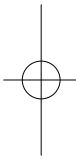
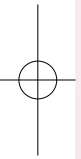
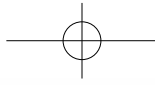


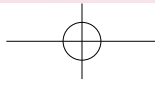
Bachelor's / Master's Program in Engineering

# Electrical, Electronics and Information Engineering

1	Motion Control Laboratory	45
2	Plasma Dynamics Laboratory	46
3	Power Electronics Laboratory	47
4	Mechatronics Lab.	48
5	Power Conversion Laboratory	49
6	Pulsed Power Laboratory	50
7	Power Engineering Laboratory	51
8	Advanced Motor Systems Laboratory	52
9	Advanced Energy Conversion Lab.	53
10	Applied Waveoptics Laboratory	54
11	Surface and Interface Device Laboratory	55
12	Electroceramics Laboratory	56
13	Optical Property and Terahertz Engineering Laboratory	57
14	Solar Energy Device Laboratory	58
15	Nanoelectronics Laboratory	59
16	High Power Laser Development and Application Engineering Laboratory	60
17	Electromagnetic wave control device laboratory	61
18	Metamaterials Laboratory	62
19	Computational Materials Science Laboratory	63
20	Chaos and Fractals Informatics Laboratory	64
21	Image and Media Information Laboratory	65
22	Spatial Image Media Laboratory	66
23	Nonlinear System Engineering Laboratory	67
24	Signal Processing Application Laboratory	68
25	Neural engineering laboratory	69
26	Communication Networks Laboratory	70
27	Lab for Data Sequence Structure	71



Bachelor's / Master's Program in Engineering  
**Electrical, Electronics and Information Engineering**



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□ SDGs を日本語版と合わせました。

1

# Motion Control Laboratory

Professor / Kiyoshi OHISHI Associate Professor / Yuki YOKOKURA  
Assistant Professor / Tran Phuong Thao

- ▶ Advancing robotics and mechatronics technology through control engineering.
- ▶ Developing practical and innovative motion control for the world
- ▶ Work hard, play hard!



<http://hp73.nagaokaut.ac.jp/>

Supervisor Professor / Kiyoshi OHISHI and Associate Professor / Yuki YOKOKURA

Prof. Ohishi and Yokokura are cheerful and energetic, always kindly looking after students. Both are specialists in robotics and control engineering. Prof. Ohishi's favorite sport is baseball, and he is a fan of the Chunichi Dragons.



## Research Content

Motion control is the branch of control engineering focused on the control of motion of motors, robots, etc. In our lab we develop practical control algorithms for high-performance motion of robots, vehicles, motor drive systems and many other mechatronic systems. Research validation is done through numerical simulation and experiment, using software such as MATLAB for simulations, and our in-house developed ARCS software for experiments. We collaborate with many companies on joint research ventures and present our research results every year on domestic and international conferences, and academic journals.



Experiment with industrial robot. Applying motion control, the heavy robot is lightly moved by human.

## A Day in the Lab

A day in the Motion Control Lab is split between study, simulations and experiments, and we conduct progress report presentations once a week where professors give useful feedback for our research. Students present their research results each year in domestic and international conferences, allowing us to discuss and network with other professionals of motion control. We have a very friendly environment where you can ask fellow labmates or professors for help whenever you need it. Each year we have several events such as softball and futsal competitions, Hanami, lab yearly trip, Nagaoka fireworks, BBQ parties and more!



Celebrating Prof. Ohishi's birthday

## Thesis Subjects

- ▶ (M) Vibration Suppression Control Using Dynamic-Torque-Input Based Variable Inertia Observer
- ▶ (M) Shockless Re-Acceleration Control from Coasting Based on Model Predictive Control for Multi-Inertia System with Two Clutches
- ▶ (D) The Back-Forward Drivable Torsion Torque Control of Two-Inertia System for Environment Interaction

## Major employers of Graduates

The number of  
PhD Graduates

18

- Mitsubishi Electric Corporation
- YASKAWA Electric Corporation
- FANUC Corporation
- TMEIC
- Honda R&D Co. Ltd.
- Mazda Motor Corporation
- Nachi-Fujikoshi Corporation
- Sumitomo Heavy Industries Ltd.
- Sanyo Denki Co. Ltd.
- Oriental Motor Co. Ltd.

Writer : Padron Parraga Juan Vicente, Energy and Environment Science  
(Simon Bolivar University)

45

### 教員名

OHISHI Kiyoshi  
YOKOKURA Yuki  
Tran Phuong Thao

### キーワード

Motion control  
Power electronics  
Motor drive  
Mechatronics

## 2

## Plasma Dynamics Laboratory

Associate Professor / Takashi KIKUCHI    Associate Professor / Toru SASAKI  
Assistant Professor / Kazumasa TAKAHASHI    Technical Staff / Tetsu TANAKA

- ▶ What is plasma and why is it important?
- ▶ How can we conduct research with plasma dynamic?
- ▶ Industrial application of plasma dynamics



<https://mhdlab.nagaokaut.ac.jp/>

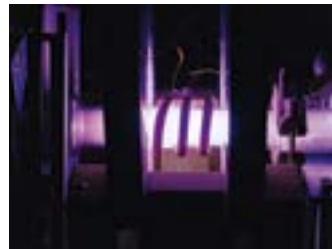
Supervisor Associate Professor / Takashi KIKUCHI, Associate Professor / Toru SASAKI, Assistant Professor / Kazumasa TAKAHASHI

Professor Kikuchi, Sasaki, and Takahashi organize the plasma dynamics laboratory. All professors always empathize with and encourage their students in their laboratories in a friendly and kind manner. Nonetheless, They have a knack for directing us to successful research.



## Research Content

Studies on the engineering applications of atmospheric plasma, high energy density physics with power-pulsed discharges, magnetohydrodynamics, and beam physics are being conducted. The experimental and simulation studies primarily focus on the properties, characteristics, and mechanisms associated with dynamic plasma. Through these experiments and simulations, it is possible to understand better the physical mechanisms underlying the natural phenomena of dynamic plasma in space and solve engineering problems involving it.



RF plasma emission

## A Day in the Lab

Each student presents their research progress twice a week in the weekly seminar. The professor and senior students provide constructive feedback to help students develop their research. Additionally to the seminar, students may communicate freely with professors and laboratory members via e-mail or in-person meetings about academic/research matters and personal matters for assistance. There are no time restrictions on switching between research and individual activities.



When conducting an experiment

## Thesis Subjects

- ▶ (M) Study on Non-Thermal Hydrophobic Coating using Atmospheric Pressure Plasma and Silicone Water-Repellent
- ▶ (D) Particle acceleration from pulsed-power-driven fast plasma flow in perpendicular magnetic field
- ▶ (D) Study on the transfer and interaction of charged particles using AC glow discharge on liquids toward noble nanoparticle synthesis

## Major employers of Graduates

The number of  
PhD Graduates

8

- Ebara Corporation
- Hokkaido Electric Power
- Tokyo Electron
- Meidensha
- Toshiba Plant System & Services Corporation
- Tokyo Electric Power Company Holdings, Inc.
- Japan Nuclear Security System Co.,Ltd
- Mitsubishi Chemical Zinnia Ring
- Japan Nuclear Security System Co.,Ltd
- YKK

46

Writer : KLADPHET Thanet, Energy and Environment Science  
(Pathumwan Institute of Technology)

## 教員名

KIKUCHI Takashi  
SASAKI Toru  
TAKAHASHI Kazumasa  
TANAKA Tetsu

## キーワード

Basic plasma analysis  
High energy density plasma  
Magnetohydrodynamic (MHD)  
Nuclear Fusion

## 3

## Power Electronics Laboratory

Professor / ITOH Junichi Assistant Professor / WATANABE Hiroki

- ▶ You can reserch advanced technology of Power Electronics
- ▶ You can contribute curb of global warming
- ▶ You can enjoy reserch life and lab events


<http://itohserver01.nagaokaut.ac.jp/itohlab/jp/index.html>

Supervisor Professor / ITOH Junichi

His policy is to do his best for both of research and playing. If we have problems about research, he always accepts to discuss technical issues with us. He also participates in futsal tournaments that is planed by the laboratory member.



## Research Content

Recently, Power Electronics is an important key to problems of global warming and nuclear power generation. Power Electronics is technique to utilize electrical energy efficiently. It is applied for wide field such as industrial machines, electrical vehicles and home appliances. In Itoh laboratory, we are doing research about power converter, motor drive, wireless power transmission, smart grid for renewable energy, energy storage and so on. Our laboratory is leading technique of evolving Power Electronics.



Matrix converter(I made this one from scratch.)

## A Day in the Lab

AM : After morning assembly, I do simulation and theoretical analysis to contrive a novel method.

Noon break : we often eat lunch with laboratory's members.

PM : I made a main circuit and a controller to do experiments. Some members write paper for upcoming conferences until late. Others continue to do experiments.

It's important to take enough rest in the evening so as to be active.



Our Laboratory has many labmate at the toughest time.

## Thesis Subjects

- ▶ (M) Digital Damping Control Method for Grid-tied inverter with small LCL filter
- ▶ (D) Switch Sequence Strategy for Accurate Voltage/Current Regulation in Isolated Matrix AC to DC Converter
- ▶ (D) Optimal Design Focusing on Magnetic Coupling for Wireless Power Transfer System with Multi-winding Transmission Coil

## Major employers of Graduates

The number of PhD Graduates

25

- Nagaoka Power Electronics
- MEIDENSHA CORPORATION
- HITACHI
- MITSUBISHI ELECTRIC Corporation
- YASKAWA Electric Corporation
- DIAMOND ELECTRIC Corporation
- Fuji Electric Corporation
- GS YUASA Corporation
- Panasonic Corporation
- TOSHIBA Corporation

Writer : UCHIDA Yasuo, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Kisarazu College)

47

## 教員名

ITOH Junichi  
WATANABE Hiroki

## キーワード

Power electronics  
Power conversion  
Motor drive  
Wireless power transmission

## 4

## Mechatronics Lab.

Professor / Toshimasa MIYAZAKI Technical staff / Yuta YOSHIDA

- ▶ "Control" everything in the world!!
- ▶ The strongest combination of machine and electric!
- ▶ Let's talk about the progress of today!


<https://whs.nagaokaut.ac.jp/elemech/>

Supervisor Professor / Toshimasa MIYAZAKI

Prof. Miyazaki is a professor at our university has been working at the University since 2010 and the Mechatronics Laboratory was started. In the laboratory, the exchange of opinions and information between students is especially important, the professor also responds to consultation kindly.



## Research Content

Mechatronics is the fusion of machinery (mechanics) and electricity (electronics) and the field of control engineering. Mechanical and electrical elements are inseparable. For example, when moving a robot arm, the movement of the arm requires a mechanical element, and the motor for driving force requires an electric element. Currently, our laboratory is studying electric transporter, industrial AC motors, DC/DC converters, walking robots reproducing human muscle structures, and so on. Our laboratory is engaged in research to control these electrical and mechanical elements at will.



Power assist controlled electric transporter

## A Day in the Lab

At the weekly report meeting, discuss the progress of the research and research plan.

~stream of time in a day~

9:30 There is a morning meeting.

In the morning, study and simulate research.

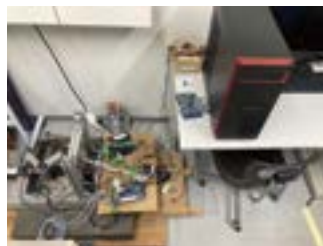
12:00 We eat lunch at school cafeteria or shop.

13:00 From the afternoon, we make experimental machines and experiment.

18:00 For dinner, we eat out with my friends.

Share the day's events.

We come home after thinking about tomorrow's schedule.



There is an experimental machine near the desk

## Thesis Subjects

- ▶ (M) High-gain power-assisted controlled transporter with pilot-induced oscillation suppressed by reaction force estimator
- ▶ (M) Potential barrier breakthrough time control using final states for a bi-articular muscle leg walking robot
- ▶ (M) Independent repositioning control of higher-order resonance frequencies using electric spring in 4-inertia system

## Major employers of Graduates

The number of PhD Graduates

0

- Toshiba Carrier Corporation
- Hitachi Astemo, Ltd.
- Bourbon Corporation
- NACHI-FUJIKOSHI CORP.
- Toshiba Mitsubishi-Electric Industrial Systems Corporation
- Honda Motor Co., Ltd.
- Renesas Electronics Corporation
- Hino Motors, Ltd.
- Showa Corporation
- Mitsubishi Electric Corporation

48

Writer : Taichi HAYASHI, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Gifu College)

教員名

MIYAZAKI Toshimasa  
YOSHIDA Yuta

キーワード

Control engineering  
Mechatronics  
Motor drive  
Power electronics

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- SDGs を日本語版と合わせました。
- 修了者数は1人でよろしかったでしょうか？

## 5

## Power Conversion Laboratory

Associate Professor / HAGA Hitoshi



- ▶ Let's enjoy power electronics!
- ▶ Don't stop the training of electric-power and physical-power!
- ▶ Kiai !!



<http://power.nagaokaut.ac.jp/hagalab/index.html>

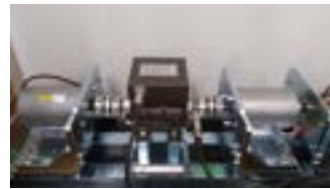
Supervisor Associate Professor / Hitoshi HAGA

Associate professor Haga send out a music about power electronics to the world, talks about "Kiai (Kiai)" in his lectures, and muscle trains when you visit him in the faculty room. He always responds to what the students want to do but he usually thinks more about beer than study. He often says, "Master the Power Lab with mind, body, and spirit!". Our teacher is the best!!



## Research Content

As the name itself implies, skillful power conversion is the main topic. In particular, we research using index-terms such as "Application technology for power storage devices", "motor drive systems", "Reduction technology in power converter". The research results contribute to the application of consumer electronics, automotive and various power source mainly through industry-academia collaboration. At the Haga-Laboratory, you can engage in power conversion technology research. We take into account the control methods, circuit design, simulations and experiments, and develop them consistently until researching the best solution possible. We also carry out activities to spread the power electronics technology to many people.



Motor experimental setup

## A Day in the Lab

At the Haga laboratory, there is no fixed work hours, students are free to decide their own research schedule. Although it opened just four years ago, the students in this laboratory are full of motivation. With students developing their research freely, while reporting their progress and doubts to the professor every week, it is truly the best environment for growing as electronics students. Because of professor haga's karate background, he treasures both the spirit and mind strength. This is why he encourages his students to practice sports such as fitness, musculatraining and any other activities outside of the laboratory.



Barbecue in the park

## Thesis Subjects

- ▶ (M) Control Method of Three-Phase Input Electrolytic Capacitor-less Dual Inverter Fed IPMSM for Reducing Torque Ripple under Grid Disturbance
- ▶ (M) High-Efficiency Wide-Range AC/DC Converter using Mode Transition of Six-Arm LLC
- ▶ (D) Phase Control Modulation for Harmonics Reduction of Dual Inverter Fed Open-End Winding Induction Motor in Light-Load Condition

## Major employers of Graduates

The number of  
PhD Graduates

1

- Hitachi
- LG Japan Lab Inc.
- DAIKIN INDUSTRIES, LTD.,
- DENSO CORPORATION
- MEIDENSHA CORPORATION
- TOSHIBA CARRIER CORPORATION
- Mitsubishi Electric Corporation
- Honda Motor Co., Ltd.
- ALPS ALPINE CO., LTD.

Writer : Ohata Jun, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Hakodate College)

49

教員名  
HAGA Hitoshi

キーワード  
Power conversion  
Energy storage system  
Motor drive  
Less power conversion technology



## 6

## Pulsed Power Laboratory

Professor / Weihua JIANG



- ▶ Pulsed power technology is the future
- ▶ Maximizing pulsed power efficiency, optimal pulse for application
- ▶ Strengthening language proficiency for research and daily life


<https://etigo.nagaokaut.ac.jp>

Supervisor Professor / Weihua JIANG

Professor JIANG is an influential professor in fields of pulsed power technology and plasma science. Professor received award of the Fellow for Institute of Electrical and Electronics Engineers (IEEE) in January 2014. Professor is very friendly with student, despite of being very busy. Professor always supports student enthusiastically and gives some kindly advice on your research.



## Research Content

Pulsed power technology can be meant simply as adding lots of small electrical energy and releasing them together in very short time-nanosecond. Pulsed power is applied in plenty of fields such as military and industry. Here, we are developing pulse generators such as LTD, Marx, SOS, all of which have lots of unique function. Applications of these pulse generator are also being investigated actively for laser excitation, water treatment and killing harmful bacteria. Beside of compact pulse generator, huge and powerful generator named ETIGO-IV, which is considered as only 1 in Japan, is being investigated and developed in this laboratory.



Laboratory members with high repetition pulsed power generator ETIGO-IV

## A Day in the Lab

Daily routine begins with Coffee and English-C&E, we can drink coffee freely and watch interesting English content-daily news or anime. C&E is very useful for improving English skill. Then, we will do experiment or read science papers for more understanding or finding new idea for our research. Especially, Professor always encourages student to improve language skill-English and Japanese, which is very useful for our future. Along with research activity, we have lots of interesting events such as seeing cherry blossom, fireworks festival and mountain climbing. Pulsed power laboratory is very interesting and active for us to study and enjoy in.



Experiment with new generation of LTD

## Thesis Subjects

- ▶ (M) Application of excimer laser excitation used LTD
- ▶ (M) Elemental Technology of MARX-type Pulsed Power Generation Circuit
- ▶ (D) High power microwave generation by double-anode virtual cathode oscillator

## Major employers of Graduates

The number of PhD Graduates

7

- DENSO
- Toshiba Corporation
- Suzuki
- Bosch Japan
- TDK-Lambda Corporation
- Mitsubishi Electric Corporation
- Daikin Industries Ltd
- Kao Corporation
- Texas Instruments Japan Ltd
- Renesas Electronics Corporation

50

Writer : PHUNG Nhat Thanh, Energy and Environment Science  
(Nagaoka University of Technology)

教員名

JIANG Weihua

キーワード

Pulsed power  
Pulse waveform  
Plasma  
Electron beam



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□ SDGs を日本語版と合わせました。

## 7

## Power Engineering Laboratory

Professor / MIURA Yushi



- ▶ Large, sophisticated, and stable power systems
- ▶ Approach energy problems with power electronics
- ▶ Progress. Not perfection.


<https://whs.nagaokaut.ac.jp/pel/>

Supervisor Professor / MIURA Yushi

Prof.Miura is an expert in power engineering, especially semiconductor converters in power systems. By working with him, we learn not only professional knowledge but also broad perspective. He is very friendly and considerate, and we get great advice from him. He is also an Aikido Sensei and from him we can learn a positive and relaxed state of mind and body.



## Research Content

Electric power systems are at a major turning point. The increase in renewable energy sources such as solar or wind power makes it necessary to compensate those power fluctuations with energy storage devices. Alternatively, DC power systems or ICT-based smart grids are also anticipated.

The key to these new systems is power electronics technology. With the emergence of new devices such as silicon carbide (SiC) and gallium nitride (GaN), the application of semiconductor power converters in power systems is expected to expand. However, power systems with many of them have specific problems such as frequency fluctuations. Our research is aimed at solving these problems.



Experimental system with real-time simulation device

## A Day in the Lab

Our motto is "the integral of the time you spend in the lab is proportional to your ability," but basically, you are free to manage your time as you wish. By sharing time and space with your colleague, you can acquire "the skills to ask others for advice and help," which is necessary in social life.

Research begins with the sharing of ideas. Next, circuits and control systems are designed and examined through computer simulations. Then, experiments are conducted in small experimental facilities, and the results are discussed.

Although the research is sometimes rigorous, we also have fun in our laboratory, just like in a club activity.



The experiment of AC series power supply system with semiconductor power converters

## Thesis Subjects

- ▶ (M) Overcurrent Suppression Method by Power Feedback Angular Frequency Control for Energy Storage System with Virtual Synchronous Generator Control
- ▶ (M) Virtual Synchronous Machine Control of SST Using Power Disturbance Detection Method Based on Swing Equation
- ▶ (M) Heat Output Control of Induction Generators Used as Heat Generators in Thermal Storage System

## Major employers of Graduates

The number of PhD Graduates

0

- Daikin Industries
- The Kansai Electric Power Company
- Toshiba Plant Systems & Services
- DENSO AIRCOOL
- Nexco-Engineering Niigata
- Tokyo Power Technology

Writer : NOGI Shogo, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Numazu College)

51

教員名  
MIURA Yushi

キーワード  
power electronics  
power systems

Mechanical

Electrical

Management

Materials

Civil

Nuclear Technology

System Safety

Innovation

## 8

## Advanced Motor Systems Laboratory

Associate Professor / HIDAKA Yuki



- ▶ Advanced motor research, ahead of its time
- ▶ In-depth research through simulation and experimentation
- ▶ Under the slogan of "Enjoy research"


<https://whs.nagaokaut.ac.jp/ams-lab/>

Supervisor Associate Professor / HIDAKA Yuki

Prof.Hidaka came to the University of Technology from a company. Since there are still only a few students in his department, he is very enthusiastic in providing guidance. He also cares about the student's lives. He is a teacher who can switch on and off.



## Research Content

With the recent proliferation of electric vehicles, research on the motors that drive them is more exciting than ever. In this laboratory, we conduct research on various types of motors, with a focus on such motors for automobiles. We also conduct simulation research using electromagnetic field analysis and numerical optimization, allowing us to balance our efforts between simulation and experimental systems. There are very few laboratories in Japan that can conduct solid research on motors in this way, so this will definitely give you an advantage in your job hunting activities.



Motor in the lab

## A Day in the Lab

In this laboratory, there are no core hours, and progress reports are given regularly at seminars. Therefore, there are relatively few time constraints and you can conduct research at your own pace. Since the laboratory was just launched in FY2021, experimental facilities and simulation environment, as well as students rooms, are not yet in place. However, this means that we can build up the laboratory with our own hands. These advantages are unique to a newly established laboratory. We also hope to build a friendly team with social events such as BBQs and futsal.



The Laboratory

## Thesis Subjects

- ▶ No data due to newly established laboratory

## Major employers of Graduates

- No data due to newly established laboratory

The number of  
PhD Graduates

0

52

Writer : TAKAHASHI Sota, Electrical, Electronics and Information Engineering  
(Akita National College of Technology)

教員名

HIDAKA Yuki

キーワード

Motor  
Automobiles  
Electromagnetic Field Analysis  
Numerical Optimization

## 9

## Advanced Energy Conversion Lab.

Specially Appointed Lecturer / KUSAKA Keisuke

- ▶ Power electronics is in demand "Now".
- ▶ Developing technologies aiming at world first.
- ▶ Welcome to the social networking with coffee breaks.


<https://eclab01.nagaokaut.ac.jp/>

Supervisor Specially Appointed Lecturer / KUSAKA Keisuke

Dr. Kusaka's motto is "Age and grade do not matter in research," and he throws himself into everything he does. His favorite drink is coffee, which may or may not be in his water bottle. He says, "I can't live without coffee".



## Research Content

This laboratory is mainly engaged in research on power supply circuits used in electrical products, and is developing compact and lightweight power supplies that could not be realized in the past. We are also working on power supply to places where it is difficult to supply power, and on technologies for transmitting large amounts of power.

These research fields are called "Power Electronics", and we are proud to say that they are the most needed cutting-edge technologies in the world today.



Single-phase inverter operation test.

## A Day in the Lab

Although this is a new laboratory established in November 2021, there are many senior students related to power electronics, so there is nothing to worry about.

Also, Dr. Kusaka knows a lot about outdoor activities, coffee, and alcohol, so even beginners can enjoy participating in events held in the lab.

As for the daily schedule, there is no core time, and students are free to do their research.

We also have a stylish coffee break at noon and take a break with a cup of coffee.



Sleeping in a cozy lab.

## Thesis Subjects

- ▶ No data due to newly established laboratory

## Major employers of Graduates

- No data due to newly established laboratory

The number of PhD Graduates

0

Writer : TOKURIKI Masaya, Electrical, Electronics and Information Engineering  
(Metropolitan College of Industrial Technology)

53

教員名

KUSAKA Keisuke

キーワード

Power electronics  
Wireless power transfer  
Power converter  
Electric vehicle

Mechanical

Electrical

Management

Materials

Civil

Nuclear Technology

System Safety

Innovation

10

## Applied Waveoptics Laboratory

Professor / Hiroshi ONO Associate Professor / Moritsugu SAKAMOTO  
 Technical Staff / Kohei NODA

- ▶ Advanced lightwave control devices using functional optical materials.
- ▶ Sample preparation, optical experiments, and theoretical analysis (consistently).
- ▶ Technologies centered on electromagnetic wave and lightwave engineering.



<https://whs.nagaokaut.ac.jp/optik/>

Supervisor Prof. Hiroshi ONO and Assoc. Prof. Moritsugu SAKAMOTO

Prof. Ono and Assoc. Prof. Sakamoto teach us how to proceed with researches, write reports, and make effective presentations. In addition, Prof. Ono has research experience in a company and kindly shares us his knowledge of R&D that will be useful in our futures.



### Research Content

Electromagnetic wave and lightwave control technologies are fundamental technologies that support our lives, such as optical information processing in optical communications and measurements/ tests in factories. Our laboratory mainly studies lightwave control using functional optical materials such as liquid crystals. Specific examples include research on polarization imaging using liquid crystal diffraction gratings and research on nano-order fine processing using special lightwave called optical vortices. We are also engaged in many other studies on electromagnetic waves and lightwaves.

This laboratory is the best for everyone who want to study lightwaves, or who like physics (including electromagnetics) or chemistry.



Laser optical system. We fabricate and evaluate optical elements using optical systems.

### A Day in the Lab

We can basically research at our own pace. Contents of research activities vary from day to day, and we do sample preparation, optical experiments, and theoretical analysis. The seminar is held once a week, where students report and discuss the results obtained, introduce papers on optics/photronics, and practice presentations at conferences. Through daily research activities and weekly seminars, we can learn the technological knowledge, logical thinking, and presentation skills required for R&D. You may get stuck in the course of your research, but I believe you will be able to get over it because there are reassuring staffs and colleagues.



Scene of usual laboratory. Currently, 13 students belong to this laboratory.

### Thesis Subjects

- ▶ (M) Fabrication of polarization imaging system and its application
- ▶ (M) Aberration correction of polarized Fresnel lens and Application to imaging systems
- ▶ (D) Basic polarization diffraction properties of polarization diffraction gratings with three-dimensional anisotropy and application of polarization electronics elements

### Major employers of Graduates

The number of  
PhD Graduates

6

- Shin-Etsu Chemical Co., Ltd.
- NIPPON SEIKI Co., Ltd.
- NIPPON CHEMI-CON Corp.
- HAYASHI TELEMPU Corp.
- Hitachi Building Systems Co., Ltd.
- Sony Digital Network Applications, Inc.
- Bosch Corp.
- Tokyo Electric Power Company Holdings, Inc.
- Seiko Epson Corp.
- Showa Denko Materials Co., Ltd.

54

Writer : Yuki ONO, Electrical, Electronics and Information Engineering  
 (Kobe City College of Technology)

#### 教員名

ONO Hiroshi  
 SAKAMOTO Moritsugu  
 NODA Kohei

#### キーワード

Optics  
 Photonics  
 Polarized light  
 Optical devices

~~【校正時ご確認をお願い致します】~~

~~□修論・卒論テーマの1行目「SrTiO<sub>3</sub>」を文字化けしてしまっていたので修正しました。~~  
ご確認をお願い致します。

11

# Surface and Interface Device Laboratory

Professor / Munehiro KIMURA

- ▶ Welcome to the world of Surface & Interface !
- ▶ Analyze the liquid crystal with light !
- ▶ Challenge for next generation display !



<http://alclan.nagaokaut.ac.jp/en/>

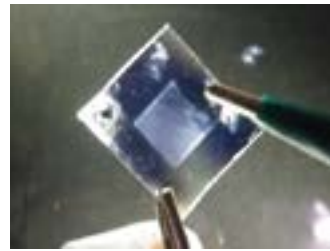
Supervisor Professor / Munehiro KIMURA

Professor Kimura gives his face in the student's room everyday, discuss about research topic is enjoyable. Necessary research environment for LCD is equipped in lab. Professor Kimura has 30 years of research career about the LC science.



## Research Content

Liquid crystal displays (LCDs) are applied to various displays such as televisions and smartphones. Prof. Kimura's laboratory is conducting research on LCDs and related science. The present topics are optical evaluation of LCD, examination of brand-new LCD manufacturing method by means of printing method, and evaluation of LCD with fast response speed. We are also doing joint research with major electric manufacturers and material manufacturers, and recently we just started a research on lead-acid batteries.



Flexible liquid crystal cell using printing method

## A Day in the Lab

We spend a time in research, prof. Kimura and students discuss a bunch of topics everyday. We have lab. -seminars once a week and introduce their progress reports of research and the surveyrance of English articles related to the research. Seminar is a precious time to find new direction of research and receive valuable advice from professor. There is an English lecture where attendee reads English textbook of liquid crystals. There are some times to be spent free, such as going to part-time job, circle activities, lunch and dinner. Students makes a plan to do laboratory work, where you can conduct research according to your own schedule.



Measurement of liquid crystal panel using spectroscopic ellipsometer

## Thesis Subjects

- ▶ (M) Preparation methods of SrTiO<sub>3</sub> (100) reconstructed surfaces using molecular beam epitaxy
- ▶ (M) Basic Study on Novel Driving Method for Nematic Liquid Crystals Manifesting Flexoelectric Effect
- ▶ (M) In-situ observation of the redox reaction on the negative electrode of the lead acid battery using atomic force microscopy

The number of  
PhD Graduates

11

## Major employers of Graduates

- Shimadzu corporation
- DENSO
- TOPPAN PRINTING CO., LTD.
- Japan Display
- Panasonic System Solutions Japan Co., Ltd.
- The Nilaco Corporation
- Merk
- TAIYO YUDEN CO., LTD
- CANON
- NACHI-FUJIKOSHI CORP.

Writer : Yuki Imamura, Science of Technology Innovation  
(National Institute of Technology Kagoshima College)

55

教員名

KIMURA Munehiro

キーワード

Liquid Crystal  
Lead acid battery  
Atomic Force Microscopy  
Display

12

# Electroceramics Laboratory

Associate Professor / Tomoichiro OKAMOTO



- ▶ Scholarship and Sportsmanship
- ▶ Science for Technology
- ▶ Drinking Event as Part of Seminar



<https://denki.nagaokaut.ac.jp/laboratory/%e9%9b%bb%e5%ad%90%e3%82%bb%e3%83%a9%e3%83%9f%e3%83%e3%82%af%e3%82%b9%7%a0%94%7%a9%b%6%e5%ae%a4/>

Supervisor Associate Professor / Tomoichiro OKAMOTO

Since Prof. Okamoto is OB of National Institute of Technology and our university, he well understands our campus life and instructs us based on a broad perspective acquired especially on the experience of business. In terms of research, students' autonomy is respected and enthusiastic seminars are given. He is a reliable teacher who can give us good advice not only on our study but also on our living.



## Research Content

Main theme of our laboratory is the research on the fine ceramic materials related to electronics and optics. "Hot spot" is a phenomenon in which a local part of a ceramic rod glows orange and the part moves slowly to the negative pole after applying voltage to the rod. The phenomenon is researched for an application to oxygen sensors. "Electric current heating" is a method to fabricate various shape of crystals. We successfully have observed an ultraviolet lasing at room temperature from zinc oxide crystals fabricated by the method. Using this method, we are actively conducting fabrication of wide band gap semiconductors, nanocrystals and carbon nanomaterials and so on.



X-ray Diffractometers

## A Day in the Lab

In our laboratory, we research own theme and have lecture, weekly luncheon meeting and seminars. In addition, we enjoy various events such as sports competitions, drinking party, summer / winter lab. trip etc. We are especially interested in sports events where all members including our teacher are competing for the annual championship. And at the drinking party, we make an atmosphere so that everyone, even non-drinker, can enjoy drinking. If you are good at "Research, Sports or Party", you will be a hero in our laboratory.



Laboratory trip in Summer

## Thesis Subjects

- ▶ (M) Photocatalytic activity of  $WO_3$  prepared by electric current heating and Fe-plated W wire
- ▶ (M) Crystal structure and luminescence properties of Pr-activated  $Ca_{2-x}A.LaNbO_6$  (A= Sr, Ba)
- ▶ (M) Evaluation of electrical properties in composite of  $GdBa_2Cu_3O_{7-x}(Gd_{1-23})$  and semiconductor

## Major employers of Graduates

The number of  
PhD Graduates

9

- MITSUBISHI GAS CHEMICAL COMPANY, INC.
- Mitsubishi Chemical Holdings Corporation.
- SUBARU Corporation
- A&D Co.,Ltd
- Hitachi Chemical Company,Ltd
- GS Yuasa,Ltd
- Hitachi Metals,Ltd
- SANDEN HOLDINGS Corporation
- NISSAN MOTOR Corporation
- TOSOH Corporation

56

Writer : TOBIOKA Ryota, Electrical, Electronics and Information Engineering  
(Niigata Meikun Senior High School)

教員名

OKAMOTO Tomoichiro

キーワード

Material science  
Fine ceramics  
Electronic device  
Thin film material



【校正時ご確認をお願い致します】

□ SDGs を日本語版と合わせました。

13

## Optical Property and Terahertz Engineering Laboratory

Professor / KATO Ariyuki



- ▶ Fusion of electricity and chemistry!
- ▶ We value people who take the initiative.
- ▶ Balancing Campus Life and Research!

Supervisor Professor / KATO Ariyuki

Mr. Kato is a Kyoto University graduate with an amazingly quick-thinking and very knowledgeable. Therefore, he is very supportive of our research. He is very mild-mannered, so if you ask him something you don't understand, he will tell you right away.



### Research Content

Our laboratory deals with "phosphor materials. Phosphor materials are luminescent materials applied to light-emitting devices such as LEDs, and play an important role in determining device performance. Since luminescence efficiency varies depending on the combination of elements as well as the fabrication method, trial and error is necessary. Once materials are fabricated, performance evaluation is performed. After physical and engineering evaluations, the results obtained will be discussed with the professor.



The luminescence of phosphor materials fabricated in our laboratory

### A Day in the Lab

There are no core hours in this laboratory. Except for attending weekly thesis seminars and bi-weekly research progress report meetings, students can basically use their time freely for research. Some students work on their research in the morning and leave in the evening, while others work through the afternoon and into the evening. The laboratory has a very good atmosphere. You can easily get to know each other regardless of your grade.



Spectroscopy equipment in our laboratory

### Thesis Subjects

- ▶ (M) Effect of matrix elements on luminescence properties of Eu doped phosphate phosphors and their correlation
- ▶ (M) Evaluation of BiVO<sub>4</sub> photocatalysts and photoelectrodes prepared by electrophoresis for artificial photosynthesis
- ▶ (M) Mist flow control for oxide phosphor thin film preparation by Mist-CVD method

The number of  
PhD Graduates

2

### Major employers of Graduates

- STANLEY
- JEOL
- NITTO BOSEKI
- nittoh
- Tokyo Electron Device
- TOKYO SEIMITSU
- Shin-Etsu Chemical
- TDK-Lambda
- Canon Tokki
- Idemitsu Kosan

Writer : SHIRAHATA Kohei, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Tsuouka College)

57

教員名  
KATO Ariyuki

キーワード  
phosphor  
light emitting device

Mechanical

Electrical

Management

Materials

Civil

Nuclear Technology

System Safety

Innovation



14

## Solar Energy Device Laboratory

Professor / Kunihiko TANAKA    Assistant Professor / Ayaka KANAI  
 Technical Staff / Hideyuki TOYOTA

- ▶ environment-friendly
- ▶ Preparation, measurement, evaluation, all with own hands!
- ▶ Cu = idol, Sn = steady, Si = friend, S = life



<http://femto5.nagaokaut.ac.jp/>

Supervisor    Kunihiko TANAKA

Professor Tanaka always works in the same room with students. Therefore, if there is something you do not understand in the research, you can discuss it immediately. In addition, prof. Tanaka is very friendly to the students, we have a chat with prof. Tanaka every day.



### Research Content

Our Laboratory mainly fabricates thin film solar cells by ourselves and investigates fundamental physics of compounds semiconductors used for solar cells, and to reduce cost and construct the solar cells easily, semiconductor thin films for solar cells are prepared in non-vacuum.

We do all process of fabrication of solar cells by ourselves and evaluate the solar cells with our own hands. Therefore we can feel very pleasure if high conversion efficiency is established.

We also growth single crystal of the semiconductors for solar cells and investigate basic physics of the semiconductors by observation of photoluminescence.



Experimental apparatus made by laboratory students

### A Day in the Lab

10:00 Preparation of materials for debriefing sessions.  
 12:00 I go to school cafeteria with laboratory members.  
 13:00 Start-up of experimental equipment.  
 14:00 Start of experiment.  
 16:00 I finished the experiment, I summarize the experiment by data reduction.  
 18:00 Ra-men time or returning home.

Of course, there are people who remain after supper and are doing experiment.  
 At our laboratory, we can plan by ourselves because lack of core-time. We are always chatting in laboratory with each other, and it is lively every day.



Photos of the camp at the lab

### Thesis Subjects

- ▶ (M) Preparation of Cu<sub>2</sub>SnS<sub>3</sub> thin film using mist CVD method
- ▶ (M) Preparation and evaluation of Cu<sub>2</sub>IVS<sub>3</sub> bulk single crystals
- ▶ (M) Preparation of Cuprous Halides transparent p-type semiconductor thin films by solution processing

### Major employers of Graduates

The number of  
PhD Graduates

1

- Tokyo Electron Ltd.
- TERUMO CORPORATION
- Stanley Electric Co., Ltd.
- SoftBank Corp.
- Hitachi Kokusai Electric Inc.
- Showa Denko Materials Co., Ltd.
- GS Yuasa Corporation
- Hirose Electric Co., Ltd.
- Hino Motors, Ltd.
- Furukawa Battery Co., Ltd.

58

Writer : OKAMURA Kazuya, Electrical, Electronics and Information Engineering  
 (Nagaoka Technical High School)

#### 教員名

TANAKA Kunihiko  
 KANA Ayaka  
 TOYOTA Hideyuki

#### キーワード

Solar cells  
 Compound semiconductor  
 Non-vacuum process  
 Spectroscopy

15

# Nanoelectronics Laboratory

Associate Professor / Takeya UNUMA

- ▶ New functions in the terahertz/infrared region
- ▶ Nanometer World
- ▶ Polite instruction and free atmosphere are compatible!



<https://quantum.nagaokaut.ac.jp/>

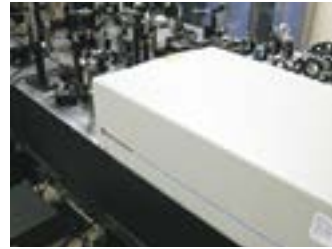
Supervisor Associate Professor / Takeya UNUMA

Prof. Unuma was assigned to the current position in November 2014. He is polite to students and gives careful instruction and advice. He always handles a lot of jobs as the lab director, walking three times faster than normal. He likes watching sports, playing table tennis, and playing Shogi (Japanese chess).



## Research Content

We manipulate quantum effects by designing nanostructures and molecular structures in semiconductor materials and explore new optoelectronics beyond traditional optical phenomena and transport phenomena. We treat both inorganic semiconductors (superlattice structures etc.) and organic semiconductors (conjugated polymers etc.), with an emphasis on their functionalities for the technologically immature terahertz/infrared region, which is located between the regions of light and radio waves. These studies will lead to next-generation solid-state terahertz sources and flexible optoelectronic devices. If you join us, you will be able to perform experiments making full use of high-performance equipment such as femtosecond lasers.



30-femtosecond-class ultrashort pulse laser and homebuilt terahertz gain measurement system

## A Day in the Lab

Currently, 8 students belong to the lab. Because the professor is polite and relatively young, he keeps the lab with such a nice atmosphere that students feel free to have discussions and ask questions. We carry out everyday research for hours including the core time from 10 to 17 o'clock on weekdays, and report progress and introduce the literature in seminars once a week. We feel that these activities in the lab develop our thinking and practical skills, and presentation skills. Join us and enjoy sports, trips, etc. together as well as research!



Experiment scene

## Thesis Subjects

- ▶ (M) Study on the terahertz conductivity of polymer-based semitransparent composite materials
- ▶ (M) Study on ultrafast ballistic conduction in inorganic and organic semiconductors
- ▶ (M) Consideration for the control of Bloch oscillations in semiconductor superlattices on the basis of their internal and external structures

## Major employers of Graduates

The number of  
PhD Graduates

0

- Sankosha Corp.
- JOLED, Inc.
- Nippo Electronics Co., Ltd.
- Tsuzuki Manufacturing Co., Ltd.
- Furukawa Electric Co., Ltd.
- TOMOEGAWA Co., Ltd.
- ALPS ALPINE Co., Ltd.
- ADTEC Engineering Co., Ltd.
- Kioxia Corporation
- TAIYO YUDEN Co., Ltd.

Writer : SATO Yoshinori, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Nagaoka college)

59

教員名

UNUMA Takeya

キーワード

Terahertz engineering  
Nanostructured semiconductors  
Organic semiconductors  
Lasers

16

# High Power Laser Development and Application Engineering Laboratory

Professor / Hisayuki SUEMATSU    Technical Staff / Akio SHIDA



- ▶ Breaking your limits by creativity challenge!
- ▶ Building your communication skills with multinational students!
- ▶ Developing your presentation skills in Japanese and international conferences!



<https://etigo.nagaokaut.ac.jp/suematsu/>

Supervisor    Professor / Hisayuki SUEMATSU

If you are a "work hard, play hard" person, this is your place because so is our professor. In study, he requires student's effortness and supports students diligently. With hobbies such as fishing, road bike, and glider, he is very excited to participate in activities with students.



## Research Content

At EDI center of this laboratory, the world's top-level research environment with electron microscopes, accelerators, etc. make it possible to carry out the fabrication and characterization of new materials in the world.

With major research contents including preparation of ultrafine particles by pulsed wire discharge, synthesis of superconductors by ultrahigh pressure method, etc., we have sent out various new materials to the world.

Moreover, by using the particle accelerator and the pulse electron accelerator, we have conducted composition analyses and particle irradiation experiments, as a result, contributed to material manufacturers, medical institutions, domestic and foreign nuclear research institutes.



Professor Suematsu and international students in front of the ETIGO-III

## A Day in the Lab

With the slogan "laboratory is family", in various activities such as traveling, sports, fishing, cooking, members are deeply tied together. In addition, laboratory's characteristic is the rich international atmosphere with international students from various countries and Japanese students studying abroad. There is no core time. Research is conducted on their own with a progressing report every week.

One day in the laboratory is like:

- 9:00 Good morning to the laboratory. Lightly chatting and turning the motivated switch ON!
- 9:30 is time to start an experiment, isn't it?
- 12:00 -13:00 Lunch and relax time (golf, badminton, gym)
- 13:00 Well it's time for a fun experiment
- 18:00 A working hard day finished. Let's go to have some ramen !



Golf during lunch break

## Thesis Subjects

- ▶ (M) High pressure growth of  $\text{Sr}_2\text{Ca}_{n-1}\text{Cu}_n\text{O}_7$  superconductor single crystal and its structural analysis
- ▶ (M) Introduction of color center into NaCl at low temperature by pulsed high intensity relativistic electron beam irradiation
- ▶ (M) Development of hydrogen recombiner using porous geopolymer

## Major employers of Graduates

The number of  
PhD Graduates

18

- National Institute of Technology
- Electric Power Company (Tokyo, Tohoku, Hokuriku)
- Sumitomo Electric
- Toshiba Corporation
- Toyohashi University of Technology
- JX Nippon Mining & Metals Corporation
- Shin-Etsu Chemical Co.,Ltd
- Panasonic Corporation
- Hitachi Power Solutions Co.,Ltd
- Mitsubishi Electric Corporation

60

Writer : Yang Yaru, Energy and Environment Science  
(Nagaoka University of Technology)

教員名

SUEMATSU Hisayuki  
SHIDA Akio

キーワード

MoO<sub>3</sub>  
ETIGO-III  
High-Tc Superconductivity  
pulsed wire discharge

17

# Electromagnetic wave control device laboratory

Associate Professor / Tomoyuki SASAKI



- ▶ Early to bed and rise, for Healthy laboratory life
- ▶ A serious approach to research.
- ▶ Reporting, communication and consultation



<https://whs.nagaokaut.ac.jp/hertz/>

Supervisor Associate Professor / Tomoyuki SASAKI

Mr. Sasaki usually gives the impression of being taciturn, but during seminars he comes out of nowhere to offer interesting topics. His e-mails to students are rarely a bit mischievous, and you'll be surprised at the gap between what you see and what you get!



## Research Content

Our lab is working on new devices to control terahertz waves. Due to their high transparency and ease of handling, terahertz waves are useful for detecting properties of materials that could not be measured in the visible light range before. Among them, we are focusing on dynamically changing the polarization state of terahertz waves, and are devoting our efforts to fabricating devices that can achieve such a thing. The polarization of terahertz waves carries various information about matter, and if we can observe them, we can identify what the matter is or image the matter itself.



Terahertz TDS (Time Domain Spectroscopy)

## A Day in the Lab

Although life in the living room is often quiet, communication among students during breaks and other times is lively, and a comfortable quietness is a characteristic of this laboratory. Whenever a new member is assigned to a laboratory, we hold a welcome party so that senior and junior members can get to know each other and build a relationship where they can ask each other anything. No strict core hours are set, but the image is generally active between 9:00 a.m. and 5:00 p.m. (Some sleep in or leave early. XD)



The laboratory at 8:50 a.m. Nobody there. Is everyone sleeping? lol.

## Thesis Subjects

- ▶ (M) A study on polarization conversion in the terahertz range using subwavelength metal-mesh structures with liquid crystals
- ▶ (M) Complex index refraction of graphene-doped liquid crystals in the terahertz band
- ▶ (M) Research on holographic terahertz devices using liquid crystals

## Major employers of Graduates

The number of  
PhD Graduates

0

- OPT Gate Co.,LTD.
- NIKON CORPORATION
- Sumitomo Electric Industry
- NIPPON SEIKI CO.,LTD.
- FUJITEC CO.,LTD.
- SIGMA Corporation
- Micron Memory Japan, K.K.
- SOLIZE Corporation
- SMK Corporation

Writer : Yuta TAKEUCHI, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Tokyo College)

61

教員名

SASAKI Tomoyuki

キーワード

Terahertz  
Metasurface  
Terahertz polarization

18

# Metamaterials Laboratory

Associate Professor / Yasuhiro TAMAYAMA

- ▶ Develop artificial optical materials : metamaterials
- ▶ Explore exotic optical and electromagnetic phenomena
- ▶ Be an optical magician


<https://whs.nagaokaut.ac.jp/mtp/index.html>

Supervisor Associate Professor / Yasuhiro TAMAYAMA

When we ask Prof. Tamayama a question, he gives us a logically clear answer, even if the question has no relation to our research. Because he thinks that it is important for us to actively act, he lets us make a research at our own pace.



## Research Content

We develop methods for controlling electromagnetic waves using metamaterials consist of subwavelength structures. Metamaterials enable us to realize electromagnetic properties that do not exist in nature and to control propagation of electromagnetic waves in exotic ways. There are many applications using electromagnetic waves, therefore, developing techniques for controlling electromagnetic waves using metamaterial would be useful for our lives.



Experimental setup for controlling microwaves using metamaterials.

## A Day in the Lab

Core time is provided in our laboratory, AM9:00-PM4:00. We must participate in a study session on research meeting, which are held once a week, respectively. In the research meeting, we present and deeply discuss our own research. In other times, we make theoretical analyses, electromagnetic simulations and experiments at our own pace. We must make our research plan for ourself, while the supervisor properly modifies the plan as needed. This lets us make a research actively and smoothly.



Electromagnetic simulator for designing metamaterial structures.

## Thesis Subjects

- ▶ (M) Tunable Fabry-Perot resonator utilizing microplasma generation and annihilation in the meta-surface
- ▶ (M) The basic study of the interaction meta-atoms and a surface lattice resonance
- ▶ (M) Broadband control of electromagnetic waves in the linear polarization basis using Brewster metafilms

## Major employers of Graduates

The number of  
PhD Graduates

0

- Daihatsu Motor Corporation
- Mitsubishi Electric Corporation
- Nittoh Inc.
- SIGMA Corporation
- Hamamatsu Photonics K.K.
- Seiko Epson Corporation
- Osaka Prefecture
- Yamagata Prefecture
- Mitsubishi Chemical Corporation
- VS Technology Corporation

62

Writer : Aoi NAKAYAMA, Electrical, Electronics and Information Engineering  
(大同大学大同高等学校)

教員名

TAMAYAMA Yasuhiro

キーワード

Electromagnetic wave  
Metamaterials  
Nonlinear optics

19

# Computational Materials Science Laboratory

Specially Appointed Associate Professor / Tomoki YAMASHITA



- ▶ Material development × Information science
- ▶ Development of crystal structure prediction
- ▶ Reseaching freely



<http://owl.nagaokaut.ac.jp/ja/>

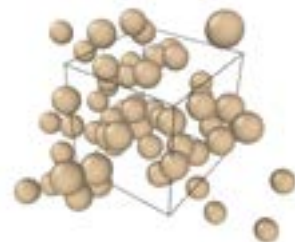
**Supervisor** Specially Appointed Associate Professor / Tomoki YAMASHITA

Prof. Yamashita is very enthusiastic about student education, because he eagerly tell us if there are something we do not understand in the weekly meeting. In addition, he often introduce papers and websites that are useful for research.



## Research Content

In recent years, in the field of materials development, methods for more efficient development have been studied by applying information science technology. Such research is called materials informatics and is an area that has recently attracted attention because it can reduce the time and cost required for material development. Computational materials science laboratory conducts research that combines first principles calculations and materials informatics. We also develop software to predict stable crystal structure from composition.



MD simulation

## A Day in the Lab

In this laboratory, students do not do what is called "experiment" using measuring devices, and research is mainly on simulation using computers. Therefore, research can be advanced anytime and anywhere with a personal computer. In addition, since there is no core time in the laboratory, you can freely decide the schedule. Students study condensed matter physics and machine learning from the basic at seminar, so you don't need to worry if you don't know anything about machine learning.



Meeting room

## Thesis Subjects

- ▶ (B) Development of Molecular Crystal Structure Generation Program Using Evolutionary Algorithm
- ▶ (B) Descriptor Dependence of Search Efficiency in Crystal Structure Prediction by Bayesian Optimization

## Major employers of Graduates

- Sorimachi Giken Co., Ltd.

The number of  
PhD Graduates

0

Writer : Hirotaka SEKINE, Electrical, Electronics and Information Engineering  
(Niitsu Minami High School)

63

**教員名**  
YAMASHITA Tomoki

**キーワード**  
Materials Informatics  
First-Principles Calculation  
Crystal Structure Prediction  
Machine Learning



20

## Chaos and Fractals Informatics Laboratory

Professor / NAKAGAWA Masahiro    Assistant Professor / HAKUSEI Manabu  
Assistant Professor / WADAMORI Naoki

- ▶ Research into Brain and Nature
- ▶ Overwhelming collaborative research achievements
- ▶ Research activities to be promoted freely



<https://pelican.nagaokaut.ac.jp/>

Supervisor    Professor / NAKAGAWA Masahiro

Professor Nakagawa has a friendly personality, and we can easily talk about research, trivial problems, hobbies, and so on. He actively provides opportunities for students to present the results of their research at academic conferences. He also focuses on research and development, and students are given the opportunity to be a part of it with responsibility.



### Research Content

Applying the concept of "chaos and fractals" in nature, we are engaged in research on the analysis of biological information and natural phenomena, especially on the quantification of human sensitivity using Electroencephalography (EEG).

In addition, we are also conducting diverse research in brain function-related fields such as neural networks and brain-computer interface, as well as in voice, image, and bioassay, applying chaos fractal theory to suit individual interests.

Our technologies have attracted social attention, and we aim to contribute to society by conducting many collaborative research projects and actively participating in exhibitions and events.



Wearable device and real-time processing system for online EEG measurement.

### A Day in the Lab

We have no core times and only students in the research office.

Except for periodic progress report seminars, the use of time is left up to the individual, allowing us to work at our own pace.

Students are given the opportunity to present at conferences and write papers, depending on the results of their research.

We can research flexibly according to our own motivation and personality.

Because of this freedom, small events are often held in addition to regular events such as cherry blossom viewing and trips, allowing students to enjoy their days while balancing their research.



A study session by students.

### Thesis Subjects

- ▶ (M) Research on Kansei Measurement of Arousal and Pleasure to Olfactory Stimuli
- ▶ (M) A Study on Sensibility Evaluation of Workspaces and Shoes in Comfort
- ▶ (M) A Study of Emotional Information Processing Using Fractal Dimension Analysis

### Major employers of Graduates

The number of  
PhD Graduates

13

- NTT DATA SYSTEM TECHNOLOGIES INC.
- Japan Total System Co., Ltd.
- TSUGAMI CORPORATION
- DENSO WAVE INCORPORATED
- FUJITSU COMPONENT LIMITED
- NTT DATA INTELLILINK Corporation
- SUZUKI MOTOR CORPORATION
- FPT Japan Holdings Co., Ltd.
- ANRITSU CORPORATION
- NEC Corporation

64

Writer : NAGASAWA Renshi, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Oyama College)

#### 教員名

NAKAGAWA Masahiro  
HAKUSEI Manabu  
WADAMORI Naoki

#### キーワード

Chaos and Fractals  
Electroencephalography  
Sensitivity analysis  
Neural network



【校正時ご確認をお願い致します】

□執筆者欄、学校名の英語指示をお願い致します。

21

## Image and Media Information Laboratory

Professor / IWAHASHI Masahiro    Assistant Professor / HARAKAWA Ryosuke  
 Technical Staff / YAMAURA Kentaro

- ▶ Research using images, sounds, texts, or anything multimedia !
- ▶ Become a deep learning and optimization expert !
- ▶ Be an excellent presenter that can impress anyone !



<https://tech.nagaokaut.ac.jp/>

Supervisor    Prof. IWAHASHI Masahiro, Assistant Prof. HARAKAWA Ryosuke, Mr. YAMAURA Kentaro

Prof. Iwahashi is a person with wide range of knowledge in image processing, who actively conducts various joint researches. Assistant Prof. Harakawa is a specialist in multimedia and a very eager teacher. Meanwhile, Mr. Yamaura is a person in charge of the technicals and will gladly help you if you were facing any technical problem.



### Research Content

As researches on multimedia signal processing to support AI and IoT technologies, we conduct researches on "image restoration," which restores desired images from incomplete observed images, and "image recognition," which detects objects and classifies their states based on deep learning. Moreover, as researches for multimedia data such as sounds and texts, we conduct researches on "semantic understanding" to reveal useful information from big data in the cyberspace. Notably, we often collaborate with researchers and companies in various fields such as robotics, physics, biology, environment, disaster prevention, and education.



Discussion in the seminar

### A Day in the Lab

In this laboratory, we hold a seminar twice a week to discuss our researches and to train for presentations. No need to worry about the lack of experience or knowledge, because you can always ask our professors and/or refer the books. In addition, many members actively present their researches through conferences and papers, both in Japan and abroad. Before the COVID-19 epidemic, we have held futsal/softball tournaments, cherry blossom viewing, Nagaoka fireworks, and laboratory trips among members. After that, we have continued to hold various events using online tools and other means, and our members get along with each other.



Laboratory travel (Kusatsu hot spring)

### Thesis Subjects

- ▶ (D)Speech Enhancement and Anti-spoofing in Speaker Recognition by utilizing Phase Information
- ▶ (D)Four-Dimensional Medical Image Compression by Using Non-Separable Integer Wavelet Transform
- ▶ (D)A Study on Speech Classification Based on Deep Neural Network under Adverse Environments
- ▶ (D)A Study on Speech Signal Processing for Noise Robust Speaker and Speech Recognition

### Major employers of Graduates

The number of  
PhD Graduates

10

- Nippon Seiki
- NTT TechnoCross
- NEC Solution Innovators
- NTT Comware
- NTT Advanced Technology
- Renesas Electronics
- Panasonic Device System Techno
- Canon Imaging Systems
- Tokyo Electron Device
- CAROL System

Writer : OKAMURA Daiki, Electrical, Electronics and Information Engineering  
 (千葉県立千葉北高等学校)

65

教員名

IWAHASHI Masahiro  
 HARAKAWA Ryosuke  
 YAMAURA Kentaro

キーワード

Multimedia  
 Signal Processing  
 AI (Artificial Intelligence)  
 IoT (Internet of Things)

22

# Spatial Image Media Laboratory

Professor / Tomohiro YENDO

- ▶ Connect virtual and real space
- ▶ Create "Interesting things" !
- ▶ A picture is worth a thousand words. Let's build an actual machine and demonstrate!

Supervisor Professor / Tomohiro YENDO

Prof.Yendo is very friendly to students. He always gives us advices for research and other matters. On the other hand, in situation other than research, he is close to students and often makes small talks.



## Research Content

We research on three main areas below.

- Three-dimensional (3D) display

We study on glasses-free 3D displays and 3D head-up displays. Transparency for augmented reality (AR) display and multi-person use are especially considered.

- Visible light communication (VLC)

We study on camera-based wireless communications by using visible light. Our target includes road-to-vehicle communications from traffic lights and on-board cameras, and smartphone-based system transmitting from electronic message boards or illuminations.

- Camera

We research on special functional cameras, for example, telephoto camera shooting direction changes instantly, and plate-shaped camera whose viewpoint is distant from the physical camera position.



This is an innovative spherical 3D display. You can study based on your own ideas, build an actual prototype, and demonstrate it.

## A Day in the Lab

Our laboratory doesn't adopt a core time system, so you can do research at any time you want. The seminar is divided into two groups, 3Ddisplay and VLC. In addition, there is a seminar in which papers are read, introduced, and discussed. When we get stuck in researches, we often have discussions with students and the professor. In addition, our relationships are very good in this laboratory, such as going out for dinner after the seminar.



This is a state of our laboratory. They are discussing on a research theme.

## Thesis Subjects

- ▶ (M) A study on imaginary image projection display using holographic optical elements
- ▶ (M) A study of high resolution super multi-view display using time division method
- ▶ (M) A study of undersampled camera communication using Quadrature Amplitude Modulation

## Major employers of Graduates

The number of  
PhD Graduates

0

- Canon Inc.
- Nippon Seiki Co.,Ltd.
- Mitsubishi Electric Corporation
- Honda Motor Co., Ltd
- Texas Instruments Japan Limited
- Canon Imaging Systems Inc.
- Kajima Corporation
- Murata Manufacturing Co., Ltd.
- Daihatsu Motor Co., Ltd.
- Bosch Corporation

66

Writer : Mion AOKI, Electrical, Electronics and Information Engineering  
(Niigata Prefectural Kokusai Joho High School)

教員名

YENDO Tomohiro

キーワード

3-Dimensional Display  
Visible Light Communication  
Augmented Reality  
Ray Space

23

# Nonlinear System Engineering Laboratory

Professor / TSUBONE Tadashi



- ▶ Nonlinear dynamics are hidden in complex phenomena
- ▶ Looking at problems from two approaches: theory and phenomena
- ▶ The catchphrase is "oily & volumey!"



<https://whs.nagaokaut.ac.jp/circuit/>

Supervisor TSUBONE Tadashi

He is a caring and reliable teacher.  
If you have any trouble, you can feel free to consult.  
It takes care of students in situations other than study.  
The laboratory is always lively.



## Research Content

The world is full of complex phenomena such as schools of fish and cloud movement.  
Nonlinear dynamics is hidden there.  
However, it is often treated as a linear system, and it cannot explain all phenomena.

Therefore, by focusing on nonlinearity, we aim for more advanced engineering applications.

Applications range from the behavior of systems and robots, optimization problems, drone control, and levitation of objects by ultrasonics.

We analyze phenomena from both sides of theory by numerical calculation and physical phenomena such as electric circuits.



Circuit experiment

## A Day in the Lab

Students have one research theme and are working to disseminate it to the world.

There is a monthly general briefing and a seminar twice a week, so you can easily consult with your teacher.

In addition, there are many opportunities such as international conferences, and you can grow through valuable experiences.

It is a laboratory where seniors and juniors get along well and laugh every day.

There are many active activities such as travel, BBQ, softball, and skiing, so you can have a memorable student life.



Research landscape

## Thesis Subjects

- ▶ (M) Study on identification of discrete-time chaotic dynamical systems by reservoir computing with noise
- ▶ (M) Study on autonomous flight of multi-UAV based on synchronous dynamics of coupled oscillator systems

## Major employers of Graduates

The number of  
PhD Graduates

2

- FUJITEC CO., LTD.
- Artiza Networks, Inc.
- FPT Japan Holdings Co., Ltd.
- SUZUKI MOTOR CO.
- Mitsubishi Motors Co.
- Furukawa Electric Co., Ltd.
- TOSHIBA TEC CO.
- East Japan Railway Company
- TKC Co.
- CyberAgent, Inc.

Writer : Miyabayashi Hiroyuki, Electrical, Electronics and Information Engineering  
(National Institute of Technology, Numazu College)

67

教員名  
TSUBONE Tadashi

キーワード  
Nonlinear  
Dynamics  
Chaos  
Electric circuit

Mechanical

Electrical

Management

Materials

Civil

Nuclear Technology

System Safety

Innovation

24

# Signal Processing Application Laboratory

Associate Professor / SUGITA Yasunori

- ▶ Let's balance work and fun!
- ▶ Let's get inspiration from everything!
- ▶ Let's put our soul in signal processing!



<https://asplab.org>

Supervisor Associate Professor / SUGITA Yasunori

Dr. Sugita, our teacher, is understanding and friendly. We often talk freely about research, hobby, and more. He also thinks with us in our shoes when we are at the seminar. Students respect him thanks to his dedicated advice and profound knowledge.



## Research Content

Nowadays, Digital Signals are surrounding our society, and everything uses them. For example, 4K/8K ultra-high definition videos and High-Res audio are typical uses of Digital Signal Processing technology.

We are researching various themes, such as super-resolution on image processing, highly directional speakers, signal processing using machine learning et cetera. Although we're a Digital Signal Processing Lab, we also make some hardware or devices like dummy heads using a 3D printer.



A dummy head and speakers set in the anechoic room

## A Day in the Lab

We have a laboratory seminar and a personal seminar almost every week.

In the laboratory seminar, we report our research progress to all the members in the lab, and reporters will receive questions and advice. Then in the personal seminar, we discuss the research plan in more detail with Dr. Sugita individually.

There are no other rules about research or core times. So we can join in the club activities or work part-time jobs, but on the other hand, we have to manage and motivate ourselves.

Sometimes we get inspiration from chatting or from the research of our colleagues.



3D-scanning to make a dummy head model

## Thesis Subjects

- ▶ (M) A Study on DPOAE Level Estimation using Dual-phase Lock-in Amplifier
- ▶ (M) Improving the sound image localization accuracy of bone conduction headphones
- ▶ (M) A DNN-based music source separation method considering music characteristics

## Major employers of Graduates

The number of  
PhD Graduates

0

- Meitec
- Rohm
- Hitachi
- FPT
- VEGA Corporation

- Mitsubishi Electric
- East Japan Railway Company
- NEC Platforms
- Panasonic
- Denso Techno

68

Writer : OGUMA Shun, Electrical, Electronics and Information Engineering  
(National Institute of Technonology, Kisarazu College)

教員名

SUGITA Yasunori

キーワード

Acoustic Signal Processing  
Digital Signal Processing  
Filter Designing  
Image Processing

25

## Neural engineering laboratory

Associate Professor / NAMBU Isao    Technical Staff / KUSANO Toshiki

- ▶ Research of nervous system mechanism
- ▶ Towards a communication interface between human and computers
- ▶ Experience and enjoy multicultural research environment in Japan

**Supervisor** Associate Professor / NAMBU Isao

Our laboratory has just been established in 2017. Nambu-sensei is a young, gentle supervisor who is friendly in discussion and who can understand his students. In addition, he also has a very encouraging spirit which helps him to point out critical problems in research and lifestyle as well as helping in resolving them.



### Research Content

Human brain can perform complex tasks such as motion control or recognition with an incredible speed that surpasses any high-graded computer. However, until now, we still do not have a clear understanding about our brain and there are still many phenomena of our brain which have not been explained in detail. Therefore, our laboratory was established with the goal and desire to discover the mystery of the human nervous system. Our laboratory main researches are related to measuring brain activities (by the ionic current within neurons of the brain or hemodynamic responses) and muscular activity



Measuring Brain Waves in the Laboratory

### A Day in the Lab

There is no core time at our laboratory as well as no impositions about the time to arrive/leave the laboratory, we can proceed research with the schedules made by ourselves and adjust it so we learn how to well-balance between research and life. In order to have a fit schedule, there is a meeting to discuss our research once a week . In addition, Japanese students as well as students from other countries (Vietnam, Malaysia) are very close friends who often go shopping, eating or just having light chats while enjoying snacks, tea or coffee.



Laboratory scene

### Thesis Subjects

- ▶ (M) A Study on Prediction of Direction of Movement by EEG during Preparation for Exercise
- ▶ (M) Research on neurofeedback using EEG during exercise execution
- ▶ (M) Estimation of arm movement direction by EEG during working memory

The number of  
PhD Graduates

0

### Major employers of Graduates

- TAKAZONO TECHNOLOGY
- SANDEN SYSTEM ENGINEERING
- Deloitte Tohmatsu akt
- Kyocera
- Secom
- NTT Lt Global Shared Services Centre Asia Pacific Sdn Bhd

Writer : PHAM LAM DINH QUANG, Electrical, Electronics and Information Engineering  
(Ho Chi Minh City University of Technology (HCMUT))

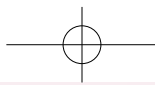
69

教員名

NAMBU Isao  
KUSANO Toshiki

キーワード

Neuroscience  
Virtual sound source  
Human physiologic and reaction of human body  
Machine Learning



26

## Communication Networks Laboratory

Associate Professor / Kohei WATABE



- ▶ Unsung heroes supporting communication infrastructure.
- ▶ Control a giant system unmatched in the history of the world !!
- ▶ Become a specialist by a boot camp program !!



<https://kaede.nagaokaut.ac.jp>

**Supervisor** Associate Professor / Kohei WATABE

He is very friendly and trusts students, so he allows us to advance research at our own pace. Students are encouraged to learn skills and knowledge that can be used even after graduation, and they can also come for consultation.



### Research Content

The Internet that supports our lives is said to be one of the largest systems in human history. That is why it is a challenging issue to control this huge system without interruption. For example, in telesurgery, using a robot arm or autonomous driving via networks, network failure can cause a life-threatening problem. Our laboratory aims to create a communication infrastructure that never stops even on a large scale and recovers quickly if halted.



Visualization of the network from NUT to post offices of various countries.

### A Day in the Lab

At ComNets Lab., except for a meeting to report progress of research for members, there are almost no fixed schedules. Individual meetings can be freely scheduled without appointments. Therefore, part-time jobs and job hunting can be compatible with research activity. Since Dr. Watabe likes alcohol and cooking, there are many events such as fireworks, cherry blossom viewing, and takoyaki parties. Because of that, students can enjoy both research and private life in the laboratory. In addition, Dr. Watabe recommends challenges other than research to students. Meetings where students show self-made IoT systems or web applications are held.



Newcomers develop Pac-Man in boot camp.

### Thesis Subjects

- ▶ (M) A Packet Level Time Series Traffic Generation Using Machine Learning

### Major employers of Graduates

- Directorz

The number of  
PhD Graduates

0

70

Writer : ABE Takumi, Electrical, Electronics and Information Engineering  
(national Institute of Technology, Tsuruoka College)

**教員名**

WATABE Kohei

**キーワード**

Internet  
Communication network  
IoT  
Algorithm



【校正時ご確認をお願い致します】  
 目録の修正に合わせて研究室名を入れました。

27

## Lab for Data Sequence Structure

Associate Professor / Akiko MANADA



- ▣ Enjoying researches in new fields
- ▣ Researching on technologies regarding graph theory
- ▣ Voluntary research activities

Supervisor Associate Professor / MANADA Akiko

Dr. Manada is a kind and dedicated teacher. She first makes us generate interest in learning, and then gives us advices and new approaches. In addition, since this lab has just been established in 2021, she helps us to improve the environment of our lab.



### Research Content

Our main research theme is to apply graph theory towards engineering. Graph theory is a mathematical study of graphs consisting of nodes and edges. We aim to apply graphs to various issues and discover new technologies. Indeed, this field is expected to find applications in a variety of technologies, including machine learning, data structure, and so on.

### A Day in the Lab

In our lab, we have no core time, but we have weekly meetings to catch up our research progress. Also, we are free to research based on our interest. So, we can do research whatever and whenever we want.



Meeting scenery

### Thesis Subjects

- ▶ No data due to newly established laboratory

### Major employers of Graduates

- No data due to newly established laboratory

The number of  
PhD Graduates

0

Writer : TOYAMA Ryo, Electrical, Electronics and Information Engineering  
 (National Institute of Technology, Nagaoka College)

71

教員名  
MANADA Akiko

キーワード  
Graph Theory  
Coding Theory  
Network Topology  
Data Storage Media



