

2018 Nagaoka Summer School for Young Engineers (NASSYE)

List of Research Topics

Mechanical Engineering

Department website: <http://mcweb.nagaokaut.ac.jp/j/>

Research Topic	Nanometer measurement and control
Instructor	AKETAGAWA, Masato
Assistant Instructor	
Contents	In nanotechnology and precision engineering fields, nanometer positioning and manufacturing are required. This training will provide basics for nanometer measurement and control. The students can study 1) basic precision engineering, 2) measurement theory, 3) basic optics and 4) basic control theory from some experiments.

Research Topic	Fabrication and Evaluation of the MAX phase Ceramics
Instructor	NANKO, Makoto
Assistant Instructor	
Contents	The MAX phase ceramics, such as Ti ₂ AlC and Ti ₂ SiC, are synthesized and consolidated by using spark plasma sintering. Mechanical properties and machinability of the MAX phase ceramics are evaluated.

Research Topic	3D nano printer and micro motion control technology
Instructor	NAKAYAMA, Tadachika
Assistant Instructor	
Contents	In this research you will synthesize nano-level three-dimensional structures and control the motion of the structure by electric field. In other words, you will create a small "robot" and practice to move it. First of all, you make your own favorite structure by 3D-CAD. We will fabricate this design by 2 photon lithography method. Motion control is performed with the electric field using the needle electrode. Based on these results, we will draw a path to collaborative research and scientific paper writing in the future.

Mechanical Engineering

Department website: <http://mcweb.nagaokaut.ac.jp/j/>

Research Topic	Development of new manufacturing technology for hybrid materials
Instructor	NAKAYAMA, Tadachika
Assistant Instructor	
Contents	Hybrid Materials (ceramics and polymers) have been applied in various fields. In this laboratory, we are developing proprietary manufacturing technology combining nanotechnology and nanosecond technology. In this seminar, we will learn about the new disciplines in the boundary area of electrical engineering, materials engineering and applied chemistry while working on mastering these technologies.

Research Topic	High Pressure Application for Food: How high pressures cook foods more delicious?
Instructor	OTSUKA, Yuichi
Assistant Instructor	MIYASHITA, Yukio
Contents	Food processing is normally conducted by using heat treatments such as grilling, boiling etc. New technology, high pressure processing for foods has been developed. High pressure can deform and denature materials in foods. In other words, high pressure “cooking “ can make unique foods such as half-simmering egg, fruit jam which preserves its original color, softened raw meat, etc. The high pressure processing can also deactivate bacteria/viruses or allergen etc. However, mechanisms in such the effects have not been fully revealed. The topic includes selection of foods/materials according to applicant’s interests, observation of the changes by high pressure processing and considerations on mechanical behaviors during the process. A discussion will also be opened to collect possible application ideas proposed by applicants.

Research Topic	Limnescent Hydroxyapatite complex and its biomedical applications
Instructor	OTSUKA, Yuichi
Assistant Instructor	MIYASHITA, Yukio
Contents	Number of application cases of artificial joints or dental implants has been increasing in Asia region due to rapid aging. Such the artificial components in human body is subjected to a risk of infection by bacteria because they have no prevention property to the infections. Various techniques which provide the artificial component antibacterial property have been developed but not been established yet. Our group developed an original technique by using calcium phosphate complex. The topic includes forming the calcium phosphate complex, characterizations, observations for cell adhesion behavior or antibacterial property etc. A discussion will also be opened to collect possible application ideas proposed by applicants.

Electrical, Electronics and Information Engineering

Department website: <http://denki.nagaokaut.ac.jp/e/>

Research Topic	The Learning about Current Network Technology through Network Simulations
Instructor	NAKAGAWA, Kenji
Assistant Instructor	WATABE, Kohei
Contents	This program introduces basic techniques of network technologies through network performance evaluations by a network simulator. Students simulate packet behaviors, such as traffic generation, packet forwarding, and queueing, on the network simulator. Network performances are investigated by evaluating various metrics, such as amount of traffic, throughput, packet delay, packet loss rate, and jitter, on the simulation. The aim of the program is to help students acquire the modeling and evaluating skills through the simulations.

Research Topic	Evaluation of LCD device parameters by means of spectroscopic ellipsometry
Instructor	KIMURA, Munehiro
Assistant Instructor	
Contents	The evaluation of the state of polarization, which is so-called ellipsometry, can provide us fruitful information such as the properties of thin films as well as the characteristics of liquid crystal display (LCD). In this theme, the attendee will study how to use ellipsometer and the process to evaluate the surface anchoring energy in LCD.

Materials Science and Technology

Department website: <http://mst.nagaokaut.ac.jp/en/>

Research Topic	Polymer electrolyte fuel cell
Instructor	UMEDA, Minoru
Assistant Instructor	MATSUDA, Shofu
Contents	Preparation and evaluation of electrocatalyst for polymer electrolyte fuel cell

Materials Science and Technology

Department website: <http://mst.nagaokaut.ac.jp/en/>

Research Topic	Photocatalytic reactions for the methane formation from carbon dioxide, removal of heavy metal ions, and decomposition of bisphenol
Instructor	SATO, Kazunori
Assistant Instructor	YAMAMOTO, Masanori
Contents	In order to apply photocatalytic reactions for an energy production and an environmental protection, photocatalytic reduction of carbon dioxide to methane in water, removal of hazardous heavy metal ions existing in an aqueous environment by photoelectrodeposition, and decomposition of bisphenol existing at a very low concentration in water by photoelectrolysis will be investigated. New photocatalyst materials will show high activities for these photocatalytic reactions. Sample preparations, characterization of the prepared samples, and the photocatalytic abilities will be examined in this lab project. Prospective students will learn a synthetic skill, material characterization by x-ray diffraction and scanning electron microscopy, and elemental analysis of metals at low concentrations by inductively-coupled plasma atomic emission spectroscopy.

Research Topic	Magnetic imaging technique utilizing magneto-optical effect
Instructor	ISHIBASHI, Takayuki
Assistant Instructor	NISHIKAWA, Masami
Contents	In this program, we provide a technical program on magnetic imaging utilizing magneto-optical (MO) effect. You can learn how to observe magnetic domain structures in magnetic material using a polarization measurement technique, and you can also learn how to measure magnetic field distribution in space or current flow in conducting materials such as metals and superconductors using MO imaging plate consisting of bismuth-substituted iron garnet films developed in this laboratory.

Research Topic	Colorimetric detection of an ultra-trace harmful ion in environmental water with a nanostructured sensor
Instructor	TAKAHASHI, Yukiko
Assistant Instructor	
Contents	During summer school a student will be able to <ul style="list-style-type: none"> - study the poisonous properties and environmental burden of legally regulated ions (mercury, lead, cadmium, arsenic, etc.) - fabricate a specific dye nanoparticle coated test strip for a target ion - observe the morphology of dye nanoparticle by surface analysis - detect a target ion with his/her own test strip - analyze the color change by colorimetric device.

Materials Science and Technology

Department website: <http://mst.nagaokaut.ac.jp/en/>

Research Topic	Observation and analysis of nano-structured photo-catalyst surface by field emission type scanning electron microscope equipped with energy dispersive X-ray and electron back scattered diffraction apparatus
Instructor	SAITO, Nobuo
Assistant Instructor	
Contents	The aim of this theme is to understand how to observe and analyze a nano-structured surface structure by scanning electron microscope equipped with EDS and EBSD. As an observation sample, metal oxide and/or metal nitride semiconductor are prepared by various techniques.

Research Topic	Implements of sustainable technologies for water treatments and biomass reuses on advanced materials
Instructor	KOBAYASHI, Takaomi
Assistant Instructor	SIRIPORN, Taokaew
Contents	In biosustainable environmental materials engineering laboratory at department of science and technology innovation, we can provide special technical programs in water treatment materials for heavy metal removals and biomass regenerated hydrogels concerning with cellulose for tissue engineering. You can learn how to prepare and evaluate these materials for the purpose of environmental materials. These are very useful in future construction of sustainable society.

Civil and Environmental Engineering

Department website: <http://globe.nagaokaut.ac.jp/en/>

Research Topic	Mix design procedure and mechanical property evaluation of hot mix asphalt mixtures for Japanese road pavements
Instructor	TAKAHASHI, Osamu
Assistant Instructor	
Contents	The surface of roads is constructed with asphalt pavements. Hot mix asphalt (HMA) mixtures constituting the asphalt pavements are one of general civil engineering materials, but are not well known about types and physical properties. Even a student of civil engineering doesn't have an opportunity to study HMA mixtures in a university and a technical college. On this training theme, we learn constituent materials and design procedures of a HMA mixture and understand relationships between those and physical properties of the HMA concrete through some experimental works. We also experience that the physical properties of HMA concrete considerably depend on the characteristics and the percentage of each material. As the result, we can study fundamental knowledge on HMA mixtures and asphalt pavements.

Civil and Environmental Engineering

Department website: <http://globe.nagaokaut.ac.jp/en/>

Research Topic	Water and Wastewater treatment technology for domestic-, industrial-, and aquaculture-fields, to make a solution for Sustainable Development Goals 17(SDGs17)
Instructor	YAMAGUCHI, Takashi
Assistant Instructor	HATAMOTO, Masashi / WATARI, Takahiro / NAMITA, Maharjan
Contents	1) sharing the water/food related situation in each attendance country. 2) laboratory tour of aqua and soil environmental laboratory and some water/food related laboratories in NagaokaUT. 3-1) experimental course as main: Joining to lab's experiments: water quality analysis for water treatment process and/or microbial analysis of microbes by molecular technics. 3-2) Promotion course of SDGs related water/food: Making some PR video of Aqua and soil environmental laboratory or Nagaoka city, including attending yang engineer's activities. 4) Presentation of the progress.

Bioengineering

Department website: <http://bio.nagaokaut.ac.jp/~en/>

Research Topic	Introduction to bioengineering techniques in animals and plants
Instructor	TAKIMOTO, Koichi
Assistant Instructor	SHIMODA, Yasushi / SATO, Takeshi / ONUMA, Kiyoshi / NISHIMURA, Taisuke
Contents	This short internship course is intended for those who are intersted in higher eukaryotic organsims and related research techniques. The course is comprised of lecture/tutorial and experimental portions. The lecture/tutorial portion provides basic knowledge and concept for several research topics in this diverse field. The experimental portion is designed for participants to gain hand-on expreience with basic cell biological, molecular biological and genetic techniques.

Research Topic	Recognition of microorganisms existing around us, and realization of their power
Instructor	OGASAWARA, Wataru
Assistant Instructor	SHIDA, Yosuke
Contents	Through making of fermented food (bread baking), you experience the function of microorganisms. In addition, you will recognize the shape and ability of microorganisms in various experiments.

Information and Management Systems Engineering

Department website: <http://imse.nagaokaut.ac.jp/e/>

Research Topic	Development of an Information Retrieval System based on an Artificial Neural Network Model with Python Programming Language
Instructor	YUKAWA, Takashi
Assistant Instructor	
Contents	The trainee will develop an information retrieval program on a Linux server. The program should be written in Python programming language. The method used for information retrieval is an artificial neural network model, Word2Vec. Prerequisite knowledge and skills for the trainee include Linux operating system and Python programming language.

Nuclear System Safety Engineering

Department website: <http://nucsafety.nagaokaut.ac.jp/>

Research Topic	Nuclear Safety System Basic Study using accelerator and cybersecurity
Instructor	MURAKAMI, Kenta
Assistant Instructor	NGUYEN, Thanh Son / ZHANG, Kun / OTSUKA, Yuichi
Contents	The purpose of this project is to provide a learning course of integrity assessment method for structural materials in light-water reactors and Fundamental of computer security at nuclear facilities. 1: Measurement Radiation Practice @ At RI center: and Regulation practice 2: Safety Regulation practice by using Accelerator 3: Nano scale material characterization using Accelerator; the participants will use the latest Accelerator to observe element in materials for safety aspect. 4: Introduction to computer security at nuclear facilities: 5: International / national standards and guidance available to those responsible for computer security at nuclear facilities: 6: Final Report on What they have learned about the Nuclear Safe Regulation and Computer Security at Nuclear Facilities, as well as the materials characterization, analysis methods, and what did you learn from recent computer security incidents.