

Course Specification

Name of Institution	Mahidol University
Campus/faculty/department	Salaya campus Mahidol University International College Science Division

Section 1 General Information

1. Course Code and course title

(Thai)	EGCI 230	การวิเคราะห์วงจรไฟฟ้า
(English)	EGCI 230	Electric Circuit Analysis

2. Number of Credits 4(4-0-8) (Lecture/Lab/Self-study)

3. Curriculum and type of subject

3.1 Curriculum	Bachelor of Engineering (Computer Engineering)
3.2 Type of subject	Major Course (Required Major)

4. Responsible faculty member

Asst. Prof. Dr. Konglit Hunchangsith

5. Trimester / year of study

5.1 Trimester 1st/ year of study	2 nd year
5.2 Number of students	5-40 students

6. Pre-requisite(s) none

7. Co-requisite(s) none

8. Venue of study Mahidol University, Salaya campus

9. Date of latest revision August 20, 2020

Section 2 Goals and Objectives

1. Goal At the end of the course, students should

1. Understand theories of electric circuits.
2. Understand methods and procedures of circuit analysis.
3. Capable of designing electric circuits to solve engineering problems.

2. Objective of development revision

To up-date the knowledge content of the course

Section 3 Course Management

1. Course Description

(Thai) องค์ประกอบของวงจร กฎของเคอร์ชอฟฟ์ วงจรตัวต้านทาน การวิเคราะห์แบบปมและตาข่าย ทฤษฎีบทของเทวินินและนอร์ตัน ออปแอมป์ วงจรอันดับหนึ่งและสอง ผลตอบสนองต่อสัญญาณแบบขั้น ผลตอบสนองสัญญาณเข้าศูนย์และผลตอบสนองสถานะศูนย์ ผลตอบสนองชั่วคราวทางดีซีและผลตอบสนองสถานะอยู่ตัวทางเอซี ฟังก์ชันถ่ายโอนเบื้องต้น รูปคลื่นแบบไซน์ การแทนด้วยเฟสเซอร์ อิมพีแดนซ์และความนำเชิงซ้อน การวิเคราะห์ในสถานะอยู่ตัวแบบไซน์ กำลังไฟฟ้าเชิงซ้อน ผลตอบสนองความถี่

(English) Circuit elements; Kirchhoff's laws and reference direction; elementary concepts of network graphs; resistive circuits; node and mesh analysis; Thevenin theorem and Norton theorem; Op-amp, inductor and capacitor, first-order and second order circuit; step responses; zero input and zero-state responses; DC transient and AC steady-state response; elementary transfer functions; sinusoidal waveforms; phasor representations; impedance and admittance; sinusoidal steady-state analysis; complex power; frequency response

2. Credit hours / trimester

Lecture (hours)	Additional Class (hours)	Laboratory/field trip/internship (hours)	Self-study (hours)
48 hours (4 hours x 12 weeks)	-	-	96 hours (8 hours x 12 weeks)

3. Numbers of hours that the lecturer provides individual counseling and guidance

1 hour/week

Section 4 Development of Students' Learning Outcome

1. Expected outcome on students' skill and knowledge

Student will be able to apply the knowledge from lecturer and additional research with the ideas received from analysis and synthesis to set up solutions / precautions to benefit individuals and their community.

2. Teaching Methods

- Lecture

- Self-study

3. Evaluation methods

1. Morality and Ethics

1.1 Expected outcome on morality and ethics:

- 1.1.1 To be aware of values and morality, ethics, scarification and honesty.
- 1.1.2 To process self-discipline, punctuality, self-responsibility and social responsibility
- 1.1.3 To process leadership and supporter skills and be able to work in a team with integrity and cooperation.
- 1.1.4 To demonstrate good listening behavior and have respect for the rights and value of others.
- 1.1.5 Respect and follow rules and regulations of institution and society
- 1.1.6 To demonstrate the ability to analyze ethical impacts of computer usage to personals, organizations and social.
- 1.1.7 To demonstrate good academic ethical behaviors.

1.2 Teaching methods:

Learning Centered Education: Emphasis on knowledge development, important skills in career development and living, encourage students to use their full potentials

- 1.2.1 Lecture
- 1.2.2 Emphasis on morality and ethics
- 1.2.3 Group assignments
- 1.2.4 Group discussion

1.3 Evaluation methods:

- 1.3.1 Written examination
- 1.3.2 Presentation
- 1.3.3 Class attendance, class participation and behavior in class
- 1.3.4 On-time submission of reports and assignments and their quality

2. Knowledge development

2.1 Expected outcome on knowledge development:

- 2.1.1 To process the knowledge related to principles, theories and practice in the course
- 2.1.2 To be able to analyze, understand and explain the computer requirements and be able to apply knowledge and skills using the appropriate tools to solve a problem.
- 2.1.3 To be able analyze, design and install and/or evaluate computer components to meet the requirements of the users
- 2.1.4 To have the ability to remain current in research, and pursue new knowledge and perform ability to apply the knowledge.

- 2.1.5 To know, understand and perform eagerness to develop computer knowledge and skills continuously.
- 2.1.6 To have a breadth knowledge in order to oversee the changes and understand the impact of new technology.
- 2.1.7 To have a hand-on experience in software development and/or software applications.
- 2.1.8 To demonstrate knowledge integration with other related sciences.

2.2 *Teaching methods:*

Learning Centered Education: Emphasis on knowledge development, important skills in career development and living, encourage students to use their full potentials

- 2.2.1 Lecture
- 2.2.2 Case studies
- 2.2.3 Group discussion

2.3 *Evaluation methods:*

- 2.3.1 Written examination
- 2.3.2 Quality of reports and assignments

3. Intellectual development

3.1 *Expected outcome on intellectual development:*

- 3.1.1 To have discretionary and systematic thinking skill.
- 3.1.2 To have the ability to search, consolidate and evaluate ideas and evidence for problem solving.
- 3.1.3 To be able to apply knowledge and experience to analyze and creatively solve problems both in general and in academic contexts.
- 3.1.4 To be able to apply knowledge and experience to synthesize solution and precautions

3.2 *Teaching method:*

- 3.2.1 Systematic problem solving examples and case studies
- 3.2.2 Group assignment

3.3 *Evaluation methods:*

- 3.3.1 Written examination
- 3.3.2 Quality of reports and assignments

4. Interpersonal relationship and responsibility

4.1 *Expected outcome on interpersonal relationship and responsibility:*

- 4.1.1 To perform good communication skills with various groups of people.
- 4.1.2 To be a constructive team member (in various roles).

- 4.1.3 To process the knowledge of the course to identify social problems.
- 4.1.4 To demonstrate self and team responsibility.
- 4.1.5 To be initiative in problem solving.
- 4.1.6 To take responsibility in a life-long learning.

4.2 Teaching methods:

- 4.2.1 Group discussion in case studies
- 4.2.2 Group discussion
- 4.2.3 Group assignment

4.3 Evaluation methods:

- 4.3.1 Class attendance, class participation and behavior in class
- 4.3.2 On-time submission of reports and assignments and their quality

5. Mathematical analytical thinking, communication skills and information technology skills

5.1 Expected outcome on mathematical analytical thinking, communication skills and information technology skills:

- 5.1.1 To be able to select and apply existing tools for computer related work.
- 5.1.2 To possess the ability to apply information technology for data gathering, processing, interpreting and presenting information/results.
- 5.1.3 To have the ability to communicate effectively and select appropriate methods for presentation.
- 5.1.4 To use information technology appropriately.

5.2 Teaching methods:

- 5.2.1 Case studies with past experiences and current events
- 5.2.2 Group discussion
- 5.2.3 Group assignment

5.3 Evaluation methods:

- 5.3.1 Written examination
- 5.3.2 On-time submission of reports and assignments and their quality
- 5.3.3 Class attendance, class participation and behavior in class
- 5.3.4 Presentation with appropriate technology

Section 5 Teaching and Evaluation Plans

1. Teaching plan

Class	Topic/Details	Number of hours		Online Sessions	On-Campus	Instructors	Note
		In-Class sessions	Lab sessions				
1	Introduction and Ohm's Law	4		x		Asst. Prof. Dr. Konglit Hunchangsith	
2	Kirchhoff's Law: KCL and KVL. Basic Resistor Circuits	4		x			
3	Nodal and Mesh Analysis	4		x			
4	Nodal and Mesh Analysis	4		x			
5	Thevenin theorem and Norton theorem	4		x			
6	Superposition and examination	4			x		
7	Capacitor and Inductor	4		x			
8	Response of 1 st order circuit	4		x			
9	Response of 2 nd order circuit	4		x			
10	DC transient and AC steady-state response	4		x			
11	Laplace transform and circuits	4		x			
12	Frequency response	4		x			

Class	Topic/Details	Number of hours		Online Sessions	On-Campus	Instructors	Note
13	Final Examination				x		
	Total	48	xx				

2. Evaluation Plan

Expected outcomes	Methods / activities	Week	Percentage
1.1.2, 2.1.1, 3.1.1, 4.1.1, 5.1.2	Attendance in class behavior and exercises	1-11	20%
1.1.7, 2.1.2, 3.1.3, 4.1.5, 5.1.2	Midterm Examination	6	35%
	Final examination	12	40%
1.1.3, 2.1.8, 3.1.2, 4.1.4, 5.1.3	Report and Discussion	4, 5, 11	5%

Section 6 Teaching Materials and Resources

1. Texts and main documents

Fundamental of Electric Circuit, Charles K Alexander and Matthew N.O. Sadiku, 5th Edition, Publisher: McGraw Hill

Introduction to Electric Circuit Analysis, Richard Dorf and James Svoboda, 8th Edition, Publisher: John Wiley

2. Documents and important information

None

3. Documents and recommended information