FUTURE UNIVERSITY IN EGYPT
جامعة المستقبل

Faculty of Engineering & Technology

Electrical Circuits

Information :

Course Code :	EPR 266	**Level :**	Undergraduate	**Course Hours :**	4.00- Hours

Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	Nabil Mohamed Hamed Mohamed	2
Teaching Assistant	Ahmed Elsayed Awad Fayed	

Area Of Study :

By the end of the course the students will be able to:
- Understand the fundamentals of electrical circuits.
- Know the main components used of electrical circuits.
- Analyse DC/AC electrical circuits using different techniques and theorems.
- Develop practical skills of testing electrical components.
- Share ideas and work in a team or a group.

Description :

Analysis of resistive circuits by simplifications (source transformations, combination of elements, star/delta and delta/star transformation, node and loop analysis), Sinusoidal steady state analysis, Phasor diagram representation, network theorems (superposition, Thevenin, Norton, compensation and maximum power transfer), Analysis of circuits with AC (Alternate Current) excitation in the time domain, Analysis of AC circuits in the frequency domain using complex number algebra, Application of network theorems on alternating current circuits, Electric power, Complex power calculations and power factor, Circuits with nonlinear resistances, Analysis of electrical circuits with non-sinusoidal alternating currents, Higher order harmonics.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Demonstrate knowledge and understanding the components and concepts of electrical circuits including Ohm's Law, Kirchhoff's Laws, resistance and source combinations, and voltage and current division.
2 -	Demonstrate knowledge and understanding of techniques to solve DC electric circuits: nodal and mesh analysis, source transformation. Theorems: superposition, and Thevenin's theorem.
3 -	Illustrate the characteristics of inductance and capacitance.
4 -	Define the impedance, admittance, and phasors for AC electric circuits.
5 -	Demonstrate knowledge and understanding of techniques and theorems to solve AC electric circuits.

6 -	Demonstrate knowledge and understanding of analysis the electrical circuits with non-sinusoidal sources.
b.Intellectual Skills: :	
1 -	Apply different techniques to solve DC circuit problems in different topologies
2 -	Apply different techniques to solve AC circuit problems in different topologies.
3 -	Compare between solutions of AC and DC circuits, and evaluate the maximum power transfer on electrical circuits.
c.Professional and Practical Skills: :	
1 -	Testing electrical components.
2 -	Implementation of simple electrical circuits.
3 -	Applying solution techniques on simple circuits in the lab.
d.General and Transferable Skills: :	
1 -	Work coherently and successfully as a part of a team in the Lab.
2 -	Communicate effectively.
3 -	Effectively manage tasks, time, and resources.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Circuit variables, Basic Circuit Elements, Basic Laws of Circuit Theory (Ohm's Law, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL))	5	3	2
Resistors in Parallel, Voltage Divider, Current Divider, and Delta-Way Transformation	5	3	2
Techniques of Circuit Analysis: Node Voltage Method (NVM)	5	3	2
Node-Voltage Method and dependent sources Concept of "Super-node"	5	3	2
Techniques of Circuit Analysis: Mesh Current Method (MCM)	5	3	2
Mesh Current Method and dependent sources Concept of "Super-mesh"	5	3	2
Source Transformation (ST) Thevenin (Norton) Equivalent	5	3	2
Maximum Power Transfer Superposition (SP)	5	3	2
Inductors & Capacitors, Sinusoidal SteadyState Analysis: Sinusoidal Source, and Sinusoidal Response.	5	3	2
The Phasor, and Inverse Phasor. Phasor Diagrams Transformation Between Polar and Rectangular Forms The Phasor, and Inverse Phasor. Phasor Diagrams Transformation Between Polar and Rectangular Forms Phasor Relations For Circuit Elements: Resistor	5	3	2

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Phasor Relations For Circuit Elements: inductor, and capacitor. Impedance & Admittance Kirchhoff's laws (KVL and KCL)	5	3	2
Source Transformation in phasor domain Node-Voltage Method (NVM) in phasor domain Mesh Current Method in phasor domain	5	3	2
Thevenin/Norton Equivalents in phasor domain Superposition (SP) in phasor domain Power calculations	5	3	2
Circuits with nonlinear resistances Analysis of electrical circuits with nonsinusoidal alternating currents Fourier series and Four Transform in circuit analysis and their practical applications in spectrum analyzers and filters.	10	6	4

Teaching And Learning Methodologies :

Interactive Lecturing
Problem solving
Experiential learning

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Final exam	40.00		
In Class Quizzes	10.00		
Mid-Term exams	30.00		
Participations	10.00		
Performance and Lab	10.00		

Books :

Book	Author	Publisher
Fundamentals of Electric Circuits	Alexander Sadiku	McGraw Hill

Recommended books :

James W. Nilsson and Susan A. Riedel, "Electric Circuits", 9th Edition, Prentice Hall, 2011.Lecture notes on the course Moodle page, FUE
website.
Charles K. Alexander and Matthew N. O. Sadiku, "Fundamental of Electric Circuits," 5th Edition, McGraw Hill, 2013.