Akashi College	Year	2022	Course Title	Electromagnetics II B

Course Information

Course Code	4426	Course Category	Specialized / Elective
Class Format	Lecture	Credits	School Credit: 1
Department	Electrical and Computer Engineering Computer Engineering Course	Student Grade	4th
Term	Second Semester	Classes per Week	2
Textbook and/or Teaching Materials			
Instructor	OHMUKAI Masato		

Course Objectives

(1) Understand and can explain the laws of magnetism.
(2) Can explain the various properties derived from the Maxwell equation.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Understand and can explain in detail the laws of magnetism.	Understand and can explain the laws of magnetism.	Do not understand and cannot explain the laws of magnetism.
Achievement 2	Can explain in detail the various properties derived from the Maxwell equation.	Can explain the various properties derived from the Maxwell equation.	Cannot explain the various properties derived from the Maxwell equation.

Assigned Department Objectives

Teaching Method

Outline	Based on the knowledge of electrostatic fields learned in Electromagnetism I, this course will be focusing on magnetic fields. Afterward, acquire the knowledge of the entire system of electro-magnetism by learning the Maxwell equation, electromagnetic waves will also be taught. There will be quizzes to check students' understanding.
Style	The first part of classes will be taught in a lecture style to explain the outline. Then, each student will self-study. There will be a quiz at the end.
Notice	This course requires an active attitude. It's essential to ask questions if anything is unclear during classes. Any assignment that are given must be submitted on time. Students who miss 1/3 or more of classes will not be eligible for a passing grade.

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☑ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	Faraday's law of electromagnetic induction	Learn about Faraday's laws of electromagnetic induction in integrals and derivatives.
		2nd	Self-inductance and its calculation	Learn about magnetic flux and magnetic field energy. Understand the definition of self-inductance and learn how to calculate it.
		3rd	Internal inductance and energy	Calculate the internal inductance. Understand the energy of the magnetic field.
		4th	Mutual inductance, Neumann formula	Learn about the concept of mutual inductance, and know the definition of coupling coefficients.
		5th	Examples of Neumann formula, general theory of energy	We will give concrete examples of calculations using Neumann's formula and discuss the general theory of magnetic energy.
		6th	Unipolar lead, betatrons, and current in conductors	Learn how to calculate the voltage generated in unipolar lead. In addition, learn about the principle of a betatron. Also know about the current in conductor.
		7th	Current distribution and skin effect within a conductor	Learn about the distribution of current to alternating current in conductors and can analyze the skin effect quantitatively.
		8th	Midterm test	Score 60 marks.
	4th Quarter	9th	Integral and derivative forms of the Maxwell equations, displacement currents, and charge conservation	Learn about Maxwell's concept of displacement current and can derive the derivative form from the integral form of the four equations.
		10th	The potential expression of the Maxwell equation, retarded potentials and the Hertz vector	Can consider the potential of time-dependent situations and use this potential to draw Maxwell's equations.
		11th	Maxwell electromagnetic equation and electromagnetic wave	Can use Maxwell's equations to derive the wave equation which is applicable to electromagnetic wave.
		12th	The nature of the electromagnetic wave	Can derive the nature of electromagnetic waves from Maxwell's equations.
		13th	Poynting vector	Learn about the definition of Poynting vector and its physical meaning.
		14th	Dielectric loss and polarization of electromagnetic wave	Learn about dielectric loss quantitatively. In addition, learn about the polarization of electromagnetic waves, also learn about plane waves and circularly polarized wave.

		15th	Electromagnetic waves in a medium	Learn about the fact that the propagation of electromagnetic waves in a medium with a finite resistance is quantized.
		16th	Final exam	Score 60 or more marks.

Evaluation Method and Weight (%)

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