



TQF. 3

Bachelor's Degree

Master's Degree

Course Specification

Course Code: CPE1002

Course Title: Circuit and Electronic

Credits: 3(2-2-5)

Programs: Bachelor of Engineering

Semester: 2

Academic Year: 2023

Faculty of Industrial Technology
Suan Sunandha Rajabhat University

Section 1 - General Information

1. Course code and course title

Course code: CPE1002

Course title (English): Circuit and Electronic

ชื่อวิชา (ภาษาไทย): วงจรไฟฟ้าและอิเล็กทรอนิกส์

2. Credits

3(2-2-5)

3. Curriculum and course category

Curriculum: Bachelor of Engineering (Computer Engineering)

Course Category:

- | | | |
|--|---|---|
| <input type="checkbox"/> General Education | <input type="checkbox"/> Specialized Course | <input checked="" type="checkbox"/> Professional Foundation |
| <input type="checkbox"/> Required Course | <input type="checkbox"/> Elective Course | <input type="checkbox"/> Internship |

4. Teacher in charge and lecturer

Teacher in charge: Dr.Pongrapee Kaewsaiha

Lecturer: Dr.Pongrapee Kaewsaiha

5. Contact

Room Number: 4733

Email: pongrapee.ka@ssru.ac.th

6. Semester/Academic year

Semester: 2 Academic Year: 2023

Sections: 001, 002 Number of enrolled students: 41, 28

7. Pre-requisite (if any)

None

8. Co-requisite (if any)

None

9. Time/Venue

Wed, 08:00-12:00, 13:00-17:00, Room 4733, Faculty of Industrial Technology, SSRU

10. Last date for preparing and revising this course

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Section 2 - Aims and Objectives

1. Course aims

This course presents basic electrical and electronic circuit analysis. Students will get to know the basic elements of electrical and electronic circuits, leading to circuit analysis and design. The content begins with an introduction to electrical measurement units and the use of resistors, which students are likely to have learned in secondary school and in foundation courses. This course then introduces passive elements, such as capacitors and inductors, which require a higher level of mathematics to analyze. After that, this course will introduce electronic components, such as diodes and transistors, to provide students with a foundation for projects or other related work.

1. Course objectives

At the end of this course, students will be able to perform in the following areas of performance:

- 1) Analyze electrical and electronic circuits.
- 2) Design electrical and electronic circuits to suit different purposes.

2. Purposes for developing and revising course

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Section 3 - Characteristics and Operations

1. Course description

(English) Fundamentals electric circuit; Ohm's law; Kirchhoff's law; Thevenin's and Norton's theorems; Superposition; Capacitor; Inductor; Semiconductor devices; Device current-voltage and frequency characteristics; P-N junction; Diode circuits analysis and design of BJT and MOS transistor circuits; Operational amplifier and its applications

(ไทย) พื้นฐานของวงจรไฟฟ้า กฎของโอห์ม กฎของเคอร์ชอฟ โครงสร้างวงจรแบบโหนดและแบบลูป ทฤษฎีเทวินิน ทฤษฎีนอร์ตันและซูเปอร์โพสิชัน ตัวเก็บประจุ ตัวเหนี่ยวนำ อุปกรณ์สารกึ่งตัวนำ คุณสมบัติทางกระแส-แรงดันและความถี่ของอุปกรณ์อิเล็กทรอนิกส์ ทฤษฎีรอยต่อพีเอ็นเบื้องต้น วงจรไดโอด การวิเคราะห์และออกแบบวงจรทรานซิสเตอร์ชนิดบีเจทีและมอส การวิเคราะห์วงจรออปแอมป์และการประยุกต์

2. Time length per semester (Lecture/Practice/Self-study hours)

Lecture	Practice	Self-Study	Remedial Class
2 hours/week	2 hours/week	5 hours/week	As needed

3. Individual consulting and guidance

Self-consulting at the lecturer's office:

Room Number 4724A, Faculty of Industrial Technology, SSRU

Mon., 13:00-15:00 or by appointment

Consulting via office telephone/mobile phone:

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Consulting via email:

pongrapee.ka@ssru.ac.th

Consulting via social media platform:

Line OpenChat

Consulting via a web forum:

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Section 4 - Developing Students' Learning Outcomes

Expected students' learning outcomes are categorized into five domains, developed from curriculum specification (TQF2), as follows:

1. Morals and ethics

1.1 Learning outcomes to be developed

- 1) Have knowledge, understanding, and realizing value, morality, ethics, sacrifice, and honesty. Have academic and professional ethics.
- 2) Be disciplined, punctual, and responsible for oneself and society. Be able to comply with organizational and social regulations.
- 3) Be able to take leader and follower roles, work as a team, resolve conflicts and priorities.
- 4) Be open-minded and respect rights, value, and dignity of human beings.
- 5) Have a conscience that considers common interests rather than personal interests.

1.2 Teaching strategies

Establish an organizational culture to instill discipline in students. Emphasis on attending classes on time as well as dressing according to university regulations. Students responsible for group work must be trained to know the responsibilities of being a group leader and being a member of a group. Be honest by not committing fraud in exams or plagiarizing other people's homework. In addition, all instructors must include morality and ethics in teaching all subjects. Also, there are activities to promote morality and ethics, such as honoring students who have done well in benefit the public and sacrifice.

1.3 Assessment & evaluation strategies

- 1) Evaluate from attentiveness and diligence in participating in class activities.
- 2) Assess students' punctuality in class, submission of work, and participation in activities.
- 3) Evaluate the responsibilities of assigned duties.

2. Knowledge

2.1 Learning outcomes to be developed

- 1) Have knowledge and understanding of important principles and theories in the course.
- 2) Have knowledge and understanding of other areas related to the course which can be integrated and applied appropriately.
- 3) Have knowledge of operational techniques using experiential learning methods.
- 4) Be able to continuously monitor academic and professional changes both in theory and in practice.

2.2 Teaching strategies

Use a variety of teaching methods emphasizing theoretical principles and practical application in real-world environments to keep pace with technological changes. This shall be in accordance with the nature of the course as well as the content of that course.

2.3 Assessment & evaluation strategies

- 1) Quiz
- 2) Assignment
- 3) Mid-term and final exams

3. Cognitive skills

3.1 Learning outcomes to be developed

- 1) Be able to think critically and systematically.
- 2) Be able to search, interpret, process, and evaluate data to identify, analyze, and solve problems creatively.
- 3) Be able to follow up, evaluate, and report results accurately and completely.

3.2 Teaching strategies

- 1) Teachers always teach and show rational thinking as an example.
- 2) Presentations and group discussions.
- 3) Provide students the opportunity to practice.

3.3 Assessment & evaluation strategies

Assess according to the real situation from the work and practice of students, such as assessing from class presentations, testing using quiz, interviews, etc.

4. Interpersonal skills and responsibilities

4.1 Learning outcomes to be developed

- 1) Be able to help and facilitate in solving problems in various situations in the group, either as a leader or a team member.
- 2) Have good human relations. Be able to work well with others and adapt well to situations and corporate culture.
- 3) Have responsibility for their own actions and for group work and learning development, both personally and professionally.
- 4) Be able to work and take responsibility for assigned tasks efficiently.

4.2 Teaching strategies

Use instructions with activities that involve group work, work that requires coordination with others, across curriculum, across faculties, external parties, external agencies, or work that students need to research information from interviewing other people or experts.

4.3 Assessment & evaluation strategies

Assess student behavior and expression in presenting group reports in class and observe the behavior shown in participating in various activities and the completeness and clarity of the information.

5. Numerical analysis, communication, and information technology skills

5.1 Learning outcomes to be developed

- 1) Be able to use quantitative analysis to make creative decisions in interpretation and suggest ways to solve problems or disputes.
- 2) Be able to communicate effectively both verbally and in writing. Know how to choose a presentation style that is suitable for different problems and audience groups.
- 3) Be able to choose appropriate information technology and communication techniques to collect data, interpretation, and information communication.

5.2 Teaching strategies

Organize learning activities in various subjects for students to analyze simulated situations, numerical analysis skills, virtual situations, and propose appropriate solutions. Learn techniques for applying technology in a variety of situations.

5.3 Assessment & evaluation strategies

Assess presentation techniques based on theory, selection of technological tools or related mathematics and statistics. Assess the ability to explain the limitations, reasons for choosing different tools, discussions, and case studies that are presented to the class.

Remark: The symbol ● means “major responsibility.”

The symbol ○ means “minor responsibility.”

No symbol means “no responsibility.”

Section 5 - Lesson Plan and Assessment

1. Lesson plan

Week	Content	Teaching Management	Program/Teaching Strategies	Material/Media	Assessment
1	Course introduction Chapter 1: Basic concepts - Units and quantities	HyFlex - On-site - Online - On-demand	- Introduce course outlines. - Introduce the course LMS (Moodle) and provide technical assistance as needed. - Discuss expected outcome and grading criteria. - Explain the concepts of units and quantities, such as SI prefix, charge, current, and voltage. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
2	Chapter 2: Resistive circuits - Resistance - Ohm's law - Kirchoff's current law - Kirchoff's voltage law	HyFlex - On-site - Online - On-demand	- Explain the concepts and roles of resistance and resistors in electric circuits. - Students learn and practice reading resistance values from color strips. - Introduce the ohm's law, Kirchoff's current law, and Kirchoff's voltage law. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
3	Chapter 3: Resistive circuit analysis methods - Nodal analysis technique - Loop analysis technique	HyFlex - On-site - Online On-demand	- Introduce nodal and loop analysis techniques. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result

Week	Content	Teaching Management	Program/Teaching Strategies	Material/Media	Assessment
4	Chapter 4: Equivalent circuits - Thevenin's theorem - Norton's theorem - Superposition theorem	HyFlex - On-site - Online - On-demand	- Study the reduction of electric circuits using Thevenin's and Norton's theorems. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
5	Chapter 5: Superposition theorem	HyFlex - On-site - Online - On-demand	- Learn how analyze circuits with multiple inputs or multiple power sources. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
6	Chapter 6: Operational amplifiers	HyFlex - On-site - Online - On-demand	- Explain the basics of operational amplifiers (op-amps) and their uses. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
7	Review	HyFlex - On-site - Online - On-demand	- Review lessons	- Presentation - Hand-on activity	- Attendance record - Activity result
8	Mid-term examination				
9	Chapter 7: Capacitance and inductance	HyFlex - On-site - Online On-demand	- Study the properties of two energy storage elements in electrical circuits - capacitors and inductors. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result

Week	Content	Teaching Management	Program/Teaching Strategies	Material/Media	Assessment
10	Chapter 8: First- and second-order circuits	HyFlex - On-site - Online - On-demand	- Explain the behavior of electric circuits consisting of capacitors and inductors using differential equations. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
11	Chapter 9: AC steady-state analysis	HyFlex - On-site - Online - On-demand	- Learn how to determine the steady-state response of voltage and current in a circuit with a sinusoidal signal source. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
12	Chapter 10: Semiconductor	HyFlex - On-site - Online - On-demand	- Study the properties of semiconductors and P-N junctions. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
13	Chapter 11: Diodes	HyFlex - On-site - Online - On-demand	- Study the properties of diodes and their applications such as rectifiers. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result
14	Chapter 12: Transistors	HyFlex - On-site - Online - On-demand	- Get to know NPN and PNP transistors and their uses, such as signal amplifier. - Get to know BJT and MOSFET transistors. - Provide some examples and practices. - Complete activities.	- Presentation - Hand-on activity	- Attendance record - Activity result

Week	Content	Teaching Management	Program/Teaching Strategies	Material/Media	Assessment
15	Review	HyFlex - On-site - Online On-demand	- Review lessons	- Presentation - Hand-on activity	- Attendance record - Activity result
17	Final examination				

2. Learning assessment plan

Learning Outcomes	Assessment Activities	Schedule (Week)	Proportion for Assessment (%)
1	Participation record	1-16	10
2, 3, 4, 5	Activities	1-16	40
	Examinations	8, 17	20, 30

Section 6 - Learning and Teaching Resources

1. Required textbooks and materials

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2. Documents and important information

Documents suggested by the lecturer

3. Recommended resources for extra study

Information retrieved from search engines

Section 7 - Course Evaluation and Revising

1. Strategies for evaluation of course effectiveness by students

Students will complete the evaluation form after the end of the course.

2. Strategies for course evaluation by the lecturer

The lecturer observes the class and collects immediate feedback from students.

3. Teaching revision

The lecturer revises the teaching and learning process based on the questionnaire results.

4. Feedback for achievement standards

The administration committees collect data and analyze students' academic performance each semester.

5. Methodology and planning for course review and improvement

Revise the curriculum, teaching methods, and learning methods by referring to the evaluation results from those involved. Meetings will be held to review the course's effectiveness and improve the curriculum.