University of Science and Technology of Hanoi	Department: Energy Specialty: Electrical engineering & Renewable energy

COURSE SYLLABUS

1. INFORMATION

Subject	Course name in English: Electrical Circuits I		
	Course name in Vietnamese: Lý thuyết Mạch điện I		
Instructor (s)	Dr. Nguyen Xuan Truong mail: nguyen-xuan.truong@usth.edu.vn		
	Dr. Hoang Trung Kien mail: hoang-trung.kien@usth.edu.vn		
Code		Credit points (ECTS)	04
Required	Compulsory		
Prerequisites	Mathematical analysis, Physic (electricity); General mathematics (Differential Equations)		
Time Commitment	Lecture	30 hrs	
	Tutorial/Exercises	08 hrs	
	Practical/Lab-work	12 hrs	
	Total	50 hrs	

2. DESCRIPTION

Objectives (CO)	CO1	to develop an understanding of the elements of electric circuits and the fundamental laws, general techniques for circuit analysis
	CO2	help students to understand the transient and the steady-state response of RC, RL and RLC circuits
	CO3	to introduce elementary electronic circuits such as operational amplifiers and their circuit models
Learning Outcomes (LO)	Having successfully completed this course, students will be able to:
	LO1	Interpret the basic circuit concepts, such as voltage, current, power, energy, current range and its effect on person, etc.
	LO2	Use Node and Mesh analyses techniques for the analysis of linear time invariant circuits
	LO3	Analyse circuits by utilizing Thevenin's and Norton's theorems
	LO4	Analyse circuits with Operational Amplifiers
	LO5	Interpret the operation of capacitors and inductors; and analyse both transient and steady-state response of first order circuits
	LO6	Analyse second order circuits
	LO7	Display a professional commitment to group work through cooperative quizzes
Description	\multicolumn{2}{l|}{This course is designed to introduce the definition, theory, and experiments in direct current circuits. Students will learn the passive and active elements, fundamental laws and theorems, circuit analysis techniques. An introduction to operational amplifiers will be presented. The course performs what is normally referred to as a transient and steady-state response of RC, RL and RLC circuits. A few examples and homework problems in later chapters must be skipped.}
Textbook(s)	\multicolumn{2}{l|}{[1] J. David Irwin, R. Mark Nelms, **"Basic Engineering Circuit Analysis"**, 2008 John Wiley & Sons Inc. [2] John O'Malley, **"Schaum's Outline of Theory and Problems of Basic Circuit Analysis"**, Second edition, McGraw-Hill}

3. ASSESSMENT/EVALUATION

	Percentage	Type
Attendance/Attitude	10%	
Practical	20%	Group report & presentation
Mid-term	20%	Written exam
Final exam	50%	Written exam

4. CONTENT

Class	Contents	Hours			Ref./Resources
		Lect.	Exr.	Prc.	

1	**PART 1: INTRODUCTION**
	• **Basic concepts and quantities**
	  - Charge, DC voltage, DC current, DC power …,
	  - Basic characteristics of sinusoidal functions (AC current, cosine waveform, frequency, magnitude, AC power…), phasor
	  - Electrical Safety: physiological effect of electric shock
	• **Circuit elements**
	  - Active element: voltage and current source (independent, dependent)
	  - Passive element: resistor, inductor, capacitor
	  - Measuring devices: Ohmmeter, Ammeter, Voltmeter
	• **Basic laws in electric circuit – Resistive Circuit**
	  - Ohm's law
	  - Two - Kirchhoff's laws
	  - Exercises
		3	0	3	- Lecture notes EC 1 (Nguyen Xuan Truong) https://moodle.usth.edu.vn/course/view.php?id=333#section-1
					- Textbooks

2	**PART 2: DC CIRCUIT ANALYSIS** • Introduction • Nodal Analysis • Loop Analysis • MATLAB DC analysis • Summary	6	2	6	- Lecture notes EC 1 (Nguyen Xuan Truong) https://moodle.usth.edu.vn/course/view.php?id=333#section-1 - Textbooks
3	**PART 3: NETWORK THEOREMS** • The concepts of linearity and equivalence • Superposition • Thevenin's and Norton's theorems • Maximum power transfer theorem • Summary	6	2	0	- Lecture notes EC 1 (Nguyen Xuan Truong) https://moodle.usth.edu.vn/course/view

						- .php?id=333 #section-1 - Textbooks
4	**PART 4: OPERATIONAL AMPLIFIER** • Introduction (model the op-amp device; analysing a variety of circuits that employ op-amps…) • Op-Amp Operation • Popular Op-Amp Circuit • Circuits with Multiple Operational Amplifiers • Summary	6	2	0		- Lecture notes EC 1 (Nguyen Xuan Truong) https://moodle.usth.edu.vn/course/view.php?id=333 #section-1 - Textbooks
5	**PART 5: FIRST & SECOND-ORDER TRANSIENT CIRCUITS** • Introduction • First-Order Circuit (RC and RL circuits) • Second-Order Circuit (RLC circuit) • Transient MATLAB analysis • Summary	9	2	3		- Lecture notes EC 1 (Nguyen Xuan Truong) https://moodle.usth.edu.vn/course/view.php?id=333 #section-1 - Textbooks

5. PRACTICAL WORK

Item	Content	Hours	Ref./Resources
1	APPLYING THE WHEATSTONE BRIDGE CIRCUIT	3	Wheatstone bridge – PHYWE https://www.phywe.com/experiments-sets/university-experiments/wheatstone-bridge_10188_11119/
2	AC TECHNOLOGY I	3	COM3LAB Course https://www.leybold-shop.com/com3lab-course-ac-technology-i-7001301.html
3	DC TECHNOLOGY I	3	COM3LAB Course https://www.leybold-shop.com/com3lab-course-dc-technology-i-7001101.html
4	DC TECHNOLOGY II	3	COM3LAB Course https://www.leybold-shop.com/com3lab-course-dc-technology-ii-7001201.html

Notes:

- Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practise).

- Exercises may include assignment, reports, student's presentation, homework, class exercises …for each class sessions

- Practicals mostly refer to Lab- work or outside practice such as field trip.