# SYLLABUS

1. **Course name: ELECTRIC CIRCUITS**
2. **Course code:** ELCI140144
3. **Credits:** 4 (4/0/8)

   Duration: 15 weeks (including 4 hours for attending class and 8 hours for self-study per week)
4. **Instructors:**
   1. M.Eng. Tran Tung Giang
   2. M.Eng. Le Thi Thanh Hoang
   3. M.Eng. Le Thi Hong Nhung
   4. M.Eng. Tran Duc Loi
5. **Course conditions**

   Former subjects: **Advanced Maths 1, 2, 3**
6. **Course description**

This course provides students the knowledge of electrical circuit analysis including basic concepts such as voltage, current, resistance, impedance, Ohm's and Kirchoff's law; basic electric circuit analysis techniques, resistive circuits, transient and steady-state responses of RLC circuits; circuits with DC and sinusoidal sources, steady-state power and three-phase balanced systems,including Laplace and Fourier transforms applications for solving circuit problems.

7. **Course Goals**

| **Goals** | ***Goal description***<br>*(This course provides students:)* | **ELOs** |
|---|---|---|
| **G1** | Knowledge of mathematics, science, and engineering to solving basic electric circuits. | 1.1<br>1.2 |
| **G2** | Ability to identify different types of circuits and devise analytical methods suitable circuit. | 2.2 |
| **G3** | An ability to use the software tools to analyze circuits. | 4.4 |

** Note: High: H; Medium: M; Low: L*

8. **Course Learning Outcomes (CLOs)**

| **CLOs** | | ***Description***<br>*(After completing this course, students can have:)* | **Outcome** |
|---|---|---|---|
| | G1.1 | Ability to describe and identify the electric circuit and the basic elements of the electric circuit. | 1.1, 1.2 |
| | G1.2 | the ability to apply the Kirchoff's law, equivalent transformation for solving the circuit problems. Determine the supply power, dissipation power, and the power preservation in a circuit. | 1.1, 1.2 |
| | G1.3 | Ability to analyze circuits using the node-voltage method, the mesh- | 1.1, 1.2 |

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| **G1** | | current method, Thevenin and Norton equivalents, and superposition property. | |
| | G1.4 | Ability to understand and solve AC circuits one phase and three phase. | 1.1, 1.2 |
| | G1.5 | Ability to determined the parameters of two-port network. | 1.1, 1.2 |
| | G1.6 | Ability to analyze and calculate the values of the transient responses and sketch waveforms of the currents and drop voltages in the time domain. | 1.1, 1.2 |
| | G1.7 | Ability to analyse and calculate the current and voltage in the time responses with non-sinusoidal source and Bode plots. | 1.1, 1.2 |
| | G1.8 | Ability to analyse and determine the currents in the nonlinear circuits. | 1.1, 1.2 |
| **G2** | G2.1 | Ability to identify different types of electric circuits and choose the suitable method in techniques of circuit analysis. | 2.2 |
| **G3** | G3.1 | Ability to use Multisim and Matlab software to simulate simple circuits. | 4.4 |

## 9. Study materials

**- Textbooks:**

[1] Tran Tung Giang – Le Thi Thanh Hoang, *Electric Circuits*, VNU-HCMC Publishers, 2013.

**- References:**

[1] Pham Thi Cu, Truong Trong Tuan My, Le Minh Cuong, *Mach dien 1*, Reproduced the 7th edition. HCMC: VNU-HCMC Publishers, 2015.

[2] Pham Thi Cu, Truong Trong Tuan My, Le Minh Cuong, *Mach dien* 2 -Reproduced the 4th edition HCMC: VNU-HCMC Publishers, 2012.

[3] Dr Wasif Naeem, Concepts in Electric Circuits, Ventus Publishing ApS 2009.

[4] Nilsson, James William, Electric circuits, James W.Nilsson, Professor Emeritus, Iowa State University, Susan A.Riedel, Marquette University.—Tenth edition, 2015.

[5] Steven T. Karris, Circuit Analysis I & II with MATLAB® Computing andSimulink®/ SimPowerSystems®Modeling, 2009.

[6] Norman Balabanian, Electric circuit, - 1st ed. - New York: McGraw-Hill, 1994. - 725p. includes index; 24cm Balabanian, Norman.

[7] Allan H. Robbins, Wilhelm C. Miller, Circuit analysis: Theory and practice- 5th ed. - Clifton Park, NY: Delmar, Cengage Learning, 2013. - xxi, 1012p; 28cm Robbins, Allan H.

[8] Charles K. Alexander, Matthew N.O Sadiku, Fundamentals of electric circuits - 2nd ed. - Boston: McGraw-Hill, 2004. - xviii, 904p ; 26 cm Alexander, Charles K.

## 10. Student Assessments

- Grading points: 10
- Planning for students assessment is followed:

| Type | Contents | Linetime | Assessment techniques | CLOs | Rates (%) |
|---|---|---|---|---|---|
| **Midterms** | | | | | **50** |
| Quick test | Review previous lessons and knowledge relating to new lessons | First class | Quizes or Individual | G1.1, G1.3 G1.4, G1.5 G1.6, G1.7 | 10% |

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| | | | paper assessment in class | G1.8 | |
| Online test | Online class in LMS (learning manage system) website.<br>Test the contents of the chapter 1, 2, 3, 6, 7 | Weeks 1-15 | Online | G1.2, G1.3 G1.4, G1.6 G1.7 | 15% |
| Exam#01 | Calculate the current and voltage, the supply power, dissipation power, and the power preservation in DC, AC circuits one phase and three phase | week 8 | Exam | G1.2, G1.3 G1.4, G2.1 | 25% |
| Report | Project | Week 10 | Power point Presentation | G1.2, G1.3 G2.1, G3.1 | 25% |
| Exam#02 | - Determined the parameters Z,Y of two-port network<br>- Calculate the values of the transient responses and sketch waveforms of the currents and drop voltages in the time domain<br>- Calculate transfer functions and draw Bode plots | Week 14 | Exam | G1.5, G1.6 G1.7, G2.1 | 25% |
| **Final exam** | | | | | **50** |
| Final Exam | - Calculate the current and voltage, the supply power, dissipation power, and the power preservation in DC, AC circuits one phase and three phase.<br>- Determined the parameters Z,Y of two-port network<br>- Calculate the values of the transient responses and sketch waveforms of the currents and drop voltages in the time domain<br>- Calculate transfer functions and draw Bode plots | | Exam | G1.1, G1.2, G1.3, G1.4, G1.5, G1.6, G1.7, G2.1, | |

## 11. Course details:

| Weeks | Contents | CLOs |
|---|---|---|
| 1 | ***Chapter 1:* <BASIC CONCEPTS>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods***: (classroom, 4 hours)*<br>**Contents:**<br>1.1 Circuits and Models, Energy and Power.<br>1.2 Circuit Elements | G1.1, G1.2 |

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| | 1.3 Kirchoff's Law: KCL, KVL, and giving examples<br>1.4 Equivalent transformation and its examples<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork Questions | |
| | ***B/* Self-study contents**: *(8)*<br>+ Homework using KCL, KVL.<br>+ Homework using the equivalent transformation, the current divider. | G1.1, G1.2 |
| 2 | ***Chapter 1:* <BASIC CONCEPTS (cont.)>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods**: *(4)*<br>**Contents:**<br>1.5 Equivalent transformation: examples and homework.<br>1.6 Exercises and guide learners to solve the problems chapter 1<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork. | G1.1, G1.2<br>G2.1 |
| | ***B/* Self-study contents**: *(8)*<br>+ Review.<br>+ Doing homework related to equivalent transformation. | G1.1, G1.2<br>G2.1, G3.1 |
| 3 | ***Chapter 2:* <ANALYTICAL METHODS FOR CIRCUITS>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods**:*(4)*<br>**Contents:**<br>2.1 Node method and examples.<br>2.2 Mesh method and examples.<br>2.3 Special cases of node method with an ideal voltage source and illustrated examples.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork. | G1.3 |
| | ***B/* Self- study contents**: *(8)*<br>+ Review<br>+ Doing homework related to analytical methods for circuits. | G1.3, G2.1<br>G3.1 |
| 4 | ***Chapter 2:* <ANALYTICAL METHODS FOR CIRCUITS (cont.)>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods**: *(4)*<br>**Contents:**<br>2.4 Superposition theorem and examples.<br>2.5 Thevenin-Norton theorem and examples.<br>2.6 Exercises chapter 2<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss. | G1.3, G2.1<br>G3.1 |

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| | + Teamwork. | |
| | ***B/* Self- study contents**: *(8)*<br>+ Review<br>+ Exercises | G1.3, G2.1<br>G3.1 |
| 5 | ***Chapter 3:* <SINUSOIDAL STEADY-STATE CIRCUITS>**<br>*(12/0/24)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>3.1 Sinusoidal waveforms and complex amplitude methods.<br>3.2 Voltage – Current Relation of sinusoidal steady state circuits involving R, L, and C<br>3.3 The Phasor Diagrams<br>3.4 Sinusoidal Steady-State Power Calculations: Instantaneous Power, Average and Reactive Power, The RMS Value and Power<br>3.5 Analytical methods for AC circuits and example.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork. | G1.4, G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Practise complex operations by using calculator.<br>+ Doing homework related to AC circuits. | G1.4, G2.1 |
| 6 | ***Chapter 3:* <SINUSOIDAL STEADY-STATE CIRCUITS (cont.)>**<br>*(12/0/24)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>3.6 Operational amplifier and examples.<br>3.7 Mutual circuits and examples.<br>**Teaching methods**:<br>+ Questions and answers<br>+ Guide to do exercises | G1.1, G1.2<br>G1.4, G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Homework related to OPAMP, mutual circuits. | G1.4, G2.1 |
| 7 | ***Chapter 3:* <SINUSOIDAL STEADY-STATE CIRCUITS (cont.)>**<br>*(12/0/24)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>3.8 Impedance matching and examples.<br>3.9 Resonant circuits and examples.<br>**Teaching methods**: | G1.1, G1.2<br>G1.4, G2.1 |

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| | + Lecture + Problem solving + Disscuss.<br>+ Teamwork. | |
| | ***B/* Self- study contents**: *(8)*<br>+ Homework related to resonant circuits. Determine the value of matched load for maximum power dissipation. | G1.1, G1.2<br>G1.4, G2.1 |
| 8 | ***Chapter 4:* <THREE PHASE CIRCUITS>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods**: *(4)*<br>**Contents:**<br>4.1 Concept of 3-phase system.<br>4.2 Star/Triangle connection.<br>4.3 Three-phase power.<br>4.4 Analytical methods for 3-phase circuits and example<br>4.5 Tests 1<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork. | G1.1, G1.4<br>G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Homework related to symmetric 3-phase circuits. | G1.1, G1.4<br>G2.1 |
| 9 | ***Chapter 4:* <THREE PHASE CIRCUITS (cont.)>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods**: *(4)*<br>**Contents:**<br>4.6 Analytical methods for asymmetric 3-phase circuits and examples.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork. | G1.1, G1.4<br>G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Homework related to asymmetric 3-phase circuits | G1.1, G1.4<br>G2.1 |
| 10 | ***Chapter 5* <TWO PORT NETWORK>** *(4/0/8)* | |
| | ***A/* Contents and teaching methods**: *(4)*<br>**Contents:**<br>5.1 Concept of 2-port network.<br>5.2 Basic matrices A, H, Z, Y.<br>5.3 Types of 2-port networks.<br>5.4 Applications.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Disscuss.<br>+ Teamwork. | G1.1, G1.2<br>G1.5, G2.1 |

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| | ***B/* Self- study contents**: *(8)*<br>+ Homework related to 2-port networks | G1.1, G1.2<br>G1.5, G2.1 |
| 11 | ***Chapter 6:* <ANALYSE CIRCUITS IN THE TIME DOMAIN>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**.<br>6.1 Concept of transient response.<br>6.2 Initial conditions.<br>6.3 Analytical methods for the transient response and steady state circuits.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Discuss.<br>+ Teamwork. | G1.2, G1.6<br>G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Homework related to steady state circuits. | G1.6 |
| 12 | ***Chapter 6:* <ANALYSE CIRCUITS IN THE TIME DOMAIN (cont.)>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>6.4 Laplace transformation.<br>6.5 Apply the Laplace transfromation to solve the transient response and steady state circuits.<br>6.6 Examples.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Discuss.<br>+ Teamwork. | G1.2, G1.6<br>G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Review Laplace transformation and do related homework. | G1.2, G1.6<br>G2.1 |
| 13 | ***Chapter 7:* <ANALYSE CIRCUITS IN THE FREQUENCY DOMAIN>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>7.1 Fourier series.<br>7.2 Transfer function and their types.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Discuss.<br>+ Teamwork. | G1.7<br>G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Do related homework with nonsinusoidal source, apply the superposition property to have the best solution. | G1.7<br>G2.1 |
| 14 | ***Chapter 7:* <ANALYSE CIRCUITS IN THE FREQUENCY** | |

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| | **DOMAIN (cont.)>** *(8/0/16)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>7.3 Concept of Bel and Decibel.<br>7.4 Magnitude and Phase response<br>7.5 Tests 2<br>**Teaching methods**:<br>+ Lecture + Problem solving + Discuss.<br>+ Teamwork. | G1.7<br>G2.1 |
| | ***B/* Self- study contents**: *(8).*<br>+ Homeworks | G1.7<br>G2.1 |
| 15 | ***Chapter 8* <NONLINEAR CIRCUITS>** *(4/0/8)* | |
| | ***A/* Contents and teaching methods***: (4)*<br>**Contents:**<br>8.1 Concept of nonlinear elements and their types.<br>8.2 Analytical methods for nonlinear circuits.<br>8.3 Overall Review.<br>8.4 Announce the final average marks of mid-term tests.<br>**Teaching methods**:<br>+ Lecture + Problem solving + Discuss.<br>+ Teamwork. | G1.2, G1.3,<br>G1.8, G2.1 |
| | ***B/* Self- study contents**: *(8)*<br>+ Do homework chapter 8.<br>+ Review all chapters and prepare the final test. | G1.2, G1.3,<br>G1.8, G2.1 |

**12. Learning ethics:**

Students must do their homework by themselves. If there are any copies which are found, student will be taken zero mark of the finally overall score of this subject for this forbidden action.

**13. First approved date:** August 01 2012.

**14. Approval level:**

| **Dean** | **Department** | **Instructor** |
|---|---|---|
| **Assoc. Prof. PhD.**<br>**Nguyen Minh Tam** | **PhD. Le My Ha** | **M.Eng. Le Thi Thanh Hoang** |

**15. Syllabus updated process**

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|---|---|
| **1st time:** Updated content dated | Instructors |
| **2st time:** Updated content dated | Head of department |

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