List of Research Topics

Mechanical Engineering

Research Topic	Ultra precision measurement and control with nanometer resolution		
Instructor	AKETAGAWA, Masato	Assistant Instructor	WEI, Dong
Contents	Precision of semiconductor circuits (e.g. flash memories) will be sub-nanometer order. To fabricate such precise circuits, a motion control with sub-nanometer accuracy should be developed. In this research, sensing and control demonstration of moving stage will be introduced. From the introduction, students can feel the latest industrial techniques in the precision engineering.		

Research Topic	Experimental understanding of dynamic deformation with respect to folding mechanics of scored paperboard, and related fundamental testing for knowing the orthotropic properties and laminated structure of sheet		
Instructor	NAGASAWA, Shigeru	Assistant Instructor	
Contents	Several experiments are considered. 1) In order to know the orthotropic behavior, appropriate in-plane tensile testing is performed when varying the fiber-grain direction. 2) Making scored boards by a creasing knife, prepare specimens for the folding test. 3) Observe the loading response when the specimen is folded under the specified rotation speed and pause time. Relaxation response will be detected. Through these experiments, the participants can know importance of time-dependent characteristics of paperboard processing.		

Research Topic	Luminescent 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 are 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.		

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.		

Electrical, Electronics and Information Engineering

Research Topic	The Learning of 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.		

Materials Science and Technology

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	
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 photoelectrolyisis 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	Implements of sustainable technologies for water treatments and biomass reuses on advanced materials		
Instructor	KOBAYASHI, Takaomi	Assistant Instructor	TAOKAEW, Siriporn
Contents	In biosustainable environmental materials engineering laboratory at department of science and technology innovation, we can provide special technical grograms in water treatment materials for heavy metal removals and biomass regenerated hydrogels concering 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.		

Research Topic	Removal of Proteins from Natural Rubber		
Instructor	KAWAHARA, Seiichi	Assistant Instructor	

Contents	Removal of proteins from natural rubber was achieved by incubation of the rubber latex with urea in the presence of a surfactant to prevent the latex-allergy caused with thin film products. Temperature, pH and time for the incubation were investigated to remove the proteins effectively, in which nitrogen content of the rubber was reduced to 0.02 from 0.38 wt% under the optimum condition. To remove further the proteins, deproteinization of natural rubber was made by incubation of the latex with proteolytic enzyme in the presence of a surfactant followed by incubation with urea. Amount of allergen decreased through the procedure to less than 0.7 μg/ml, which is a small amount of allergen compared to that for the commercial, deproteinized natural rubber.

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 able to - 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		

Civil and Environmental Engineering

Research Topic	Hydrological modeling and flood forecasting		
Instructor	LU, Minjiao	Assistant Instructor	
Contents	1. Basic hydrology 2. Hydrological modeling 3. Flood forecasting		

Research Topic	Mix design procedure and mechanical property testing of hot mix asphalt mixtures for Japanese road pavements		
Instructor	TAKAHASHI, Osamu	Assistant Instructor	
Contents	The surface of roads is constructed with asphalt pavements. A hot asphalt mix (HMA) mixture constituting the asphalt pavements is one of general civil engineering materials, but is 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 HAM mixture and understand relationships between those and physical properties of the HAM 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.		

Research Topic	Evaluation of Transportation policy by Micro Traffic Simulation		
Instructor	SANO, Kazushi	Assistant Instructor	ITOU, Jun
Contents	In this seminar, students collect real traffic data in Nagaoka, develop transportation network on the micro traffic simulator, PARAMICS, and evaluate transportation policy such as signal control by using the micro traffic simulator.		

Bioengineering

Research Topic	Introduction to bioengineering techniques in animals and plants		
Instructor	**TAKIMOTO, Koichi**	**Assistant Instructor**	**OHNUMA Kiyoshi** **SHIMODA, Yasushi** **SATO, Takeshi** **NISHIMURA, Taisuke**
Contents	This short internship course is intended for those who are interested in higher eukaryotic organisms 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 experience with basic cell biological, molecular biological and genetic techniques. Research interests/topics of the advisor faculties may be found at the Department of Bioengineering website (http://bio.nagaokaut.ac.jp/~en/).		

Information and Management Systems Engineering

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

Research Topic	Thermal-Hydraulic Experiments and Simulations for Nuclear Applications		
Instructor	TAKASE, Kazuyuki	Assistant Instructor	
Contents	Water, which is the coolant of the nuclear reactor, is heated by the fuel rods. Then, boiling occurs and a water-vapor two-phase flow generates. Therefore, in order to clarify the cooling performance of the reactor core, it is important to accurately grasp the bubble behavior around the fuel rods. In the seminar, simulations will be carried out to quantitatively clarify the bubble dynamics in the fuel channel. In addition, at the seminar, the flow behavior of hydrogen generated in the storage container by radioactive decomposition of water by fuel debris will be visually observed using a small-scale experimental apparatus and the simulated fluid instead of hydrogen for the purpose of improving the safety of long-term waste storage containers. Moreover, simulations will be performed to clarify the circulating flow behavior of hydrogen in the storage container.		

Science of Technology Innovation

Research Topic	Multidisciplinary innovation course		
Instructor	YAMAZAKI, Wataru	Assistant Instructor	YAMAGUCHI, Takashi OHISHI, Kiyoshi KOBAYASHI, Takaomi YAMADA, Noboru ITOH, Junichi
Contents	This course is intended for those who are interested in a wide range of Engineer. We will offer experiential learning activities including Robotics, Power electronics, Energy engineering, Environment, and Biomaterials.		