

**Ministry of Higher Education and Scientific Research  
Scientific Supervision and Scientific Evaluation Apparatus  
Directorate of Quality Assurance and Academic Accreditation  
Accreditation Department**



# **Academic Program and Course Description Guide**

**2024**

Academic Program Description Form

University Name: Al-Furat Al-Awsat Technical University

Faculty/Institute: Karbala Technical Institute

Scientific Department: Department of Renewable Energy technologies

Academic or Professional Program Name: Diploma

Final Certificate Name: Diploma in Renewable Energy technologies

Academic System: Annual System

Description Preparation Date: 27/03/2024

File Completion Date: 31/03/2024

Signature:



Head of Department Name:

Asst. Prof. Dr. Hakim Tarteeb Kadhim

Date: 31/3/2024

Signature:



Scientific Associate Name:

Asst. Prof. Dr. Layth Hasan Jawad

Date: 31/3/2024

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Asst. Prof. Ali Neamah Hasan



Date:

Signature:

Fadhil M. Dahir  
3-4-2024

Approval of the Dean

Prof. Dr. Fadhil M. Dahir

## **Introduction:**

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process

## **Concepts and terminology:**

**Academic Program Description:** The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

**Course Description:** Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

**Program Vision:** An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

**Program Mission:** Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

**Program Objectives:** They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

**Curriculum Structure:** All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

**Learning Outcomes:** A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

**Teaching and learning strategies:** They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

### **1. Program Vision**

The department aims to prepare technical personnel capable of installing and operating solar energy systems and other renewable energy systems.

### **2. Program Mission**

The department is moving towards expanding the base of technical education and its applications in the field of alternative and clean energy to graduate national cadres with a level of education and skill to keep pace with global developments and fulfill the following: Using computer and Internet technologies in education and training. Keeping pace with technological development in the field of manufacturing renewable energy systems and devices and activating the relationship with the private sector in the field of industry, training and technical qualification. Develop future plans to develop educational and training curricula and graduate technical cadres in the field of renewable energy. Producing research and creative projects that serve society, by creating a stimulating environment for learning and intellectual creativity.

### **3. Program Objectives**

The department aims to graduate qualified technical personnel to be a link between the specialist and the skilled worker. It prepares and prepares the graduate, provides him with theoretical and practical information, and works on installing modern energy systems so that he is able to carry out his own work and the graduate is a resource for the cadres of the electricity generation and distribution station systems.

#### 4. Program Accreditation

NON

#### 5. Other external influences

NON

#### 6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	---			
College Requirements	11	44	36%	
Department Requirements	12	76	64%	
Summer Training	1	---		
Other	---			

\* This can include notes whether the course is basic or optional.

#### 7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
First stage		mathematics	2	-
		Electronics	2	2
		English language	2	-
Second stage				
		Electronic capacity	2	2

## 8. Expected learning outcomes of the program

Knowledge	
Learning Outcomes 1	Learning Outcomes Statement 1
Skills	
Learning Outcomes 2	Learning Outcomes Statement 2
Learning Outcomes 3	Learning Outcomes Statement 3
Ethics	
Learning Outcomes 4	Learning Outcomes Statement 4
Learning Outcomes 5	Learning Outcomes Statement 5

## 9. Teaching and Learning Strategies

There are several strategies followed in the department, which are:  
Developed lecture - brainstorming - in-person and electronic education - discussion circles - exploration education - discussion strategy - cooperative education - public speaking strategy - human development courses for students

## 10. Evaluation methods

Daily exams – questions during the lecture – extracurricular activities – final exams

## 11. Faculty

### Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)	Number of the teaching staff	
	General	Special		Staff	Lecturer
استاذ مساعد	هندسة ميكانيكية	حراريات		2	
استاذ مساعد	هندسة	مواد		1	

	كيمائية	هندسية				
مدرس	مكائن والآلات زراعية	مكائن والآلات زراعية			1	
مدرس مساعد	ميكانيك قوى	حراريات			1	
مدرس مساعد	علم فيزياء	بصريات الكترونية			1	
مدرس مساعد	هندسة ميكانيكية	مكائن هيدروليكية			1	
مدرس مساعد	علوم سياسية	علاقات دولية			1	
مدرس مساعد	هندسة كهربائية	قدرة			1	
مدرس مساعد	هندسة كهربائية	اتصالات			1	

### Professional Development

#### Mentoring new faculty members

The number of teachers in the department is 9 with different academic titles, and there is a part-time teacher

#### Professional development of faculty members

The department's need for postgraduate studies, master's or doctoral studies, is updated annually according to the department's plan

### 12. Acceptance Criterion

Central admission – scientific academy

### 13. The most important sources of information about the program

Scientific Division



14. Program Development Plan
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NON
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Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
first stage		Electronic		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Mathematic		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		English Language		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second stage		Power electronics		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

- learning outcomes under evaluation.

## Course Description Form

1. Course Name:	
Mathematics 1	
2. Course Code:	
3. Semester / Year:	
First semester – first course	
4. Description Preparation Date:	
25/ 2/ 2024	
5. Available Attendance Forms:	
Weekly lectures and online program : Weekly lectures and online program	
6. Number of Credit Hours (Total) / Number of Units (Total)	
: 2 Theoretical - Number of units 4 None practical	
7. Course administrator's name (mention all, if more than one name)	
Name: Teacher: Khalid Haltom Swain Email: Khalid.swain@atu.edu.iq	
8. Course Objectives	
<p><b>Course Objectives : Studying expressions and sentences related to mathematics, groups and their operations, relationships, functions, matrices, determinants, vectors, and calculus, to prepare the student to deal with operations in the future in a correct, logic manner, and to train him so that he can crystallize what he has learned in his studies and link it to his practical life.</b></p> <p><b>A- The student acquires the concept of expressions, mathematical logic, and ways to deal with them algebraically.</b></p> <p><b>B- Clarifying the concept of sets, relationships, functions, the links between them, and the theories related to them.</b></p> <p><b>T- Giving the student experience in dealing with all types of matrices and performing various operations on them.</b></p>	
9. Teaching and Learning Strategies	
<b>Strategy</b>	<p><b>1- Acquiring the ability and skill to recognize and deal with mathematical expressions and sentences.</b></p> <p><b>2- Introducing students to the principles of applying exercise solutions and mental development while working.</b></p> <p><b>3- Acquiring the skill of distinguishing between relationships and functions and linking them.</b></p> <p><b>4- Dealing with arrays.</b></p> <p><b>5- Using counting principles.</b></p>

10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
first 1	2 hours	The student's ability to understand problem solving and apply it in the field of work	Matrices / determinants / and their properties	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 2	2 hours	The student's ability to understand problem solving and apply it in the field of work	Solving linear equations - Cramer's method - applications to determinants	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 3	2 hours	The student's ability to understand problem solving and apply it in the field of work	Use the compensation method to find the value of currents in a multi-source electrical circuit.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 4	2 hours	The student's ability to understand problem solving and apply it in the field of work	Vectors / Vector analysis / Vector and scalar quantities / Vector algebra (direct and scalar multiplication.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 5	2 hours	The student's ability to understand problem solving and apply it in the field of work	Scalar multiplication of vectors using angle/scalar multiplication	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 6	2 hours	The student's ability to understand problem solving and apply it in the field of work	For vectors using coordinates Function/trigonometric functions Calculating angles between vectors	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 7	2 hours	The student's ability to understand problem solving and apply it in the field of work	Trigonometric relations/logarithmic functions	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 8	2 hours	The student's ability to understand problem solving and apply it in the field of work	Exponential function/hyperbolic functions Objectives / Objectives of algebraic and trigonometric functions	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 9	2 hours	The student's ability to understand problem solving and apply it in the field of work	Applications to goals. Differentiation/derivative/derivative of algebraic functions	Theoretical	By understanding the material, solving exercises, general

					questions, and discussion.
first 10	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Chain rule - building a differential circuit / calculating speed and acceleration – speed	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 11	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	the light . Implicit function/higher order derived standard function.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 12	2 hours	<b>The student's ability to understand problem solving and apply it in the field of work</b>	Derivative of trigonometric functions / derivative of logarithmic functions Derivative of exponential functions.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 13	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Derivative of hyperbolic functions/calculation of the time constant.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 14	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Applications of the derivative / tangent and perpendicular equation / velocity and acceleration.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 15	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Calculations of the rate of change of voltage and current as a function of time	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 16	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	General physical and engineering applications.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 17	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Integration - laws - and its relationship to differentiation.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 18	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Definite and indefinite integration	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
		<b>The student's ability understand problem sol</b>	Implicit – engineering applications of	Theoretical	By understanding

first 19	2 hours	<b>and apply it in the field of w</b>	integration		the material, solving exercises, general questions, and discussion.
first 20	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Areas and volumes) and physics	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 21	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	General methods of integration, substitution and partiality.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 22	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Use exponential and logarithmic fractions.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 23	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Discrete differential equations	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 24	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Homogeneous and linear equations with their various applications within the field of specialization.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 25	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Increasing and decreasing / maxima and minima / inflection points / drawing functions	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 26	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Complex numbers/addition, subtraction, multiplication, and division - geometric representation of complex numbers.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 27	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Polar formula - converting an algebraic characteristic to polarity and vice versa.	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 28	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Forces and roots - representing roots graphically - finding roots to analyze stability.	Theoretical	By understanding the material, solving exercises, general questions, and

					discussion.
first 29	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Statistics (principles) and probability theory. Mode/coefficient of variation – standard variable	Theoretical	By understanding the material, solving exercises, general questions, and discussion.
first 30	2 hours	<b>The student's ability understand problem sol and apply it in the field of w</b>	Arithmetic mean/range standard deviation variance relative dispersion	Theoretical	By understanding the material, solving exercises, general questions, and discussion.

## 11. Course Evaluation

- 1– Daily surprise and continuous weekly tests.
- 2– Exercises and activities in the classroom.
- 3– Directing students to some websites to benefit from them.
- 4– Daily exam by solving exercises.
- 5– Semester exam.
- 6– Weekly duties.

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

## 1. Learning and Teaching Resources

Required textbooks (curricular books, if any)	<ul style="list-style-type: none"> <li>● Applied Mathematics Author: Yacoub Sabbah</li> <li>● Schaum series (solving electrical circuits).</li> <li>● Methods of solving differential equations Author: (Khaled Ahmed Al-Samarei</li> </ul>
Main references (sources)	<ul style="list-style-type: none"> <li>● Calculus (Thomas)</li> <li>● Laplace Transformation)</li> <li>● Various Internet sources</li> </ul>
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

## Course Description Form

1. Course Name:					
<b>Electronics</b>					
2. Course Code:					
3. Semester / Year:					
2023-2024					
4. Description Preparation Date:					
1/12/2023					
5. Available Attendance Forms:					
Abet					
6. Number of Credit Hours (Total) / Number of Units (Total):					
90					
7. Course administrator's name (mention all, if more than one name):					
Name: Assist lec. Ali Sajid Shakir Email <a href="mailto:ali.shakir@atu.edu.iq">ali.shakir@atu.edu.iq</a>					
8. Course Objectives					
<b>Course Objectives</b>		Make the student know <ul style="list-style-type: none"> <li>• Atomic structure of materials</li> <li>• Knowing the transfer of electrons between energy Bands</li> <li>• Conductive, semiconducting and insulating properties</li> </ul>			
9. Teaching and Learning Strategies					
<b>Strategy</b>		There are several strategies followed in the department, which are: Developed lecture - brainstorming - in-person and electronic learning - discussion circles Exploration education - discussion strategy - cooperative education – public speaking strategy Human development courses for students			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
2-1	3	The student should know the atomic structure and semiconductors	Semiconductor theory and atomic structure	listen 'debate Blended learning - da questions	Assess daily homework Reports Exams
4-3	3	The student knows energy	Energy levels and conductivity	listen 'debate Blended learning - da	Assess da homework Reports



		packages and how to move electronically	in a crystal	questions	Exams
6-5	3	The student should know the Doping and the P-type of and n-type crystals	Doping - having positive and negative type as well as voltage divider	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
8-7	3	The student should know Diode installation - types of diode bias, diode applications	Diode installation - types of diode bias, diode applications	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
10-9	3	The student should know Half-wave rectifier and center tap rectifier and bridge rectifier	Half-wave rectifier and full-wave rectifier	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
12-11	3	The student should know Filters – choke input filter, time constant calculation, capacitor input filter	Filters – choke input filter, time constant calculation, capacitor input filter	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
14-13	3	To know the student How to multiply voltages to... Double, triple, quadruple and types Cutting circles And clipping	multiply voltages to Double, triple, quadruple and types Cutting circles And clipping	listen 'debate Blended learning - da questions	Assess da homework Reports Exams

16-15	3	The student should know how a zener diode works and how it differs from ordinary diode	Zener diode and application	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
18-17	3	The student should know Emitting diode To the light and the recipient of the light	Emitting diode To the light and the recipient of the light	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
20-19	3	To know the student The mechanism of action of the Schottky, tunnel and pin valve	Schottky diode And the tunnel and the pin	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
22-21	3	The student should know the structure Transistor And also Aries line	Transistor and equivalent circuit - Continuous load line	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
24-23	3	To know the student Use of transistor in Magnify small signals How to connect the equivalent alternating circuit	transistor in Magnify small signals How to connect the equivalent alternating circuit	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
26-25	3	To know the student Using a transistor voltage regulation	transistor in voltage regulation	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
28-27	3	The student should know how to connect bias circuit	Bias circuits Practical examples	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
30-29	3	To know the student Phototransistor structure, operation and practical applications	Phototransistor structure, operation and practical applications	listen 'debate Blended learning - da questions	Assess da homework Reports Exams
11.Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc					
First semester			Second semester		

Attendance, assignments and tests 5%	Theoretical 10%	Practical 10%	Attendance, assignments and tests 5%	Theoretical 10%	Practical 10%
12.Learning and Teaching Resources					
Required textbooks (curricular books, any)			- Semiconductors - Semiconductor engineering		
Main references (sources)					
Recommended books and references (scientific journals, reports...)			Information from research published international peer-reviewed journals		
Electronic References, Websites					

## Course Description Form

1. Course Name: English Language					
2. Course Code:					
3. Semester / Year: First year					
4. Description Preparation Date: 25/12/2023					
5. Available Attendance Forms: Abet					
6. Number of Credit Hours (Total) / Number of Units (Total): 30 hours					
7. Course administrator's name (mention all, if more than one name):					
Name: Asst. Prof. Dr. Hakim Tarteeb Kadhim					
Email: dw.hkm@atu.edu.iq					
8. Course Objectives					
<b>Course Objectives</b>		The student is able to write in English			
		The student is able to speak in English			
9. Teaching and Learning Strategies					
<b>Strategy</b>		Teaching with PowerPoint			
		Using groups learning			
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	1	Unit One : Hello , Greetings	Unit One : Hello , Greetings	Discussion and dialogue, group learning, PowerPoint	Oral tests
2	1	Unit One : Am, are, is , you, your , This is with practice in work	Unit One : Am, are, is , you, your , This is with practice in work	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
3	1	Unit Two: your world , Countries , adjectives, he , she , it	Unit Two: your world , Countries , adjectives, he , she , it	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
4	1	Unit Two: your world , Reading and speaking part 16	Unit Two: your world , Reading and speaking part 16	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
5	1	Unit Three: all about you Negatives and questions	Unit Three: all about you Negatives and questions	Discussion and dialogue, group learning, PowerPoint	Oral tests
6	1	Unit Three: Social expressions	Unit Three: Social expressions	Discussion and dialogue, group learning,	Self-evaluation and evaluation of colleague

				PowerPoint	
7	1	Unit Four: Family and friends , Possessive 's	Unit Four: Family and friends , Possessive 's	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
8	1	Unit four :Family and friends , Has \ Have , Adjective + noun	Unit four :Family and friends , Has \ Have , Adjective + noun	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
9	1	Unit five: the way I live Present simple	Unit five: the way I live Present simple	Discussion and dialogue, group learning, PowerPoint	Oral tests
10	1	Unit Five: the way I live Articles , Languages and nationalities	Unit Five: the way I live Articles , Languages and nationalities	Discussion and dialogue, group learning, PowerPoint	Oral tests
11	1	Unit six: every day , Types of questions	Unit six: every day , Types of questions	Discussion and dialogue, group learning, PowerPoint	Oral tests
12	1	Unit six: every day , present simple adverbs of frequency	Unit six: every day , present simple adverbs of frequency	Discussion and dialogue, group learning, PowerPoint	Oral tests
13	1	Unit seven : My favorite Question words	Unit seven : My favorite , Question words	Discussion and dialogue, group learning, PowerPoint	Oral and written tests
14	1	Unit seven: My favorite pronouns , This \ That	Unit seven: My favorite pronouns , This \ That	Discussion and dialogue, group learning, PowerPoint	Oral tests
15	1	Unit Eight : Where I live There is \ There are	Unit Eight : Where I live There is \ There are	Discussion and dialogue, group learning, PowerPoint	Oral tests
16	1	Unit Eight: where I live prepositions	Unit Eight: where I live prepositions	Discussion and dialogue, group learning, PowerPoint	Oral tests
17	1	Unit Nine: Times past , Past simple	Unit Nine: Times past , Past simple	Discussion and dialogue, group learning, PowerPoint	Oral tests
18	1	Unit Nine: Was \ were born	Unit Nine: Was \ were born	Discussion and dialogue, group learning, PowerPoint	Oral tests
19-20	1	Unit Ten : we had a great time! , past simple , regular	Unit Ten : we had a great time! , past simple , regular	Discussion and dialogue, group learning, PowerPoint	Oral tests

		and irregular verbs	regular and irregular verbs	learning, PowerPoint	
21	1	Unit Ten: Speaking , Sport and leisure	Unit Ten: Speaking , Sport and leisure	Discussion and dialogue, group learning, PowerPoint	Oral and written tests
22	1	Unit Eleven: I can do this , Can \ can't	Unit Eleven: I can do this , Can \ can't	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
23	1	Unit Eleven: I can do this , Adverbs \ requests	Unit Eleven: I can do this , Adverbs \ requests	Discussion and dialogue, group learning, PowerPoint	Oral tests
24	1	Unit Twelve: please and thank you! , I'd like, sorry and any	Unit Twelve: please and thank you! , I'd like, sorry and any	Discussion and dialogue, group learning, PowerPoint	Oral tests
25	1	Unit Twelve: please and thank you , Like and would like	Unit Twelve: please and thank you , Like and would like	Discussion and dialogue, group learning, PowerPoint	Oral tests
26	1	Unit Thirteen: here and now , Present continuous	Unit Thirteen: here and now , Present continuous	Discussion and dialogue, group learning, PowerPoint	Oral tests
27	1	Unit Thirteen : here and now , Opposite verbs	Unit Thirteen : here and now , Opposite verbs	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
28	1	Unit Fourteen: It's time to go , Future plans	Unit Fourteen: It's time to go , Future plans	Discussion and dialogue, group learning, PowerPoint	Oral tests
29-30	1	Unit Fourteen: it's time to go , Revision writing email and information letter	Unit Fourteen: it's time to go , Revision writing email and information letter	Discussion and dialogue, group learning, PowerPoint	Oral tests

#### 11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

First semester			Second semester		
Attendance, assignments and tests 5%	Theoretical 20%	Practical 0%	Attendance, assignments and tests 5%	Theoretical 20%	Practical 0%

#### 12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	The prescribed book (Headway)
Main references (sources)	
Recommended books and references (scientific journals, reports...)	



## Course description form

### **Course Description: Power Electronics**

This course describes the study of the performance and properties of various power electronics elements. It also includes how to use them in building various electronic circuits as a means of converting power from A.C to D.C and vice versa, as well as controlling the voltage and frequency of the power source, battery charging circuits, and uninterruptible power devices. After training, the trainee or student will be able to learn the uses of various electronic circuits with the aim of controlling machines and electrical forces. This is achieved through theoretical explanation supported by practical experiments of power electronics circuits with the help of drawing diagrams and incoming and outgoing signals.

<b>Educational institution</b>	<b>Al-Furat Al-Awsat Technical University / Karbala Technical Institute</b>
<b>Scientific department/center</b>	<b>Electrical technologies - second stage</b>
<b>1- Course name/code</b>	<b>Power electronics</b>
<b>2- Instructor's name</b>	<b>Asst. L. Ali Akbar Khalil Mahmood</b>
<b>3- Email</b>	<b><a href="mailto:Ali.mahmood@atu.edu.iq">Ali.mahmood@atu.edu.iq</a></b>
<b>4- Academic title</b>	<b>Assistant Lecturer</b>
<b>5- Attendance forms available</b>	<b>Attendance</b>
<b>6- Semester / year</b>	<b>Annual</b>



<b>7- Number of study hours (total)</b>	<b>120 hours (60 theoretical hours + 60 practical hours)</b>
<b>8- Date this description was prepared</b>	<b>27/02/2024</b>
<b>9- Course objectives:</b>	
<p>This course aims to provide the trainee with the cognitive skills related to the elements of power electrons, their properties, how to operate them, and their uses in power circuits and electrical machines, such as controlled and uncontrolled unit circuits, direct current interrupters, alternating voltage governors, and inverters, in addition to how to use these circuits in the field of industry. One of the objectives of this course in the educational institutions attended by students is:</p> <ol style="list-style-type: none"> <li>1- Preparing the student to recognize electronic components manufactured from semiconductor materials.</li> <li>2- Preparing the student to learn about the analysis of electronic circuits for power electronics systems.</li> <li>3- Identify the applied circuits of power electronics systems.</li> <li>4- Preparing human cadres who possess technical qualifications that enable them to enter the labor market efficiently.</li> <li>5- Preparing qualified technical personnel to study and design electronic circuits as required by the labor market, build electrical circuits, control and control the operation and manufacture of electronic devices, and convert electrical energy from one type to another according to the required study.</li> <li>6- Meeting the requirements of the labor market with modern, technical methods.</li> <li>7- The specialty aims to graduate competent personnel equipped</li> </ol>	

with all electrical and electronic information enabling them to carry out maintenance work and operate electrical circuits based on electronic designs.

#### **10- Definition of student**

- Introducing the student to the various electronic switches made from semiconductor materials such as (silicon, germanium).
- Teaching the student how to build power electronics systems.
- Teaching the student to analyze electronic circuits and their applications.
- Teach the student to use mathematical equations to make mathematical conclusions.
- Teaching the student how to find and derive mathematical equations from signals entering and leaving electronic circuits.
- Teach the student how to build, operate and use laboratory equipment.
- Teaching and training the student to read the values of incoming and outgoing current and voltages.
- Learning about the waves coming out and entering electronic circuits and how to convert them from one form to another by controlling and changing some electronic elements.
- Teaching the student to use electronic devices accurately and how to use means and methods of protection for the devices and the student.

#### **11- Course outcomes and teaching, learning and evaluation methods**

##### **A- Cognitive objectives:**

1. Preparing the student to study the various calculations in electronic circuits with alternating current and direct current and identifying

several types of phases and different connections to study these calculations.

2. The student will be able to identify electronic components, how they work, and their outputs. He is able to determine the needs required to design or build some electronic circuits.
3. Studying the subject Power Electronics enables the student to control and transform the types and values of electrical energy.
4. The student will be able to build electronic circuits and manufacture devices and methods for controlling and protecting various loads.
5. The student will be able to become familiar with electronic components manufactured from semiconductor materials of their various types, composition, properties, uses and applications.
6. The student will be able to present a clear and comprehensive picture of occupational safety and protection methods.

#### **B- Course-specific skills objectives**

- Applying theoretical topics through experiments on direct and alternating current circuits and training the student to use laboratory equipment for various measurements.
- Know the specifications, characteristics and features of electronic elements.
- Determine the basic devices to implement the experiment according to the components and measurements required in the circuit design.
- The student acquires manual skills in using tools and laboratory equipment.
- Training the student to read results from laboratory devices accurately.
- The student gains self-confidence in implementing and practicing electrical technical work.
- Enabling the student to link and apply designs to laboratory boards and how to choose appropriate devices to carry out the experiment.

### **C- Emotional and value goals**

- Guiding students in group work
- Activating the holding of workshops and seminars and activating the role of the Educational Guidance Committee
- Providing students with practical skills in laboratories and laboratories
- Providing students with the ability to think about solving practical problems
- Directing students to take care and maintain the property of the laboratory, department, and institute
- Developing students' Internet research skills
- Operating and maintaining electronic devices and control devices of all types. Maintaining, assembling and operating measuring devices and high-power devices of all types

### **D- Transferable general and qualifying skills (other skills related to employability and personal development).**

- Applied skills within laboratories, workshops and laboratories.
- Working in the field of maintenance and repair of electrical appliances.
- Skills in using electronic switches in electronic circuits.
- Electronic circuit analysis skills.
- Designing applied circuits for some electronic components.
- Computerized electrical mapping.
- Practical visits.
- summer training

### **Teaching and learning methods.**

- Theoretical lecture
- Practical lecture
- Discussion with students and students among themselves
- Preparing reports and projects related to the scientific material of the lecture
- Summer training in the private and public sectors
- E-Learning
- Using modern methods in teaching and training students
- Forming discussion circles during lectures to discuss study topics
- Assigning students to class duties

### Evaluation methods:

- Daily exams
- Monthly and final exams
- Ask exercises and questions
- Assigning homework
- Weekly reports of practical experiments in laboratories
- Extracurricular duties and volunteer work

### 12- Course structure

the week	hours	Required learning outcomes	Name of the unit or topic	Teaching method	Evaluation method
1	5	Identify the basic components of power electronics circuits	Power electronic, electronic componts which used in high power control (power diodes, thyristor and power transistors) pevison of single-phase rectifier circuits by using diodes.	Lectures + Practical applications	Daily, monthly, and annual exams
2	5	Identify three-phase rectifier circuits	Three phase rectifier circuits by using diodes, output voltage waveform, diode current waveform, output voltage equation in case of resistance lode.	Lectures + Practical applications	Daily, monthly, and annual exams
3	5	Learn about	Using the transistor	Lectures	Daily,

		the use of a transistor as a switch	as switch, regions of operation, transistor as a switch (cut off and saturation).	+ Practical applications	monthly, and annual exams
4	5	Learn about improving the opening and closing of a transistor	Power transistor in (off)and (on) state, improvement of (off) and (on) time by using speed up capacitance, practical problems.	Lectures + Practical applications	Daily, monthly, and annual exams
5	5	Identify the bipolar transistor	Uniplolor junction transistor, construction, theoretical operation, using the transistor as relaxation oscillator practical example.	Lectures + Practical applications	Daily, monthly, and annual exams
6	5	Learn how to use an operational amplifier	operational amplifier, description of operational amplifier (op-amp) as asparate components, zero detector, comparator.	Lectures + Practical applications	Daily, monthly, and annual exams
7	5	Learn how to use an operational amplifier	The use of op-amp as actable multivibrator and a monostable multivibrator, photo conduction cells,	Lectures + Practical applications	Daily, monthly, and annual exams

			photo diodes.		
8	5	Learn about the use of the LED electronic element	Light – emitting diodes (LED), photo transistors, the use of optical comparator in power electronic circuits.	Lectures + Practical applications	Daily, monthly, and annual exams
9	5	Learn about the use of thyristor properties	Thyristor, construction, characteristic, curves for a thyristor, thyristor conduction in forward biasing, thyristor family, thyristor representation as a double transistor circuit.	Lectures + Practical applications	Daily, monthly, and annual exams
10	5	Learn about ways to connect thyristors	Thyristor conduction methods, conduction through the gate minimum gate current causing conduction, conduction time, conduction due to high forward voltage rectifier (dv/dt)	Lectures + Practical applications	Daily, monthly, and annual exams
11	5	Learn about Dayak and Trayak	DIAC, TRIAC characteristics, practical applications, thyristor, triggering methods, triggering	Lectures + Practical applications	Daily, monthly, and annual exams

			on DC and AC current, pulse triggering types		
12	5	Learn about the methods of thyristor switching	thyristor triggering circuit, DC and AC triggering circuits.	Lectures + Practical applications	Daily, monthly, and annual exams
13	5	Learn about mug pulse circuits	Pulse current triggering circuit, relaxation oscillator, zero detector, comparator with a stable and monostable multivibrators (operational amplifiers and timer).	Lectures + Practical applications	Daily, monthly, and annual exams
14	5	Learn about thyristor applications	Thyristor general application introductory, AC to DC inverter DC to AC inverter, DC to DC inverter, AC to AC inverter, phase controlled halfwave rectifier with resistance and inductance load output current and voltage waveform ,	Lectures + Practical applications	Daily, monthly, and annual exams



			output voltage equations		
15	5	Identify the semi-controlled thyristor rectifier	Half controller full wave rectifier fully controlled, resistance and inductance load , generated wave forms, output voltage equation for free wheeling diode.	Lectures + Practical applications	Daily, monthly, and annual exams
16	5	Identify the fully controlled thyristor rectifier	Regenerating fully controlled inverters, examples, DC motor speed control.	Lectures + Practical applications	Daily, monthly, and annual exams
17	5	Identify the three-phase thyristor inverter	Three face inverters, out put voltage wave form with, triggering pulses and equations.	Lectures + Practical applications	Daily, monthly, and annual exams
18	5	Identify thyristor protection circuits	Thyristor protection from the high-rate change in current and voltage, protection from the transient change in source voltage, fully protection circuit from all possible faults due to current and voltage.	Lectures + Practical applications	Daily, monthly, and annual exams

19	5	Identify thyristor suppression circuits	DC to AC inverters methods of forcing the thyristor to get off.	Lectures + Practical applications	Daily, monthly, and annual exams
20	5	Identify series and parallel thyristor inverter circuits	Parallel and series inverter, single and three phase, control methods in charging frequency and voltage, output wave forms.	Lectures + Practical applications	Daily, monthly, and annual exams
21	5	Identify series and parallel thyristor inverter circuits	Inverter application, emergency power supply, single phase DC motor speed control.	Lectures + Practical applications	Daily, monthly, and annual exams
22	5	Learn about ways to control motors	Three phase motor control by using a constant ratio of variation frequency and voltage.	Lectures + Practical applications	Daily, monthly, and annual exams
23	5	Identify thyristor circuits	Choppers, DC to DC inverter frequency constant, line constant	Lectures + Practical applications	Daily, monthly, and annual exams
24	5	Identify the types of clips	Types of choppers, DC motor speed control.	Lectures + Practical applications	Daily, monthly, and annual exams

25	5	Learn about voltage regulators	AC to AC inverter, single phase voltage regulator, three phase voltage regulator	Lectures + Practical applications	Daily, monthly, and annual exams
26	5	Learn about methods of controlling single-phase and three-phase motors	General application on single and three induction motor speed control due to the change in stat or voltage, using the closed loop feedback circuit to control the slippery rings of AC motor.	Lectures + Practical applications	Daily, monthly, and annual exams
27	5	Learn about frequency modulator circuits	Cyclic inverter, AC to DC cyclic inverter, DC to DC cyclic inverter.	Lectures + Practical applications	Daily, monthly, and annual exams
28	5	Identify circuits of inverters, structure diagrams	AC to AC cyclic inverter control block diagram.	Lectures + Practical applications	Daily, monthly, and annual exams
29	5	Learn about PWM	Using amplitude modulation for speed control.	Lectures + Practical applications	Daily, monthly, and annual exams
30	5	Identify the unipolar transistor	Using polar transistor for AC motor speed	Lectures + Practical	Daily, monthly, and

			control .	applications	annual exams
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### 13- Course structure

#### 1- Main references (sources)

- Electrical Technology (Edward Hughes)
- Basic Circuits (A.M.F Brooks) Pergaman Press.
- Introduction to Electric circuits (M. Romanwitz) John Willy
- Basic Electrical Engineering (Fitzgerald & Rlgginborthan) Mc – Graw – Hill
  
- المصدر للمادة العملية
- Electrical Technology (Edward Huges)
- Basic Electrical Engineering
- الكترونيات في خدمة التطبيقات الكهربائية ترجمة الدكتور سمير رستم
- Power electronics handbook, Third edition, Muhammad H. Rashid, Elsevier,2011.
- دليل المهندس والفني في العناصر الكهربائية والالكترونية، محمد قاسم، شعاع للنشر والعلوم، 2012.
- Power Electronics Basics, YuriyRozanov, Sergey E. Ryvkin, EvgenyChaplygin, Pavel

	<p>Voronin, CRC Press, 2015</p> <ul style="list-style-type: none"> <li>● Introduction to Power Electronics, Paul H. Chappell, Artech House, 2014.</li> </ul>
2- Electronic references and websites	<ul style="list-style-type: none"> <li>● Various Internet sources</li> </ul>
3- Recommended books and references (scientific journals, reports)	<ul style="list-style-type: none"> <li>● مشروع كتاب الدوائر والقياسات</li> <li>● مبادئ علم الهندسة الكهربائية / دكتور محمد زكي – دكتور مظفر النعمة</li> <li>● ملزمة الدوائر والقياسات العملي</li> <li>● Advanced industrial electronics by morris</li> <li>● Thyristor engineering by B.B. berde</li> <li>● الكترونييات القدرة (تأليف الدكتور مظفر أنور النعمة)</li> </ul>

#### 14- Course development plan

- Forming committees of subject teachers at Al-Furat Al-Awsat Technical University to update the curriculum
- Matching vocabulary with the labor market and the private sector
- Preparing courses for trainers in the laboratory so that they can train students more efficiently
- Providing laboratories with modern equipment that keeps pace with scientific development in developed countries