

Akashi College		Year	2023	Course Title	Geophysics
Course Information					
Course Code	5003		Course Category	General / Elective	
Class Format	Lecture		Credits	Academic Credit: 2	
Department	Mechanical and Electronic System Engineering		Student Grade	Adv. 1st	
Term	Second Semester		Classes per Week	2	
Textbook and/or Teaching Materials	Printed materials				
Instructor	YOKOYAMA Masahiko				
Course Objectives					
(1) Learn about the observation techniques and results characteristics for the physical properties related to the solid Earth (gravity, seismic waves, geomagnetism, thermal flow, etc.) and understand their meaning. Also understand the basic principles of observation equipment. (2) Learn about how the Earth's internal structure, surface phenomena, and history have been interpreted using the observations described in (1). By doing this, comprehensively understand the solid Earth system. (3) Understand the concept of plate tectonics and the relationship between them and the movement of the Earth's layers and topography. By doing so, learn the basic knowledge for considering the global environment and disasters such as earthquakes and volcanic eruptions. It is necessary to self-study the basic theorems of mechanics and electro-magnetism in order to achieve these goals.					
Rubric					
	Ideal Level		Standard Level		Unacceptable Level
Achievement 1	Fully understand the mechanism for estimating the physical properties of objects from the observation results.		Understand the mechanism for estimating the physical properties of objects from the observation results.		Do not understand the mechanism for estimating the physical properties of objects from the observation results.
Achievement 2	Fully understand what kinds of observation evidence the modern understanding of the Earth is estimated on.		Understand what kinds of observation evidence the modern understanding of the Earth is estimated on.		Do not understand what kinds of observation evidence the modern understanding of the Earth is estimated on.
Achievement 3	Fully understand natural phenomena such as earthquakes and volcanic eruptions through the concept called plate tectonics.		Understand natural phenomena such as earthquakes and volcanic eruptions through the concept of plate tectonics.		Do not understand natural phenomena such as earthquakes and volcanic eruptions through the concept called plate tectonics.
Assigned Department Objectives					
Teaching Method					
Outline	The course will have lectures on how the structure and properties of the Earth (mainly the solid Earth) are currently understood. Since the purpose of geophysics is to capture the Earth quantitatively using physical quantities such as gravity and heat, the main purpose of this course is to understand the physical properties of the materials that make up the Earth, and explain the basic properties and observation techniques of each physical quantity. It will also explain the laws of physics and basic structures used in the observation equipment. It will be taught by a faculty member who is investigating the magnetic properties of deep-sea sediment obtained in core drilling at Academia Sinica in Taiwan.				
Style	Classes are held in a lecture style. The liaison for this course is Takeuchi.				
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. The course plan may change. Lessons are serial, not standalone. Students who miss 1/3 or more of classes will not be eligible for evaluation.				
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 checked="" type="checkbox"/> Instructor Professionally Experienced
Course Plan					
			Theme	Goals	
2nd Semester	3rd Quarter	1st	Course guidance / The shape and size of the Earth (1) Explain, as guidance, the course policy and overview. Introduce a perception of the Earth's shape and size in ancient times.	Understand the role played by the academic field of "geophysics" and the role that physics development plays in understanding the Earth's internal structure.	
		2nd	The shape and size of the Earth (2) Explain the definitions of the currently recognized shapes for the Earth (Earth ellipsoid and geoid), and also describe the basics of positioning, too.	Understand the basics of positioning using geometry.	
		3rd	Gravity Explain what gravity means, by showing the Earth's mass and density obtained by using it. Also explain the meaning of gravity anomaly.	Understand how to estimate the Earth's internal structure from the laws and observed values of gravity that acts on it.	
		4th	Isostasy Explain the concept of isostasy and its relationship with gravity. Also introduce examples of crustal movement caused by it.	Understand the concept of isostasy and the characteristics of the Earth's gravity that is related to it.	
		5th	Seismic waves Explain the nature of seismic waves, and explain the methods for surveying underground structures using them.	Understand the characteristics of seismic waves and how to estimate earthquake information using them.	

		6th	The interior structure of the Earth (1) Introduce the larger structure of the Earth's interior, which has been estimated mainly using seismic wave analysis.	Understand the principles of a seismic refraction survey and the method for estimating the Earth's interior structure that uses it.
		7th	The interior structure of the Earth (2) Introduce the subterranean structure of the Earth's surface layer, which has been estimated mainly using seismic wave analysis.	Understand the principles of a seismic reflection survey and the method for estimating the shallow subterranean part's structure that uses it.
		8th	Earth heat Explain what is the source of heat inside the Earth, and show the calorimetric distribution on the surface layer of the Earth.	Understand the meaning of heat in physics and the state of the Earth's interior that can be estimated from the calorimetric distribution on the its surface.
	4th Quarter	9th	Geomagnetism Explain the magnetic distribution on the Earth's surface and how geomagnetism was created. Furthermore, explain magnetic anomalies.	Understand the causes of geomagnetism by understanding "What does magnetism mean?"
		10th	Rock magnetism and paleomagnetism Explain the mechanism for rocks becoming magnetized and introduce the magnetism shifts from the past that have been investigated using it.	Understand the mechanism that records past geomagnetic information in rocks.
		11th	Continental drift Introduce the classic continental drift theory by Wegener. Also explain the continental position's restoration by paleomagnetism that has triggered a revival of continental drift theory.	Understand the original information for "continental drift theory," its interpretations, and how to estimate the continental drift using current observation data.
		12th	The spreading of the seafloor Explain seafloor's topography and underground structure and the relationship between magnetic anomaly distribution in the ocean and the theory of seafloor spreading.	Understand the hypothesis that associates geomagnetic records with continental drift.
		13th	Plate tectonics (1) Explain the concept and movement of plates and the shape their boundaries as the basis for plate tectonics.	Understand the original meaning of the concept called plate tectonics and its difference from continental drift theory.
		14th	Plate tectonics (2) Use plate tectonics to explain the movement of the Earth's layers (earthquakes, volcanic activity, orogeny, etc.)	Understand how natural phenomena such as earthquakes and volcanic activities can be explained with plate motions.
		15th	Plate tectonics (3) Introduce the properties of hotspots, and explain the difference between relative and absolute plate motions. Furthermore, explain the driving force of plate motions.	Understand how plate motions work within the mechanism of the entire Earth.
		16th	Final exam	

Evaluation Method and Weight (%)

	Exercise	Examination	Total
Subtotal	30	70	100
Basic Proficiency	30	70	100
Specialized Proficiency	0	0	0
Cross Area Proficiency	0	0	0