熊本高等専門学校	開講年度	平成29年度 (2017年度)	授業科目	電気回路学I

科目基礎情報

科目番号	CI302	科目区分	専門 / 必修
授業形態	授業	単位の種別と単位数	履修単位: 2
開設学科	制御情報システム工学科	対象学年	3
開設期	通年	週時間数	2
教科書/教材	Fundamentals of Electric Circuits Companion Site, 5/e(Charles K. Alexander, Matthew N. O. Sadiku, Prairie View A&M University,McGraw-Hill Science Engineering)		
担当教員	嶋田 泰幸		

到達目標

This course aims that students can:
1) analyse DC circuits consists of passive elements.
2) express AC voltage/current in phasor form and/or complex form.
3) calculate power which is absorbed in circuits.
4) know methods of analysis, e.g. nodal analysis, mesh analysis and source transformation and apply them to analyse AC circuits.

ルーブリック

	理想的な到達レベルの目安	標準的な到達レベルの目安	未到達レベルの目安
Basic laws	Solve advanced problems, e.g. design of DC meters, in the textbook.	Understand example of basic laws of electric circuits in the text book and solve simple problem	Cannot solve example or problems in the textbook.
Method of analysis	Solve advanced problems, e.g. Thevenin and Norton equivalent circuits, in the textbook.	Understand example of mesh/nodal analysis, superposision theorem, source transformation, Thevenin/Norton equivalent circuits in the text book and solve simple problem	Cannot solve example or problems in the textbook.
AC voltage/current in phasor form and/or complex form	Solve advanced problems, e.g. Phase-Shifters, in the textbook.	Understand example of representation of the AC voltage/current in phasor in the text book and solve simple problem	Cannot solve example or problems in the textbook.
AC power	Solve advanced problems, e.g. Complex power and improvement of power factor, in the textbook.	Understand example of AC power in the text book and solve simple problem	Cannot solve example or problems in the textbook.

学科の到達目標項目との関係

教育方法等

概要	This course covers two parts; One is analysis of Direct Current(DC) circuits and the other is analysis of Alternative Current(AC) circuits. DC circuits parts will cover basic laws which you've already learnt. AC circuits parts will cover fundamental concepts of AC circuits, phasor and complex form of AC voltage and current, AC power analysis and magnetically coupled circuits.
授業の進め方・方法	Flipped teaching will be introduced in this subject. Learning video will be provided by uploading on Web server in advance of the class. Students have to access ther web server and watch the video for self-learning. Only students who learned by watching the video can participate in the class. During class, students have to discuss with friends/team-mates in order to solve problems that are given at the beginning of each class, and submit a report within the class.
注意点	Put in as much effort as you can. Problem solving is an essential part of the learning process. Solve as many problems as you can. The best way to learn is to solve a lot of problems. Prescribed teaching hours : 60 hours a year

授業計画

		週	授業内容	週ごとの到達目標
前期	1stQ	1週	Introduction to electric circuits which consist of passive elements(1)	Students will be able to understand the basic concepts of electric circuits.
		2週	Basic laws(1)	Students wil be able to solve simple problems using Ohm's law, Kirchhoff's laws and Wye-Delta transformations.
		3週	Basic laws(2)	Same as above
		4週	Methods of analysis(1)	Students will be able to analise simple DC circuits using nodal analysis and/or mesh analysis.
		5週	Methods of analysis(2)	Same as above
		6週	Methods of analysis(3)	Same as above
		7週	Circuits theorem(1)	Students will be able to understand some fundamental circuits theorems; superposition, source transformation, Thevenin's theorem, Norton's theorem, and so forth. Futhermore students will be able to solve simple problems of DC circuits using the circuits theorems.
		8週	Circuits theorem(2)	Same as above
	2ndQ	9週	Circuits theorem(3)	Same as above
		10週	Circuits theorem(4)	Same as above
		11週	Comprehensive exercise(1)	Students will be able to solve analyse simple DC circuit using theorems/laws, e.g. Kirchhoff’s laws, the superposition theorem, Thevenin’s theorem and Norton’s theorem
		12週	Comprehensive exercise(2)	Same as above

		13週	Sinusoids and Phasors(1)	Students will be able to know what the phasor is. Also students will be able to express sinusoids in phasor form, complex form and/or exponential form.
		14週	Sinusoids and Phasors(2)	Same as above
		15週	Sinusoids and Phasors(3)	Same as above
		16週	Examination, Evaluation & Course summary	
後期	3rdQ	1週	Sinusoidal steady-state analisys(1)	Students will be able to apply some circuits theorems to AC circuits.
		2週	Sinusoidal steady-state analisys(2)	Same as above
		3週	Sinusoidal steady-state analisys(3)	Same as above
		4週	Sinusoidal steady-state analisys(4)	Same as above
		5週	Sinusoidal steady-state analisys(5)	Same as above.
		6週	Series resonance	Students will be able to able to analise series resonance in RLC circuit.
		7週	Parallel resonance	Students will be able to able to analise parallel resonance in RLC circuit.
		8週	AC power analysis(1)	The aim of this mid-term test is to assessing students' understandings.
	4thQ	9週	AC power analysis(2)	Students will be able to apply some circuits theorems to AC circuits.
		10週	AC power analysis(3)	Same as above.
		11週	AC power analysis(4)	Students will be able to understand the basic concepts of AC power and how to calculate AC power which is absorbed in a circuit.
		12週	AC power analysis(5)	Same as above.
		13週	Comprehensive exercise(1)	Students will be able to analise simple electric cirsuits using theorems.
		14週	Comprehensive exercise(2)	Same as above.
		15週	Comprehensive exercise(3)	Same as above.
		16週	Examination, Evaluation & Course summary	

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	電気回路	キルヒホッフの法則を用いて、直流回路の計算ができる。	3	前1,前2,前3,前8,前11,前12
				重ねの理を説明し、直流回路の計算に用いることができる。	3	前2,前3,前4,前5,前6,前7,前8,前9,前10,前11,前12
				ブリッジ回路を計算し、平衡条件を求められる。	3	前2,前3,前4,前5,前6,前7,前8,前9,前10,前11,前12
				電力量と電力を説明し、これらを計算できる。	3	前2,前3,前4,前5,前6,前7,前8,前9,前10,前11,前12
				正弦波交流の特徴を説明し、周波数や位相などを計算できる。	3	前13,前14,前15,後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				平均値と実効値を説明し、これらを計算できる。	3	前13,前14,前15,後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				正弦波交流のフェーザ表示を説明できる。	3	前13,前14,前15,後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				R、L、C素子における正弦波電圧と電流の関係を説明できる。	3	前13,後1,後2,後3,後4,後5,後6,後7,後13,後14,後15

				瞬時値を用いて、簡単な交流回路の計算ができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				フェーザを用いて、簡単な交流回路の計算ができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				インピーダンスとアドミタンスを説明し、これらを計算できる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				正弦波交流の複素表示を説明し、これを交流回路の計算に用いることができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				キルヒホッフの法則を用いて、交流回路の計算ができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				合成インピーダンスや分圧・分流の考え方を用いて、交流回路の計算ができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				網目電流法や節点電位法を用いて交流回路の計算ができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				重ねの理やテブナンの定理等を説明し、これらを交流回路の計算に用いることができる。	3	後1,後2,後3,後4,後5,後6,後7,後13,後14,後15
				交流電力と力率を説明し、これらを計算できる。	3	後8,後9,後10,後11,後12,後13,後14,後15

評価割合

	試験	レポート	合計
総合評価割合	20	80	100
基礎的能力	0	0	0
専門的能力	20	80	100
分野横断的能力	0	0	0