

## Faculty of Engineering & Technology

### Electronics

#### Information :

**Course Code :** ELE 213

**Level :** Undergraduate

**Course Hours :** 4.00- Hours

**Department :** Department of Electrical Engineering

#### Instructor Information :

Title	Name	Office hours
Associate Professor	Waleed Eid Abd Elrahman Alhanafy	1
Associate Professor	Mohamed Hassan Mohamed Elmahlawy	
Lecturer	Muhammad Abdullaouf Mohamed Othman	2
Assistant Lecturer	Mostafa Mohamed Salaheldin Abdelkhalek	4
Assistant Lecturer	Amiraa Sayed Ahmed Abdallah Elhamshary	
Assistant Lecturer	MOHAMED MOUSA SAYED EMAM AHMED	2
Teaching Assistant	Abdelrahman Khaled Abdelrahman Abdelrahman Hamed	2

#### Area Of Study :

- 1- A broad coverage of the semiconductors theory.
- 2- Theory of the P-N junction.
- 3- Diode Characteristics.
- 4- Diode models and application circuits.
- 5- Rectifiers ,voltage doublers , clipping circuits , and clampers.
- 6- Special diodes : Schottky , Zener , Light Emitting Diodes ( LED )
- 7- Bipolar Junction Transistor ( BJT )
- 8- Transistor circuits : Transistor Amplifiers : Common Emitter ( CE ) ,  
Common Base ( CB ) , Common Collector ( CC )
- 9- Field Effect Transistor (JFET) : Characteristics and Circuits.
- 10- MOSFET, Physical structure , Characteristics and applications.

#### Description :

Semiconductor diode (theory of the P-N junction, I-V characteristics, junction potential, forward and reverse biased P-N junction, diffusion capacitance), Diode models .Diode circuit applications (rectifier circuits, voltage doublers, clipping circuits), Special diodes: Zener diode, Schottky barrier diodes, Light emitting diodes (LED) .and photodiodes. Bipolar Junction Transistor (BJT), Static and dynamics characteristics, Field Effect Transistor (FET), linear, nonlinear and pinch off regions, Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET): physical structure, basic configurations, the I-V characteristics, FETs applications: MOSFET as a resistance, JFET as a constant current source, Single stage amplifiers (biasing, small signal models). Other semiconductor devices.

#### Course outcomes :

#### **a.Knowledge and Understanding: :**

1 -	understand the fundamentals of the semiconductors. To understand the characteristics and applications of the semiconductor devices.
2 -	Solving and analysis of the diode circuits : Rectifiers, Limiters, Clampers, Voltage doublers , and stabilization.
3 -	Solving the Electronic circuits of the ( BJT ), the ( JFET ), and the ( MOSFET ) transistor amplifiers.
4 -	develop the practical skills of testing the electronic components and circuits.

#### **b.Intellectual Skills: :**

1 -	Ability to apply different alternative solutions.
2 -	Ability to apply different solution alternatives using different approximation models : Ideal ( First approximation ) , Second approximation , and Third approximation models .
3 -	Analysis of the obtained results both individually or as a part of a team.

#### **c.Professional and Practical Skills: :**

1 -	Testing and measurements of the characteristics of the Diode , and Transistor Components.
2 -	Connections and Measurements of the input and output signal levels and waveforms of the diode rectifying circuits and the transistor amplifier circuits.
3 -	Fault detection and repair of the diode and transistor circuits.

#### **d.General and Transferable Skills: :**

1 -	Ability to write technical reports.
2 -	Ability to work in a self-directed manner.
3 -	Can work coherently as a part of a team.
4 -	Can find innovative solutions

#### **Course Topic And Contents :**

<b>Topic</b>	<b>No. of hours</b>	<b>Lecture</b>	<b>Tutorial / Practical</b>
Characteristics of semiconductor materials. P-N junction.	6	3	3
Diode I-V characteristic. Junction potentials.Diode Models. Lab: measurement of the diode I-V ch.	12	6	6
Half-wave,Full-wave ,Bridge rectifiers.Clippers and Clampers. Lab:LED , Zener ch. MT Exam 1	12	6	6
Special diodes : Zener , LED , and Photodiode circuits. Lab : waveforms of Clippers and Clampers	12	6	6
Bipolar Junction Transistor BJT. BJTcircuits.Transistor amplifiers. CE,CB,CC. Power Amplifiers.	6	3	3
Field Effect Transistor JFET. MOSFET .Basic configurations. I-V ch. Applications. MidTerm Exam 2.	18	9	9
Multistage amplifiers. Small signal models. Biasing. JFET and MOSFET circuits.	12	3	3

#### **Teaching And Learning Methodologies :**

Lectures
Tutorials

Laboratories

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final Written Exam	40.00	15	to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving.
First Mid-Term Exam	17.50	7	to assess the skills of problem solving, understanding of the course topics.
Laboratory Tutorials	5.00	6	to assess the ability of implementing simple electronic circuits and measure the different characteristics.
Quiz and Assignment	5.00	9	to assess the skills of problem solving, understanding of the course topics.
Quiz and Assignment 1	5.00	5	to assess the skills of problem solving, understanding of the course topics.
Second Mid-Term Exam	17.50	14	to assess the skills of problem solving, understanding of the course topics.

**Course Notes :**

No course notes are required

**Recommended books :**

"Electronics Principles", A. Malvino, 7th edition.