

Tsuyama College		Year	2021		Course Title	General Aspects of Engineering I
Course Information						
Course Code	0003			Course Category	Specialized / Elective	
Class Format	Lecture			Credits	Academic Credit: 2	
Department	Advanced Mechanical and Control System Engineering Course			Student Grade	Adv. 1st	
Term	First Semester			Classes per Week	2	
Textbook and/or Teaching Materials	有機機能材料 第2版（荒木孝二，明石満，高原淳，工藤一秋，東京化学同人）					
Instructor	HIROKI Kazuaki,MORITOMO Hiroki					
Course Objectives						
Learning purposes : To understand that the properties and functionality of various materials are determined at the atomic and molecular levels and at the level of molecular assemblies. Students will also understand that it is possible to evaluate the properties and functions of materials in detail by making full use of analytical instruments. Through this lecture, we aim to acquire the skills to manage so-called "materials" including mechanical materials not only from a macroscopic perspective but also from a microscopic perspective.						
Course Objectives : 1. Students will be able to explain the functions and properties of materials from the microscopic viewpoint of atoms, molecules, and molecular assemblies. 2. Students will understand the operating principles and characteristics of a variety of analytical instruments.						
Rubric						
	Excellent		Good		Acceptable	Not acceptable
Achievement 1	Students will be able to explain in their own words the functions and properties of materials from the microscopic viewpoint of atoms, molecules, and molecular assemblies, giving specific examples.		Students will be able to explain in their own words the functions and properties of materials from the microscopic viewpoint of atoms, molecules, and molecular assemblies.		Students understand the functions and properties of materials from the microscopic perspective of atoms, molecules, and molecular assemblies.	Not attained to the left.
Achievement 2	Students will be able to understand the operating principles and characteristics of analytical instruments and explain them in their own words. To be able to analyze the actual data obtained by oneself.		Students will be able to understand the operating principles and characteristics of analytical instruments and explain them in their own words.		Students will understand the operating principles and characteristics of analytical instruments.	Not attained to the left.
Achievement 3						
Assigned Department Objectives						
Teaching Method						
Outline	General or Specialized : Specialized Field of learning : Common and basic natural sciences Foundational academic disciplines : Materials Engineering (Structural and Functional Materials) Relationship with Educational Objectives :This class is equivalent to the major's learning objectives (2) Relationship with JABEE programs :The main goals of learning / education in this class are "(A) A-1". Course outline :All materials can be regarded as a set of "atoms and molecules" from a microscopic viewpoint. In the first half of this lecture, we will look at various functional materials at the atomic and molecular level, and try to bridge the gap between microscopic properties (electronic states of molecules and atoms, bonding modes) and macroscopic properties (thermal, mechanical, etc.) of materials. In the latter half of the lecture, various instrumental analyses, which are methods to evaluate the properties of materials, will be outlined. Through this lecture, students will learn to look at materials as "substances" and develop skills to process and handle them appropriately.					
Style	Course method : Mainly lecture-based. Grade evaluation method : In principle, the evaluation will be based on the scores of mini-reports and presentations given in each class (50%) and the regular exam (50%). The evaluation method will be discussed with the students.					
Notice	This is a class that requires study outside of class hours. A total of 45 hours of study is required per credit, including both class time and study outside class time. Follow the instructions of the instructor regarding study outside of class hours. Course advice : Motivation to learn is important. A proactive attitude is necessary. Foundational subjects : Chemistry I (2 years), Materials Science (2 years), Chemistry II (3 years), Mechanics of Materials I and II (3 and 4 years), Applied Chemistry (4 years) Attendance advice :If you attend lectures with a passive attitude, you will never learn the contents. Be sure to read the designated sections of the textbook before the lecture. Be careful not to rely on easy memorization. In order to understand the essence of the discipline of chemistry, I would like you to always keep thinking logically while attending the lectures.					
Characteristics of Class / Division in Learning						

<input type="checkbox"/> Active Learning	<input checked="" type="checkbox"/> Aided by ICT	<input checked="" type="checkbox"/> Applicable to Remote Class	<input checked="" type="checkbox"/> Instructor Professionally Experienced
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Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Guidance for the first half	
		2nd	Fundamentals of Functional Mechanical Materials	Students will confirm their knowledge of materials science and chemistry required for this course and prepare for future lectures.
		3rd	Optoelectronic materials	Students will understand the properties of optical materials such as optical lenses and optical fibers.
		4th	Electrical and Electronic Functional Materials	Students will understand the various properties of dielectric and conductive materials.
		5th	Mechanics and strength functional materials①	Students will understand the mechanical properties of polymer materials and the general theory of viscoelasticity.
		6th	Mechanics and strength functional materials②	Students will understand the properties and structures of various high strength and high elasticity polymers.
		7th	Summary of the first half	To check the degree of retention of knowledge through reading of papers.
		8th	Guidance for the second half	
	2nd Quarter	9th	Preface to Machine Analysis	Students will understand the advantages, features, and cautions of instrumental analysis.
		10th	Thermal Analysis	Students will understand the principles of typical thermal analysis such as thermogravimetric analysis and differential scanning calorimetry, the information obtained, and how to interpret the data.
		11th	Mechanical strength analysis	Students will understand the principles of strength measurement equipment, the information obtained, and how to interpret the data.
		12th	Microscopic observation	Students will understand the principles of typical microscopic observations such as SEM and TEM, the information obtained, and how to interpret the data.
		13th	Surface Analysis	Students will understand the principles of typical surface analysis such as XPS, the information obtained, and how to interpret the data.
		14th	X-ray analysis	Students will understand the principles of typical X-ray analysis such as XRD, the information obtained, and how to interpret the data.
		15th	final exams	
		16th	Returning exams, General summary	Reviewing the previous lectures, we will deepen the discussion on how to handle and evaluate various functional materials.

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	50	0	0	0	0	50	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	50	0	0	0	0	50	100
Cross Area Proficiency	0	0	0	0	0	0	0