

長岡工業高等専門学校		開講年度	令和04年度 (2022年度)		授業科目	電気回路演習
科目基礎情報						
科目番号	0040		科目区分	専門 / 必修		
授業形態	演習		単位の種別と単位数	履修単位: 2		
開設学科	電気電子システム工学科		対象学年	3		
開設期	通年		週時間数	2		
教科書/教材	Basic Electric Circuit Note III, written by Osamu Koseki and Shinichi Komoto					
担当教員	髙 将哉					
到達目標						
(Course Code: 21570, English Title: Exercises in Electric Circuits) This course actively focuses on NIT (KOSEN), Nagaoka College's Educational Goal (D). The following table shows the achievement objectives of this course, evaluation weights, and the relationship between each achievement objective and the learning and educational achievement objectives set by KOSEN. ① To be able to explain mutual inductance, ideal transformers, and calculate mutual inductance circuits: 25% (D1) ② To be able to calculate AC circuits using the mesh current method, nodal potential method, the principle of superposition, etc.: 25% (D1) ③ To be able to calculate AC circuits using Thevenin's theorem, etc., and to be able to explain the equivalent transformers of delta connections and star connections, as well as circular diagrams: 25% (C2) ④ To be able to explain three-phase circuits: 25% (E1)						
ルーブリック						
	Ideal Level	Standard Level	Acceptable Level	Unacceptable Level		
Achievement 1	The student can explain mutual inductance and ideal transformers and can calculate mutual inductance circuits in detail.	The student can explain mutual inductance and ideal transformers and calculate mutual inductance circuits.	The student is generally able to explain mutual inductance and ideal transformers and calculate mutual inductance circuits.	The student can neither explain mutual inductance and ideal transformers nor calculate mutual inductance circuits.		
Achievement 2	The student can perform detailed calculations of AC circuits using the mesh current method, the nodal potential method, the principle of superposition, etc.	The student can calculate AC circuits using the mesh current method, the nodal potential method, the principle of superposition, etc.	The student is generally able to calculate AC circuits using the mesh current method, nodal potential method, principle of superposition, etc.	The student cannot calculate AC circuits using the mesh current method, nodal potential method, principle of superposition, etc.		
Achievement 3	The student can perform detailed calculations of AC circuits using Thevenin's theorem, etc., and provide detailed explanations of equivalent transformations between delta and star connections, as well as circular diagrams.	The student can calculate AC circuits using Thevenin's theorem, etc., and explain the equivalent transformers of delta connections and star connections, as well as circular diagrams.	The student is generally able to calculate AC circuits using Thevenin's theorem, etc., and explain the equivalent transformers of delta connections and star connections, as well as circular diagrams.	The student cannot calculate AC circuits using Thevenin's theorem, etc., and explain the equivalent transformers of delta connections and star connections, as well as circular diagrams.		
	The student can provide detailed explanations of the three-phase circuits.	The student can explain three-phase circuits.	The student can vaguely explain three-phase circuits.	The student cannot explain three-phase circuits.		
学科の到達目標項目との関係						
教育方法等						
概要	This course consists of exercises related to Electronic Circuits I. Students will deepen their understanding by solving problems on mutual inductance, the foundations of AC circuits, transformers, the fundamentals of graph theory, various theories of circuits, and polyphase alternating current. ○Related Courses: Basic Electronic Circuits (taken in the previous year), The Mathematics of Electricity (taken in the previous year), Electronic Circuits I (taken this year), Electronic Circuits IIA (taken next year), and Electronic Circuits A (taken next year).					
授業の進め方・方法	Exercises will focus on Electronic Circuits Notebook III. For units not covered in the textbook, lecture materials and exercises will be provided separately. In addition, students are requested to work on assignments immediately following the lectures to deepen their understanding.					
注意点	The course requires a basic knowledge of mathematics (trigonometric functions, calculus, vectors, matrices, etc.) and basic electric circuits, as well as an understanding of the material covered in Electronic Circuits I. Assignments will be given at the end of each unit. This course was originally planned as an in-person class; however, due to the COVID-19 pandemic, it will be conducted remotely when necessary.					
授業の属性・履修上の区分						
☐ アクティブラーニング		☐ ICT 利用		☒ 遠隔授業対応		☐ 実務経験のある教員による授業
授業計画						
		週	授業内容	週ごとの到達目標		
前期	1stQ	1週	Resonant Circuit Exercises	Solve exercise problems on resonant circuits.		
		2週	Exercises in Mutual Inductance (1)	Solve exercise problems on mutual inductance circuits.		
		3週	Exercises in Mutual Inductance (2)	Solve exercise problems on mutual inductance circuits.		
		4週	Exercises in Transformers	Solve exercise problems on circuits that include transformers.		
		5週	Exercises in T-type Equivalent Circuits	Solve exercise problems on circuits that include transformers.		

後期		6週	Exercises in Coupled Circuits	Solve exercise problems on T-type equivalent circuits.
		7週	Exercises in Ideal Transformers	Solve exercise problems on coupled circuits.
		8週	Report Assignment (1st Quarter)	Solve comprehensive exercise problems covering the material studied in the 1st Quarter.
	2ndQ	9週	Report Assignment Review (1st Quarter)	Solve comprehensive exercise problems covering the material studied in the 1st Quarter.
		10週	Exercises in Directed Graphs and Circuit Equations	Solve exercise problems on directed graphs and circuit equations.
		11週	Exercises using the Mesh Current Method	Solve exercise problems on AC circuits using the mesh current method.
		12週	Exercises using Cramer's Rule	Solve exercise problems on AC circuits using Cramer's Rule.
		13週	Exercises using the Contact Potential Method	Solve exercise problems on AC circuits using the contact potential method.
		14週	Exercises in the Law of Energy Conservation	Solve exercise problems on AC circuits using the law of energy conservation.
		15週	Exercises using Various Theories of Circuits	Solve exercise problems on AC circuits using various theories of circuits.
		16週	Report Assignment (2nd Quarter) Week 17: Report Assignment Review (2nd Quarter)	Solve comprehensive exercise problems covering the material studied in the 2nd Quarter.
	3rdQ	1週	Exercises in the Principle of Superposition	Solve exercise problems on AC circuits using the principle of superimposition.
		2週	Exercises in the Reciprocity and Compensation Theorems	Solve exercise problems on AC circuits using the reciprocity and compensation theorems.
		3週	Exercises in Thevenin's and Norton's Theorems	Solve exercise problems on AC circuits using Thevenin's and Norton's theorems.
		4週	Exercises in Resistive, Inverter, and Dual Circuits	Solve exercise problems on constant resistive, inverter, and dual circuits.
		5週	Exercises in the Maximum Power Transfer Theorem	Solve exercise problems on AC circuits using the maximum power transfer theorem.
		6週	Exercises in Equivalent Transformations of Delta and Star Connections	Solve exercise problems on equivalent transformations of delta and star connections.
		7週	Exercises in Circular Diagrams	Solve exercise problems on circular diagrams.
		8週	Report Assignment (3rd Quarter)	Solve comprehensive exercise problems covering the material studied in the 3rd Quarter.
	4thQ	9週	Report Assignment Review (3rd Quarter)	Solve comprehensive exercise problems covering the material studied in the 3rd Quarter.
		10週	Exercises in Polyphase and Three-Phase AC	Solve exercise problems on how to denote three-phase current and wire three-phase circuits.
		11週	Exercises in Three-Phase AC Notation and Circuit Wiring	Solve exercise problems on voltage, current, and star connections.
		12週	Exercises in Voltage and Current in Delta and Star Connections	Solve exercise problems on voltage, current, and delta connections.
		13週	Exercises in Balanced Three-Phase Circuits	Solve exercise problems on balanced three-phase circuits.
		14週	Exercises on the Power of Three-Phase Circuits	Solve exercise problems on the power of three-phase circuits.
		15週	Exercises on Open Delta (V) System Circuits	Solve exercise problems on V-system circuits.
		16週	Report Assignment (4th Quarter) Week 17: Report Assignment Review (4th Quarter)	Solve comprehensive exercise problems covering the material studied in the 4th Quarter.

モデルコアカリキュラムの学習内容と到達目標

分類	分野	学習内容	学習内容の到達目標	到達レベル	授業週
専門的能力	分野別の専門工学	電気・電子系分野	電力	三相交流における電圧・電流(相電圧、線間電圧、線電流)を説明できる。	4
				電源および負荷の Δ -Y、Y- Δ 変換ができる。	4
				対称三相回路の電圧・電流・電力の計算ができる。	4

評価割合

	Unit Report (1st)	Report (1st)	Unit Report (2nd)	Report (2nd)	合計
総合評価割合	10	40	10	40	100
Basic Proficiency	0	0	0	0	0
Specialized Proficiency	10	40	10	40	100
Cross Area Proficiency	0	0	0	0	0