

Sub-course: Five Elements of Natural Science

	Course Title	Code	Credits
Undergraduate students	Summer Program in English III	26N3051	2
Graduate students	Special Lectures in Humanities and Sciences III	26S0153	2

1. Description

Research in natural sciences is advancing day by day. This sub-course provides lectures comprising four subjects to learn about recent advances in five areas of natural sciences: mathematics, physics, chemistry, biology, and computer science. Students can learn about each subject from basics to the latest topics through this sub-course.

Sub-course title: Five elements of natural science

This course offers a variety of lectures from five fields of natural science –mathematics, physics, chemistry, biology, and information– as an introduction to the wide range of natural science. These lectures will be arranged to explain key ideas of natural science in plainer language by professors of our university who are on the cutting edge of their own field of natural science.

A comprehensive knowledge of these fields will help you deepen your own specialty, even if the understanding is not so deep. We hope that these lectures will contribute your future development.

2. Teaching Day and Time

Day	Time	Lecturer	Topic/Contents	Place
July 21 Tue	18:10-	Prof. Dr. Mitsuhiko MIYAZAKI	Course Orientation	Room A 2F, Plaza
July 22 Wed	9:30-12:40	Prof. Dr. Akira CHIKAMATSU	[1] Crystal structure in solids	Room A 2F, Plaza
July 23 Thu	9:30-12:40	Prof. Dr. Takayuki ITO	[2] Computer Graphics and Information Visualization	Room A 2F, Plaza
July 23 Thu	13:40-15:10	Prof. Dr. Shohei NISHIZAKA	※General Education: Japanese Culture 1 “Kyogen”	The junior high school gym
July 24 Fri	9:30-12:40	Prof. Dr. Tomohiro FUJITA	[3] Cosmology: Its History and Cutting-Edge Research	Room A 2F, Plaza
July 27 Mon	9:30-12:40			
July 28 Tue	9:30-12:40	Prof. Dr. Kazuyoshi CHIBA	[4] Reproductive Biology and Technology	Room A 2F, Plaza
July 28 Tue	13:40-15:10	Prof. Dr. Shohei NISHIZAKA	※General Education: Japanese Culture 2 “Kodo”	Room A-C 2F, Plaza
July 29 Wed	13:30-16:00	Prof. Dr. Mitsuhiko MIYAZAKI	Field trip (The Tokyo waterworks historical museum)	Hongo, Bunkyo-ku

July 30 Thu	9:30-12:40	Prof. Dr. Sin Yi TSANG	[5] Mathematical Magic Tricks	Room A 2F, Plaza
July 31 Fri	9:30-12:40			

3. Class Contents:

Topic 1: Crystal structure in solids

Prof. Dr. Akira CHIKAMATSU

In solids, the arrangement of atoms, ions, or molecules forms a crystal structure. This refers to the ordered and repeating pattern in which these particles are arranged in a solid. The structure is defined by the unit cell, which is the smallest repeating unit that retains the symmetry and properties of the entire crystal. Solids exhibit a variety of properties depending on the combination of elements and differences in crystal structure. In this lecture, we will learn about various crystal structures in solids while assembling crystal structure models.

Topic 2: Computer Graphics and Information Visualization

Prof. Dr. Takayuki ITOH

The lecturer focuses on computer-based visual technologies. The former part of this class introduces fundamental computer graphics techniques that are used in various industries including engineering design and entertainment.

The latter part introduces information visualization that makes visual representations of daily information. Also, applications of information visualization to the analysis of music and arts are introduced.

Topic 3: Cosmology: Its History and Cutting-Edge Research

Prof. Dr. Tomohiro FUJITA

Astronomy is one of the oldest fields of science. Originally developed for astrology and navigation, it has evolved alongside modern science, greatly enhancing our understanding of the universe that we live in. Today, cosmology presents astonishing insights into the origins of the universe and its fundamental components. In the first part of this lecture, I will provide an introductory review of the history of astronomy and key discoveries in modern cosmology. The second half will focus on recent research exploring the possibility that the universe may have a preferred handedness, suggesting a violation of left-right symmetry (parity symmetry).

Topic 4: Reproductive Biology and Technology

Prof. Dr. Kazuyoshi CHIBA

In this class, I will discuss the biological reasons why sexual conflict occurs between females and males. I will then outline medical procedures used in assisted reproductive technologies, such as in vitro fertilization and intracytoplasmic sperm injection, and discuss how these medical treatments affect humankind.

Topic 5: Mathematical Magic Tricks

Prof. Dr. Sin Yi TSANG

In this lecture, we will explore a series of magic tricks that are based on mathematical concepts such as number representation, modular arithmetic, and combinatorics. We will give a detailed explanation of the ideas involved in each trick. You will also have the opportunity to practice performing these tricks during class.

4. Evaluation

The final grade for the course will be determined by the evaluation of Reaction papers. Each participant must submit one paper per lecture, i.e., seven papers in total.

※**General Education** Prof. Dr. Shohei NISHIZAKA

Japanese Culture 1 “Kyogen”

Kyogen is a traditional form of Japanese comic theatre that has been performed for centuries alongside Noh drama. Through its distinctive language, stylized movements, and humorous portrayal of everyday life, Kyogen offers insight into Japanese aesthetics, social values, and perspectives on human relationships. In this session, students will first gain an overview of Kyogen and observe a live demonstration by three professional Kyogen performers—MIYAKE Tokuro, IZUMI Junko, and IZUMI Motoya. They will then participate in introductory training exercises to experience its basic techniques. Through this direct cultural experience, students will reflect on the characteristics of Japanese culture and consider similarities and differences in relation to their own cultural backgrounds.

Japanese Culture 2 “Kodo”

Kodo, the traditional Japanese art of incense appreciation, is considered one of the three major classical arts of refinement in Japan, alongside the tea ceremony and flower arrangement. Compared to these more widely practiced arts, opportunities to experience Kodo firsthand are relatively rare. Through engagement with this traditional cultural practice, students will explore Japanese aesthetics and sensibilities while also reflecting on their own cultural backgrounds from a broader, comparative perspective. In this session, led by SHIMADA Hanako, students will learn about the history of Kodo, experience “listening” to incense, and create their own scented sachets. Through these activities, they will gain a deeper understanding of the cultural and spiritual dimensions of Japanese incense traditions.