Major in Industrial System

Learning objectives

Fostering people to engage in environment-friendly manufacturing and system building

Building industries that recycle and conserve resources and optimizing production processes have become essential to creating a new, value-added industrial society. Constructing these new production systems is also becoming important to the symbiosis of industry and the environment. Through multilateral research on human and environment-friendly materials and energy, the Industrial System major fosters people who possess an understanding of science and technology, and who have system design abilities and statistical analysis abilities and also the business sense to take the lead in manufacturing and system building in 21st century industry.

Points

- **Students will effectively learn a broad array of foundational science necessary for industrial system development, such as material chemistry, energy engineering, biotechnology, and business engineering.**
- **We foster engineers with an environmental mind and a keen business sense.**
- **We prioritize building a global career for our students through internships and overseas practicum programs.**

Ideal student

- Has a strong interest in building recycling-oriented industry systems, production optimization systems or other industrial systems.
- Wants to be an engineer versed in production and manufacturing, who also understands and will be active in corporate management.

Pathways after graduation

- Engineers or researchers in manufacturing and energy related companies
- Intellectual property management, engineering business management or patent related occupations
- Trading or logistics related companies
- Teaching in the science, information, technology, or manufacturing fields, for example

Student's Voice

Integrated learning of humanities and sciences will give me a clearer perspective of my future career. Encouragement towards achieving my goals.

Fourth Year Industrial System Student
Takuya Sugiyama
(From Ibaraki Prefecture, Shimodate Dai-Ichi High School)

I wanted to study management engineering geared to improving productivity in corporations and factories, but it was not available where I am from, so I cast a wider net to nearby areas and found this university. I like mathematics and am interested in business management as well, so I was attracted to the prospect of learning both areas at the same time. Also, as a faculty that boasts integration of humanities and sciences, you can get a balanced education in the humanities as well. I've also realized since entering this university that economics is an interesting field. After taking Industry Structure Theory, which studies regional and national differences through a firm understanding of basic industrial concepts, I chose Regional Industrial Policy with the same teacher as my seminar subject. I learned about the role of government institutions involved in industry and became interested in public service.

I am currently studying towards a career in administration. The University Co-op provides some courses for public servant exams and receiving in-depth support from them is really encouraging. I know I'll be able to use the perspectives I've gained in my science studies in all sorts of areas. The university campus is really beautiful and there is quite a lot to do in the town as well, so Fukushima is a good place to live. I'm glad I chose Fukushima University for many different reasons.

Third Year Second Semester Timetable

	Mon	Tue	Wed	Thu	Fri
1					
2		Resource Recycling Theory			Supply Chain Management
3	Recycling-oriented Industrial Theory				
4					
5					

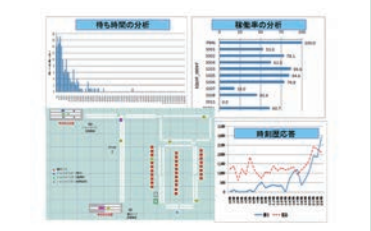
Mathematical Sciences and Management Engineering

- Management Engineering
- Ecological Economics
- Industry Structure Theory
- Incubation Systems
- Statistics and Numerical Analysis Practice
- Social Systems Modeling Practice
- Industrial Support Engineering Practice
- Production Systems
- Production Systems Analysis Practice
- Supply Chain Management
- Logistics Systems
- Quality Control
- Decision Making Theory
- Mathematical Programming
- Applied Statistics
- Applied Analysis
- Modeling Theory
- Intellectual Property Rights Theory
- Management Information Systems

Example of the Courses

Research on assessments using system modeling and simulation analysis

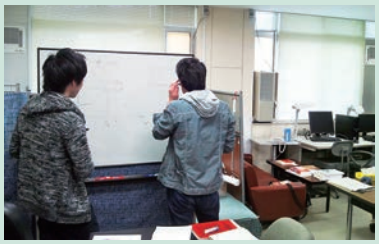
We are analyzing target systems and modeling them using differential equations and Unified Modeling Language (UML). The models created become the basis for researchers to share a common understanding about the target and are necessary for communication and design optimization. Simulations make these models act under various conditions. Analysis using simulations study internal and external factors in systems to deepen the enquiry of the target system and further design optimization. The main target systems include production, logistics, transport and management. We are especially targeting research topics that address the needs of industry and regional communities.



Example of the Courses

Research on constructing sustainable human/environment systems

Our ultimate goal is to seek out the *true nature of environmental crisis*. However, this is a vast topic and we are nowhere near reaching the crux of the matter. What we can say is that the environmental crisis is not so simple as to be solved by sleight-of-hand technological wizardry. The environmental crisis is not a problem with the environment, but rather a human and social problem. At our lab, we mainly think about the issue of humans and the environment from a social science perspective. In recent years, we have focused on the energy issue and are researching the relationship between economic prosperity and energy through time series analysis and agent based modeling.



Example of the Courses

Research on non-linear mathematics

In our world, there are various phenomena: some that are favorable to society and some that are not. In order to maintain a stable society, predictions and controls on such phenomena are essential. To extract and analyze a common structure behind two seemingly disparate phenomena, it is necessary to describe target phenomena in mathematical language and handle mathematical models of phenomena. At our lab, we are researching this type of mathematical modeling of natural and social phenomena using modern mathematical methods. Alongside modeling natural phenomena such as quantum effect, waves and thermal phenomena, economic phenomena and non-linear phenomena that occur on graphs and networks are also included in our range of science-humanities cross-disciplinary research activities.

Material Science and Manufacturing Technology

- Overview of Material Engineering Theory
- Overview of Sanitary Engineering Theory
- Overview of Chemical Engineering Theory
- Experimental Chemistry A & B
- Overview of Manufacturing Technology Theory
- Ecological Production Systems Practice
- Material Conversion Chemistry
- Physics and Chemistry of Interfaces
- Applying Physical Properties
- Biochemical Engineering
- Resource Recycling Theory
- Overview of Functional Materials Theory
- Introduction to Material Analysis
- Industry System Engineering Experiment
- Organic and Polymer Materials
- Heat and Substance Transport Phenomena Theory
- Energy Systems Engineering
- Biological Resource Development

Example of the Courses

Research on new development, increasing functionality, and adding value to materials, starting with carbon-based materials

What is unique about our lab is that we study materials (ceramics, plastics and combined materials) from fundamental research to its application. From the standpoint of resource conservation, energy conservation and low environmental burden, we strive for object creation that benefits the greater society beyond, by researching improvements in physical, chemical and mechanical properties as well as its fabrication. Our main focus has been on carbon-based materials. We take elements from one or more categories and composite them from the nano to macro level and modify processes for improved functionality and added value. We take a wide perspective and take on the challenge and research the material regardless of type, provided that as it has interesting functions to study.

Example of the Courses

Research on strong and adhesive plastics to reduce the weight of cars and airplanes

Always focused on originality and newness, we have a two-pillar ethos to our research: 1) *research that is immediately beneficial to society* and 2) research *that strives for academic progress*. Under 1) our research has shifted from *making plastics absorb water* to *technology that allows non-adhesive plastics to become adhesive*, then to *weight reduction for materials for cars and airplanes* and finally, *developing materials that clean the air and water.* Shown in the photo is our submission to *Innovation Japan* (at the Tokyo International Forum), where research outcomes with practical applicability are presented. We had so many visitors that entrance restrictions were required for multiple sessions. Under 2) we are publicizing our research on *synthesis of model proteins with identical molecular sizes*, which had been deemed impossible prior to our study.

Example of the Courses

Research on molecular chemistry that aims to solve resource, energy and environmental problems

Resources, energy and the environment are important issues in our modern society. Humanity must gather its wisdom from all fields to solve these issues. We are carrying out research on these issues from a chemistry perspective. For instance, a current idea posits that, if photosynthesis that occurs in plants could be recreated artificially, the vast amounts of CO_2 emitted into the atmosphere could be utilized as an energy source and resource, thus solving all three problems. We are looking at remarkable chemical reactions that occur in nature, and designing and creating molecules that can recreate them artificially at the nano level in the aim of achieving the eternal dream.