

Akashi College		Year	2022	Course Title	Industrial Materials
Course Information					
Course Code	4010		Course Category	Specialized / Compulsory	
Class Format	Lecture		Credits	Academic Credit: 2	
Department	Mechanical and Electronic System Engineering		Student Grade	Adv. 1st	
Term	First Semester		Classes per Week	2	
Textbook and/or Teaching Materials	A separate handout will be provided.				
Instructor	SAKAIDA Akiyoshi,KAJIMURA Yoshihiro,TAKEDA Naho,HIRAISHI Toshihiro				
Course Objectives					
(1) Understand the basic issues related to metal materials and learn their characteristics and how to test the strength. (taught by Sakaida). (2) Become able to think about technological innovation through the fusion of different fields for the construction, maintenance, and control of concrete structures. (taught by Takeda). (3) Understand the factors to consider when making environmentally friendly choices for materials, and deepen understanding by individually studying and explaining materials of interest to each other. (taught by Hiraishi). (4) Understand the physical quantities related to magnetism along with units, and aim to understand and explain the properties of various magnetic materials. (taught by Kajimura).					
Rubric					
	Ideal Level		Standard Level		Unacceptable Level
Achievement 1	Understand the basic issues related to metal materials and can explain specifically their characteristics and how to test the strength.		Understand the basic issues related to metal materials and can explain their characteristics and how to test the strength.		Do not understand the basic issues related to metal materials and cannot explain their characteristics and how to test the strength.
Achievement 2	Can explain the relationship between their own specialty and concrete engineering, and make new proposals.		Can explain the relationship between their own specialty and concrete engineering.		Cannot explain the relationship between their own specialty and concrete engineering.
Achievement 3	Can perform LCA analysis for making environmentally friendly choices for industrial materials.		Understand the items to consider for making environmentally friendly choices for industrial materials.		Do not understand the need to make environmentally friendly choices for industrial materials.
Achievement 4	Understand the physical quantities related to magnetism, along with units, and understand and can explain the properties and applications of various magnetic materials.		Understand the physical quantities related to magnetism, along with units, and understand and can explain the properties of various magnetic materials.		Do not understand the physical quantities related to magnetism, along with units, and do not understand and cannot explain the properties of various magnetic materials.
Assigned Department Objectives					
Teaching Method					
Outline	(1) With a focus on steel materials, explain the characteristics and types of metal materials, and methods for strengthening them together with breakdown phenomena under various conditions. (8 hours, taught by Sakaida.) (2) Explain the mechanical properties and reinforcement methods of concrete (a typical material for urban construction), maintenance and control techniques, and consideration for environmental issues. (6 hours, taught by Takeda.) (3) Deepen understanding by individually studying and explaining materials' environmental impact and the properties of various industrial materials. (8 hours, taught by Hiraishi.) (4) Understand the characteristics and properties of various magnetic materials and explain their application cases. (8 hours, taught by Kajimura.)				
Style	The class will be held in an omnibus format by four faculty members. Weeks 1-4: Sakaida will teach classes in a lecture-style format. Weeks 5-7 (Takeda): Students will learn about the mechanical properties of concrete, reinforcement methods, maintenance and control techniques, and consideration for environmental issues. Weeks 8-11 (Hiraishi): After explaining choices of industrial materials and the difference in their environmental impact according to a Life Cycle Assessment (LCA), students will select one industrial material related to their graduate study's special research and use PowerPoint to present its advantages, disadvantages, and environmental impact. Weeks 12-15 (Kajimura): Students will learn the physical quantities related to magnetism along with units, and become able to understand and explain the properties of various magnetic materials. Students will also investigate application cases.				
Notice	This course's content will amount to 90 hours of study in total. These hours include the learning time guaranteed in classes and the standard self-study time required for pre-study / review, and completing assignment reports. Students who miss 1/3 or more of classes will not be eligible for a passing grade.				
Characteristics of Class / Division in Learning					
<input type="checkbox"/> Active Learning		<input type="checkbox"/> Aided by ICT		<input checked="" type="checkbox"/> Applicable to Remote Class	<input type="checkbox"/> Instructor Professionally Experienced
Course Plan					
			Theme	Goals	
1st Semester	1st Quarter	1st	Introduction to metal materials (Sakaida) Learn about the crystal structures and plastic deformation mechanism of metal materials.	Can explain the crystal structures and plastic deformation mechanism of metal materials.	
		2nd	Types and characteristics of metal materials (Sakaida) Learn about the types and characteristics of metal materials that are used as materials for machinery and construction.	Can explain the types and characteristics of metal materials that are used as materials for machinery and construction.	

		3rd	Methods for strengthening metal materials (Sakaïda) Learn about heat treatment, strengthening methods, and reinforcement mechanisms for steel materials.	Can explain heat treatment, strengthening methods, and reinforcement mechanisms for steel materials.
		4th	Mechanical properties of metal materials (Sakaïda) Learn about the mechanical properties of metal materials and how to test the strength.	Can explain the mechanical properties of metal materials and how to test the strength.
		5th	Introduction to concrete (Takeda) Learn about concrete (a typical material for urban construction), its constituent materials, and its mechanical properties.	Can explain concrete's constituent materials and mechanical properties.
		6th	Durability, maintenance and control techniques for concrete structures (Takeda) Learn how to reinforce concrete structures, and how to deal with deterioration that affects its durability.	Can explain the maintenance and control techniques for concrete structures.
		7th	Innovation in the construction field (Takeda) Learn about environmental issues and new technologies in the construction field	Can explain how to deal with environmental problems and new technologies in the construction field.
		8th	Materials and environmental impact (Hiraishi) Learn about the results of analyzing various industrial materials' environmental impact using an LCA (Life Cycle Assessment) method.	Can analyze the difference between various industrial materials by means of an LCA (Life Cycle Assessment).
	2nd Quarter	9th	Study a material's properties (Hiraishi) Give a presentation on the characteristics of an industrial material of interest.	Can explain the applications, advantages, and disadvantages of an industrial material related to special research.
		10th	Study a material's properties (Hiraishi) Give a presentation on the characteristics of an industrial material of interest. Create presentation materials.	Can explain the applications, advantages, and disadvantages of an industrial material related to special research.
		11th	Study a material's properties (Hiraishi) Give a presentation on the characteristics of an industrial material of interest.	Can explain the applications, advantages, and disadvantages of an industrial material related to special research.
		12th	An outline of magnetic materials (Kajimura) Outline the development history of magnetic materials and their characteristics. Also learn about specific cases that are widely used in many fields today.	Outline the development history of magnetic materials and their characteristics. Can also explain the specific cases that are widely used in many fields today.
		13th	Physical properties of magnetic materials (Kajimura) Learn about the basics of magnetism and the physical properties of magnetic materials as learned in the field of electricity, etc. Investigate use and application cases of interest in the respective areas of specialty and deepen understanding of their principles.	Learn about the basics of magnetism and the physical properties of magnetic materials as learned in the field of electricity, etc. Can investigate use and application cases of interest in the respective areas of specialty and deepen understanding of their principles.
		14th	Principles and application examples of magnetic sensors that use magnetic materials (Kajimura) Introduce principles and application examples of magnetic sensors that use magnetic materials, and also introduce intelligent materials and intelligent magnetic materials.	Can explain the principles and application examples of magnetic sensors that use magnetic materials, and explain intelligent materials and intelligent magnetic materials.
		15th	Applications examples in various fields (Kajimura) Compile into a report the results of an investigation into magnetic materials in one's own area of specialty.	Can compile into a report and explain the results of an investigation into magnetic materials in one's own area of specialty.
		16th	Final exam	

#### Evaluation Method and Weight (%)

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