Project. The project I worked on for the Fundamental Project explored the impact of COVID-19 on logistics by analyzing ship types and locational information.

The pen case we made

In the Advanced Project, I worked on a project that used a method called scenario planning to envisage the future in a few decades from the perspective of decarbonization, and on a project to create captions and quizzes for a special exhibition on the asteroid explorer Hayabusa2 at the Space Museum in Bunkyo-ku.

HAYABUSA 2 special exhibition

What Did You Think of the Classes?

The first class I took, Introductory Project, made me realize how difficult creative engineering is. Until then, I had thought that writing software and programs on a computer would get me through, but when it came time to make something on my own, that involved a lot more thinking and manual work than I had expected, it took a lot of time, and I got a sense of how hard creators work as well. On the other hand, in Core Disciplinary Project I and Applied Project I, I worked on projects under the supervision of several professors, which allowed me to learn about various parts of society besides my own interests and broaden my knowledge. Although my work also included steady and unrefined tasks like collecting data and contributing ideas for quizzes at the special exhibition, analyzing actual data was a new experience for me, and I was able to experience the joy of having my work exhibited and presented to society.

Written by **Yuki Tsuji**

International Historic Car Rally Project

The old Daihatsu Charade G10 Coupe used in this project, after conversion into a rally car

Restoring an old car (historic car)※1, converting it into a rally car, and then entering and completing a historic rally※2 held overseas are the aims of this project. Students take the initiative in the project, which is an official UTokyo-Honda Technical College Kanto joint project. During the 2020 academic year COVID-19 prevented participation in overseas historic rallies, the ultimate goal shifted to domestic activities, and students successfully completed the Shinshiro Rally 2021 held in the city of Shinshiro in Aichi Prefecture.

Eiki Mori

Fourth year undergraduate student
Department of Aeronautics and Astronautics, FOE

"How Did You Get Involved?"

I had a lot of free time since COVID-19 kept us away from campus, and when I saw the Creative Engineering Projects flyer I decided to participate in one of them. Among the options, the International Historic Car Rally Project would give me a chance to participate in a rally in a foreign country, which I found interesting because I like to travel. I could not easily participate in an overseas rally on my own, so I decided on this project.

"What Kind of Feel Does the Project Have?"

Being a Faculty of Engineering project, it had many FOE students, some Faculty of Science students and Agriculture post-grads. The group seemed to have car enthusiasts and people wanting to go abroad. The old cars used in this project must pass vehicle inspections before they can be driven on public roads. Plus, rally competition modifications include installing reinforced frames and specially designed seats for safety. Labor was divided so that Honda Technical College students restored the old car, while UTokyo students converted it into a rally car. Students were also responsible for finding potential rally events, communicating with sponsors, setting up a website, shipping the rally car, and booking rally accommodations. UTokyo students also took charge of management and liaison activities, including team leadership.

Honda Technical College students working on an old Toyota Corolla Levin TE27

※1 Old cars (historic cars): These are cars that have been manufactured for several decades. The two cars students used in this project were a 1979 Daihatsu Charade G10 coupe and a 1972 Toyota Corolla Levin TE27.

※2 Historic rally: A rally is a type of motorsport in which competitors drive under specified regulations on a predetermined course that includes sections of public roads. Contestants compete for the fastest time in some rallies, and they compete for driving accuracy at a fixed speed in others. A historic rally is a rally with historic cars.

"Did You Encounter Any Difficulties While Working on the Project?"

This project is in its eleventh year, and repeated enrollment is prohibited. My manufacturing experience didn't even include soldering, so everything was new to me. Simple explanations included tool use, but one actually has to work with their hands to be able to make something. Some things the teacher thought were obvious, we didn't, so even to explain our problem every time we didn't understand something, we asked the teacher, and thinking we understood we tried it out and failed again, so we asked again, and this happened repeatedly.

UTokyo students converting a rally car

COVID-19 forced the suspension of in-person activities from April to August in the 2020 academic year. Instead of vehicle maintenance beginning in May as usual, it began in September making things even harder for us. When not allowed to meet in person, we primarily worked on management. We abandoned our overseas rally plans, and the many halts, including the emergency declaration in January, made scheduling difficult.

As the UTokyo student leader, having no previous leader experience, I worried about how to evenly assign tasks to members I had only met online.

"What's the Best Part About Participating in the Project?"

I initially worried about the advisability of making modifications to a finished product, such as drilling holes. Checking with the instructor in advance let me realize there was no need to be anxious. This good experience reduced my fear and resistance to doing things for the first time. Our teacher always told us that we might work for some companies who also employed tradesmen such as welders and that experiencing and understanding their work first-hand was important, which I grasped well. Driving the rally car to the rally site ourselves gave us a chance to practice.

I also felt that rather than just contemplating a task that might take a long time, daring and taking action are important for completing it in a limited amount of time. Although we could not take our rally car overseas, it was good to have managed to bring the project to a close.

Drivers and project members at the rally

"Has it Affected Any of Your Other Activities?"

One reason we use old cars in this project is that mechanically controlled old cars are easier to understand than modern computer-controlled cars whose control mechanisms cannot be understood from the outside, and they can thus be modified. Learning how old cars work and manually modifying them was definitely a meaningful experience. Through this experience, visualizing how classroom lecture and seminar knowledge could be put to practical use became easier for me. In the FOE we are required to build our own equipment and conduct experiments, and I think my resistance to that has eased a bit. It was also a good opportunity for me to recognize how amazing various technologies that we encounter daily are. Valuable discussions I have had with people in various professions, beginning with my teachers to whom I am indebted, those who joined forces with us as rally drivers, and corporate sponsor representatives, will be helpful as I consider my future career.

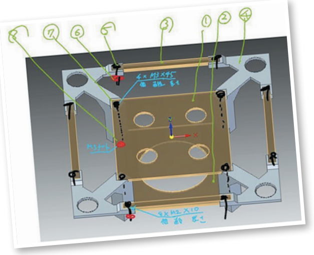
A project member filing the car body

Written by **Mizuki Noguchi**

Creative Engineering Projects

Flying Robot Project

In this project, while learning how to design flying robots in the classroom, groups of five or six students build small flying robots (such as airplanes or drones) and compete in a flight distance contest in the final session. Students start by designing the body, so they can create original flying robots. In the 2020 academic year, the COVID-19 impact prohibited us from building robots in-person, so the project covered drone basics, business creation, and flight programming.



Drone CG

"How Did You Get Involved?"

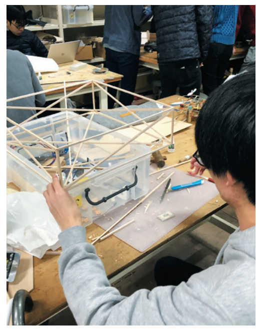
I have always been interested in flying robots. I chose the Department of Materials Engineering for grad school, but I was interested in flying robots even as an FOE undergrad. I chose the Flying Robot Project because it teaches about flying robots from designing to conducting flight tests. In S semester of 2019, I built an 'airplane-type robot', and the drone another group made did not fly. Thinking, "I want to take the project again to make a drone that flies!" I signed up for the project again in A semester.

"How Was the Project Conducted?"

This project is designed for learning basic skills so that even those with no prior knowledge can start building flying robots. After covering the basics, students divide into groups according to their chosen flying robot, and then building begins. I was in the drone group!

When building flying robots, parts are manufactured and assembled in FOE Building 13. Class time was basically, spent on designated manufacturing tasks, but towards the end of the semester, some groups met outside of hours for finishing work. I think that being allowed to continue building until our intended quality is reached is why this project is appealing.

In the final session the university gymnasium or a large plaza are reserved for test flights of the flying robots we had made. Some groups made flying robots that flew for more than a few minutes, while others had theirs break down on the initial flight. It was quite exciting.



Production

Koki Hayashi

First year master's student
Department of Materials Engineering, SOE

"Did You Have Any Difficulties During the Project?"

The biggest difficulty was designing the drone. When creating a general 'airplane-type robot', we can use light balsa or bamboo sticks, but drones need a three-dimensionally 'strong' structural design because their motors and controllers must be installed vertical to the ground. We thus used a 3D printer that could produce strong parts. To reduce body weight, only the parts that needed to be particularly strong (joints) were printed that way. Materials choices and structural improvements allowed us to reduce the body weight!

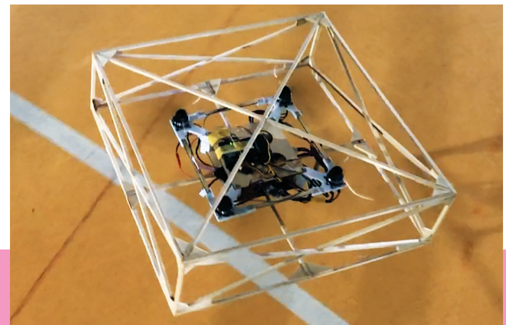
"What Appeals to You About the 'Making Things' Project Format?"

I can absorb more knowledge through manual work than by sitting in a classroom, so rather than simply learning about flying robots, the fact that I could acquire the skills to build a flying robot was appealing. Plus, the act of 'manufacturing' has a very 'FOE' feel and I recommend it to people wanting to do something typically FOE! In each FOE department offers student experiments but the Creative Engineering Projects often allow students to 'make anything' they want, so I think the 'high degree of freedom' in determining your own course of action and working toward a single goal is another appealing point not found in other projects.

"What Was Good About Participating in the Project?"

While building the flying robot, we were able to learn various production techniques. For example, I learned how to use the production software when printing with a 3D printer, and how to operate a laser cutter when machining plywood. This was a great experience for me since I wouldn't have opportunities to come into contact with such processing equipment my major. I hope people interested in flying robots or like crafts will participate in this project!

Drone in flight



Written by **Sota Nagahara**

Kosuke Gonome

First year master's student
Department of Materials Engineering, SOE

EV Project

In this project, we learn about EV performance by gathering data at the annual ALL JAPAN EV-GP race, and we think about the future of automobiles.

"Why Did You Decide to Participate in This Project?"

I signed up for this project as a third-year undergrad in the Department of Materials Engineering. I was interested in light metals like aluminum. The auto industry says that reducing vehicle body weight improves fuel efficiency. I decided to participate in this project thinking it would be a good chance to investigate how vehicle body weight actually affects vehicle running properties.

"What Did You Actually Do in This Project?"

I was involved in the project in 2019, and I attended a Japan Electric Vehicle Race Association (JEVRA) race called the ALL JAPAN EV-GP to measure the road performance of Hikaru Jitosho, a current UTokyo student professional driver. For Round 6 of the EV-GP at the Tsukuba Circuit, as well as the test run, I measured the tire pressure, tire temperature, remaining battery, and lap time for each run. I was unable to attend, but following those two fieldwork activities I was also invited to a Society of Automotive Engineers of Japan symposium.

"What Have You Learned from This Project?"

Heavy batteries make many electric vehicles heavier than regular gasoline-powered cars. The electric vehicle used in this race weighed nearly 2 tons. Since the vehicle body weight of an ordinary gasoline-powered car is about 1.2 tons, compared with that, the loads on the tires and drivetrain are greater.

The Tsukuba Circuit, where the race is actually run, has many corners, which puts a lot of stress on tires when cars make turns, and tire temperatures were so different before and after the race that the difference was evident just by approaching the car. In addition, the many corners require more frequent acceleration and braking, which puts a greater load on the battery. Thus, the power output drops visibly from when the car runs at the beginning and end of the race. I learned a great deal about these sorts of issues unique to electric vehicles directly from my fieldwork.

I think these are unique racing environment issues, but Japan's roads have many corners, the Metropolitan Expressway has short merge zones, urban areas have many traffic lights and congestion points, which are harsh environments for frequently accelerating and decelerating cars.

Team TAISAN Todai racing car

It was good to envision what would happen when actually operating an electric vehicle in those situations.

My major is materials engineering, and I have been able to broaden my thinking in relation to my major and research field, such as developing light metal materials to decrease vehicle body weight that will reduce the loads on the drivetrain and tires.

"What Makes the Creative Engineering Projects Appealing?"

In classrooms I was often wrapped up reading alone, but I think one of the most appealing aspects of this project was that it presented multifaceted perspectives on a single issue. For example, I thought that since heated air expands inside a tire, increasing the risk of a blowout, reducing the air pressure in tires as much as possible would be good. Yet, when I asked racer Hikaru Jitosho about this, he said that conversely from the driver's perspective, reducing the tire pressure too much affects the driving feel. Thus, without having to draw my own conclusions, perceiving issues from various views was a very good experience for me.

Written by **Aoi Watanabe**

Creative Engineering Projects

Startup Training

This hands-on training considers and refines ideas for business, social innovation and media art. It teaches lean startup and problem solving concepts and skills. It is offered as part of a Sony, The University of Tokyo (UTokyo), and Tokyo University of the Arts (Tokyo Geidai) social cooperation program. Students who are interested in creating and starting up projects with students from other universities are encouraged to participate on multiple levels.

The renovation project

"What Can be Learned in This Program?"

Originally starting in 2019 as cooperation between UTokyo and Sony, Startup Training transformed into a social cooperation program with Tokyo Geidai the following year in 2020, and some offshoots began as club activities this year. Classroom lectures offer participants training in how to set long-term goals and know-how for pitching their ideas. Club activities, including workshops such as rice planting and visiting art festivals, are offshoots, and auditions are held for getting projects up and running. Instead of just taking twelve classroom lectures and ending up with some ideas, we challenge ourselves to actually work on social implementation, including club activities. Our various participants include undergraduate and graduate students from UTokyo, and last year Tokyo Geidai students, Digital Hollywood University students, and working adults joined. It's a diverse environment. Both Tokyo Geidai and Digital Hollywood University are within walking distance of the Hongo Campus. Nonetheless, there has not been much previous collaboration between these three universities, and our goal is to create change, like a chemical reaction, through this program.

Additionally, in some situations it is difficult for students to independently bring an idea through to social implementation. One feature of this program is that students can work together with current investors and internal Sony investors who can pace set the student teams.

Although in 2020 we had to hold online Zoom events due to COVID-19, we did have the opportunity to go make a short onsite observation. This kind of off-campus visit was proposed by Sony, and it was an opportunity for students to directly confront real-world problems. Last year, we went to the Echigo-Tsumari Art Triennale held in Tokamachi, Niigata Prefecture. Since people who are actually working out in society often have a great deal more to offer when handling social issues than university students who are not, I think it is quite interesting for students to be able to encounter those real world difficulties while they are still students.

Classroom scene

Kohei Sato

Third year undergraduate student
Department of Economics,
Faculty of Economics

This year, part of the UTokyo-Sony social cooperation program became a club activity, and he is serving as the student representative for the club.

Observation

"Why Did You Decide to Take This Program?"

I knew of the word 'startup', and I was curious about what exactly they were doing. That's when I happened to find this program at Komaba and took it. I didn't have any intention of starting a business or anything like that.

"What Did You Think of the Program?"

Before taking the class I had a vague impression that startups were challenging, however, while learning how to give a pitch, sketch ideas, conduct interviews and other startup activities, one of the main things I realized was that there is a systematic way of thinking. Working with limited time and resources I was able to learn how to think in order to create something that at least would be worthwhile as a startup. The secret to success in projects is ultimately connected to the way one thinks about succeeding in life events, and I think that way of thinking can be used in daily life.

"What Projects Were You Actually Involved in?"

During lectures, we learned about a vacant building renovation project in Asakusa, and we teamed up with UTokyo master's degree engineering students and Tokyo Geidai students to work on the project. The building in Asakusa is called HATCH, and in a declining sales circumstances caused by COVID-19 and increasing maintenance costs, we worked on crowd-funding to ensure HATCH's survival. Arising out of that topic, we also held a community exchange-type workshop on renovating vacant houses. In that activity we visited vacant houses in the community with DIY enthusiasts, and interacted with local people while doing renovation work. While that was happening, someone connected us with an advisor for regional development from the Ministry of Internal Affairs and Communications, and we asked about actual regional development challenges. For example, we were told that even constructing beautiful buildings for the purpose of regional development becomes a problem if no one in the region will use them. From the perspective of co-creation with local residents, we were therefore encouraged to convey where the central hub for regional revitalization was when carrying out renovation projects. Because team member personalities differed, we had difficulty answering the question, 'Why are we involved in this project?' However, with outside instructors who are actually involved in concept making out in society mentoring us, we were able to discuss this in depth and carry on with the project. If it was not for this project I would not have met any of my team members, and in that sense, this has been a great opportunity to meet people I would not have met in my normal university life.

Written by Aoi Watanabe