Anan College	Year	2024	Course Title	Electrical Circuit Theory 1

Course Information

Course Code	1312A01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	School Credit: 2
Department	Course of Electrical Engineering	Student Grade	2nd
Term	Year-round	Classes per Week	前期:2 後期:2
Textbook and/or Teaching Materials	Introductory electrical circuit, basics (Ohmsha)		
Instructor	Nakamura Yuichi		

Course Objectives

1. Understand the relationship between current, voltage, and resistance using Ohm's law, and be able to calculate combined resistance.
2. Understand Kirchhoff's laws and be able to apply them to DC circuit calculations.
3. Understand Thevenin's theorem, superposition theorem, and Millman's theorem and be able to apply them to DC circuit calculations.
4. Understand various methods of expressing sine wave alternating current and be able to calculate frequency, phase, effective value, etc.
5. Understand the relationship between sinusoidal AC voltage and current in R, L, and C elements, and be able to calculate voltage, current, and impedance in a series circuit.

Rubric

	Ideal Level	Standard Level	Minimum achievement level
Achievement 1	Understand Ohm's law and be able to calculate the combined resistance of a circuit that combines series and parallel circuits, as well as the current and voltage of each part.	Able to calculate the combined resistance, current, and voltage of each part of a basic circuit according to Ohm's law.	Able to calculate the combined resistance, current, and voltage of each part of a simple circuit according to Ohm's law.
Achievement 2	By applying Kirchhoff's laws, circuit equations for various circuits can be derived and calculations can be performed accurately.	From Kirchhoff's laws, circuit equations for basic circuits can be derived and calculations can be performed.	Able to derive circuit equations for simple circuits using Kirchhoff's laws and perform calculations.
Achievement 3	Understand Thevenin's theorem, superposition theorem, and Millman's theorem and be able to apply them to DC circuit calculations.	Able to explain at least two of Thevenin's theorem, superposition theorem, and Millman's theorem and apply them to calculations.	Able to explain and apply one of Thevenin's theorem, superposition theorem, or Millman's theorem to calculations.
Achievement 4	Understand the correspondence between sine wave alternating current and trigonometric functions, vectors, and complex numbers, and be able to calculate frequencies, effective values, etc.	Understand the correspondence between sine wave alternating current and trigonometric functions or complex numbers, and be able to calculate frequencies, effective values, etc.	Able to understand and explain the correspondence between sine wave alternating current and trigonometric functions or complex numbers.
Achievement 5	Able to explain the characteristics of R, L, and C elements. Understand, explain, and calculate the relationship between voltage, current, and impedance in a series circuit.	Ability to explain the characteristics of R, L, and C elements. Ability to calculate voltage, current, and impedance of a series circuit.	Able to explain the characteristics of R, L, and C elements.

Assigned Department Objectives

学習・教育到達度目標 D-1

Teaching Method

Outline	The purpose of this course is to acquire the introductory part of electrical circuit theory, which is essential basic knowledge in electrical and electronic engineering.
Style	The first half deals with DC circuits, which are the basis of electrical circuit theory. Understand Ohm's law and Kirchhoff's law, and learn how to calculate voltage, current, and resistance in DC circuits. Understand Thevenin's theorem, the superposition theorem, and learns about efficient circuit calculations. In the second half, it will be explained the basics of AC circuits. Understand how to express sinusoidal alternating current using trigonometric functions, vectors, and complex numbers, and the concepts of frequency and phase. Learns about the properties of R, L, and C elements and the impedance of series circuits.
Notice	It is important not only to memorize Ohm's law and Kirchhoff's law as formulas, but also to fully understand the physical relationships among voltage, current, and resistance. Also, in order to understand AC circuits, you need knowledge about vectors, trigonometric functions, and complex numbers, so review what you learned in mathematics and acquire calculation skills.

Characteristics of Class / Division in Learning

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

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	1. DC circuit (1) Current/voltage/resistance	Understand various laws in DC circuits and be able to apply them to calculations. Able to explain the concepts of current, voltage, and resistance.

		2nd	1. DC circuit (1) Current/voltage/resistance	Understand various laws in DC circuits and be able to apply them to calculations. Able to explain the concepts of current, voltage, and resistance.
		3rd	1. DC circuit (2) Power, energy, Ohm's law, combined resistance	Understand various laws in DC circuits and be able to apply them to calculations. Understand the concept of electric power and electric energy and be able to calculate it. Understand Ohm's law and be able to calculate current, voltage, resistance, and combined resistance.
		4th	1. DC circuit (2) Power, energy, Ohm's law, combined resistance	Understand various laws in DC circuits and be able to apply them to calculations. Understand the concept of electric power and electric energy and be able to calculate it. Understand Ohm's law and be able to calculate current, voltage, resistance, and combined resistance.
		5th	1. DC circuit (3) Kirchhoff's law	Understand various laws in DC circuits and be able to apply them to calculations. Understand Kirchhoff's laws and be able to apply them to DC circuit calculations.
		6th	1. DC circuit (3) Kirchhoff's law	Understand various laws in DC circuits and be able to apply them to calculations. Understand Kirchhoff's laws and be able to apply them to DC circuit calculations.
		7th	1. DC circuit (3) Kirchhoff's law	Understand various laws in DC circuits and be able to apply them to calculations. Understand Kirchhoff's laws and be able to apply them to DC circuit calculations.
		8th	[First semester midterm exam]	Check your understanding of the lesson content up to the mid-term exam of the first semester.
	2nd Quarter	9th	1. DC circuit (4) Superposition principle	Understand various laws in DC circuits and be able to apply them to calculations. Understand the principle of superposition and be able to apply it to DC circuit calculations.
		10th	1. DC circuit (4) Superposition principle	Understand various laws in DC circuits and be able to apply them to calculations. Understand the principle of superposition and be able to apply it to DC circuit calculations.
		11th	1. DC circuit (5) Thevenin's theorem	Understand various laws in DC circuits and be able to apply them to calculations. Understand Thevenin's theorem and be able to apply it to DC circuit calculations.
		12th	1. DC circuit (5) Thevenin's theorem	Understand various laws in DC circuits and be able to apply them to calculations. Understand Thevenin's theorem and be able to apply it to DC circuit calculations.
		13th	1. DC circuit (5) Thevenin's theorem	Understand various laws in DC circuits and be able to apply them to calculations. Understand Thevenin's theorem and be able to apply it to DC circuit calculations.
		14th	1. DC circuit (6) Millman's theorem	Understand various laws in DC circuits and be able to apply them to calculations. Understand Millman's theorem and be able to apply it to DC circuit calculations.
		15th	1. DC circuit (6) Millman's theorem	Understand various laws in DC circuits and be able to apply them to calculations. Understand Millman's theorem and be able to apply it to DC circuit calculations.
		16th	[First semester final exam] [Return of answers]	Check your understanding of the lesson content up to the final exam of the first semester.
2nd Semester	3rd Quarter	1st	2. Fundamentals of AC circuits (1) Trigonometric functions	Be able to explain the concepts of trigonometric functions, vectors, and complex numbers necessary to express sinusoidal alternating current. Able to explain the trigonometric functions and their graphs necessary to express alternating current.
		2nd	2. Fundamentals of AC circuits (1) Trigonometric functions	Able to explain the concepts of trigonometric functions, vectors, and complex numbers necessary to express sinusoidal alternating current. Be able to explain the trigonometric functions and their graphs necessary to express alternating current.
		3rd	2. Fundamentals of AC circuits (2) Representation and calculation methods of complex numbers	Able to explain the concepts of trigonometric functions, vectors, and complex numbers necessary to express sinusoidal alternating current. Understand the complex numbers necessary to express alternating current and be able to perform calculations.

		4th	2. Fundamentals of AC circuits (2) Representation and calculation methods of complex numbers	Able to explain the concepts of trigonometric functions, vectors, and complex numbers necessary to express sinusoidal alternating current. Understand the complex numbers necessary to express alternating current and be able to perform calculations.
		5th	2. Fundamentals of AC circuits (2) Representation and calculation methods of complex numbers	Able to explain the concepts of trigonometric functions, vectors, and complex numbers necessary to express sinusoidal alternating current. Understand the complex numbers necessary to express alternating current and be able to perform calculations.
		6th	3. Complex number representation of sine wave AC (1) Generation of sine wave AC electromotive force	Able to explain the correspondence between sine wave alternating current and complex numbers, frequency, phase, effective value, etc. Able to explain the principle of generating sine wave AC electromotive force.
		7th	3. Complex number representation of sine wave AC (1) Generation of sine wave AC electromotive force	Able to explain the correspondence between sine wave alternating current and complex numbers, frequency, phase, effective value, etc. Able to explain the principle of generating sine wave AC electromotive force.
		8th	[Second semester midterm exam]	Check your understanding of the lesson content up to the mid-term exam of the second semester.
	4th Quarter	9th	3. Complex number representation of sine wave AC (2) Complex number representation of AC	Able to explain the correspondence between sine wave alternating current and complex numbers, frequency, phase, effective value, etc. AC voltage and current can be expressed using complex numbers.
		10th	3. Complex number representation of sine wave AC (2) Complex number representation of AC	Able to explain the correspondence between sine wave alternating current and complex numbers, frequency, phase, effective value, etc. AC voltage and current can be expressed using complex numbers.
		11th	4. R, L, C AC circuit (1) R, L, C element	Able to calculate simple sine wave AC circuits. Able to explain the relationship between sinusoidal AC voltage and current in R, L, and C elements.
		12th	4. R, L, C AC circuit (1) R, L, C element	Able to calculate simple sine wave AC circuits. Able to explain the relationship between sinusoidal AC voltage and current in R, L, and C elements.
		13th	4. R, L, C AC circuit (2) Series circuit/impedance	Able to calculate simple sine wave AC circuits. Understand the impedance of series-connected circuits and be able to calculate current and voltage.
		14th	4. R, L, C AC circuit (2) Series circuit/impedance	Able to calculate simple sine wave AC circuits. Understand the impedance of series-connected circuits and be able to calculate current and voltage.
		15th	4. R, L, C AC circuit (2) Series circuit/impedance	Able to calculate simple sine wave AC circuits. Understand the impedance of series-connected circuits and be able to calculate current and voltage.
		16th	[Second semester final exam] [Return of answers]	Check your understanding of the lesson content

Evaluation Method and Weight (%)

	Examination	Confirmation test	Report/Assignment	Total
Subtotal	65	10	25	100
Basic Proficiency	30	5	10	45
Specialized Proficiency	35	5	15	55
Cross Area Proficiency	0	0	0	0