

**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

2025

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.

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

Description Preparation Date: 10-10-2024

File Completion Date: 20-10-2024

Signature:



Head of Department Name:

Asst. Prof. Dr. Hakim T. Kadhim

Date: 21/05/2025

Signature:



Scientific Associate Name

Asst. Prof. Dr. Mohammed F. Neamah

Date: 21-5-2025

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Signature:

Asst. Prof. Ali Neamah Hasan

Date:



Approval of the Dean

Prof. Dr. Fadil M. Dahir

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				
		Electrical circuits and measurements	2	2
		Human rights and democracy	1	–
		mathematics	2	–
		Engineering drawing	–	3

		Computer principles 1	1	2
		Renewable energy	2	2
		Electronics	1	2
		English language	1	–
Second stage				
		Energy storage systems	2	2
		Electrical power equipment	2	2
		solar energy	2	2
		Electrical installations	2	2
		Occupational safety	1	–
		Baath Party crimes in Iraq	1	–
		Computer principles 1	1	2
		Control and Measurement	2	2
		Photovoltaic Systems	2	2
		English language	1	–

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
Asst. proof.	Mechanical engineering	Refractories			*	
Asst. proof.	Mechanical engineering	Refractories			*	
Asst. lecturer	Mechanical engineering	Refractories			*	

lecturer	Mechanical electric	power			*	
Asst. proof.	Mechanical chemistry	Material engineering			*	
lecturer	Agricultural engineering	agricultural machinery			*	
Asst. lecturer	Physics sciences	Electron optics			*	
Asst. lecturer	Mechanical engineering	Hydraulic systems			*	
Asst. lecturer	Mechanical electric	Power			*	
Asst. lecturer	Political science	international relations			*	
Asst. lecturer	mathematics	General mathematics			*	
Asst. lecturer	Mechanical engineering	Refractories			*	
Asst. lecturer	Mechanical electric	General electricity			*	

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
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Scientific Division

14. Program Development Plan

NON

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		Electrical circuits and measurements		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Human rights and democracy		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		mathematics		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Engineering drawing		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Computer principles 1		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Renewable energy		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Electronic		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

		English Language		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second stage		Energy storage systems		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Electrical power equipment		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		solar energy		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Electrical installations		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Occupational safety		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

		Baath Party crimes in Iraq		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Computer principles 1		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Control and Measurement		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Photovoltaic Systems		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		English language		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

- learning outcomes under evaluation.

Course Description Form

1. Course Name:					
Electronic					
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 ali.shakir@atu.edu.iq					
8. Course Objectives					
Course Objectives		Make the student know • Atomic structure of materials • Knowing the transfer of electrons between energy Bands • Conductive, semiconducting and insulating properties			
9. Teaching and Learning Strategies					
Strategy		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 - dai questions	Assess daily homework Reports Exams
4-3	3	The student knows energy packages and how to move	Energy levels and conductivity in a crystal	listen 'debate Blended learning - dai questions	Assess da homework Reports Exams

		electronically			
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 - dai 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 - dai 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 rectifi	listen 'debate Blended learning - dai questions	Assess da homework Reports Exams
12-11	3	The student should know Filters – choke input filter, time constant calculation, capacit input filter	Filters – choke input filter, time constant calculation, capacit input filter	listen 'debate Blended learning - dai questions	Assess da homework Reports Exams
14-13	3	To know the student How to multiply voltages to... Double, triple, quadruple and type Cutting circles And clipping	multiply voltages to Double, triple, quadruple and type Cutting circles And clipping	listen 'debate Blended learning - dai questions	Assess da homework Reports Exams

16-15	3	The student should know how a zener diode works and how it differs from diode Ordinary diode	zener diode and application	listen 'debate Blended learning - daily questions	Assess daily 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 - daily questions	Assess daily 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 p	listen 'debate Blended learning - daily questions	Assess daily 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 - daily questions	Assess daily 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 - daily questions	Assess daily homework Reports Exams
26-25	3	To know the student Using a transistor voltage regulation	transistor in voltage regulation	listen 'debate Blended learning - daily questions	Assess daily homework Reports Exams
28-27	3	The student should know how to connect bias circuits	Bias circuits Practical examples	listen 'debate Blended learning - daily questions	Assess daily 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 - daily questions	Assess daily 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	Theoretical 10%	Practical 10%	Attendance, assignments and tests	Theoretical 10%	Practical 10%
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tests 5%			5%		
12. Learning and Teaching Resources					
Required textbooks (curricular books, if 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

13. Course Name: Engineering drawing (AutoCAD)
14. Course Code:
15. Semester / Year: First year
16. Description Preparation Date: 25/12/2023
17. Available Attendance Forms: actual presence/computers
18. Number of Credit Hours (Total) / Number of Units (Total): 90 hour
19. Course administrator's name (mention all, if more than one name):
Assistant Lecher: malik Jaffer fezea
Name: malik Jaffer fezea

Email: malik.fezea@atu.edu.iq					
20. Course Objectives					
Course Objectives		Teaching and training students on the basics and commands of engineering drawing in AutoCAD.			
21. Teaching and Learning Strategies					
Strategy	Preparing the student to work in the field of specialization by using computer skills and engineering programs.				
22. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	3	The student will be familiar with computer and their benefits, generations, connecting their parts, physical components, means of input and output, software, and units. Measure memory, identify files and folders.	Introduction to computer and their benefits, generations, connecting computer parts, physical components of calculator and means of input and output, software memory measurement units, and definition of files and folders.	Listening and discussion, e-learning, practical application, PowerPoint, questions and answers	Daily assessment reports, surprise test, pre-determined test, theoretical and practical, homework
3-4	3	The student will be familiar with the operating system (WINDOWS7), its advantages, requirements for its operation, and components of the main desktop screen.	Operating system (WINDOWS 7) its advantages, operating requirements, components of the main desktop screen	=	=
5-6	3	The student will be familiar with the concept of the window and know its main components and deal with the computer icon, documents, and trash can, as well as copying, cutting, and pasting files and folders.	The concept of the window identifying its main components, dealing with the computer icon, documents, and the trash can, copying, cutting, and pasting files and folders.	=	=
7-8	3	The student will be able to understand the properties of files, folders and disks, change the desktop wallpaper and change the colors of windows and screen savers	Properties of files, folders and disks, changing the desktop background, changing window colors, and screen savers.	=	=
9-10	3	The student will be familiar with the control panel, mouse properties, programs and their	Getting to know the control panel and mouse properties, programs and their properties, and how to	=	=

		properties, and how to delete installed programs, and will be familiar with some accessories such as the calculator, WordPad, and WINDOSWS MEDIA PLAYER for playing video files.	delete installed programs and getting to know some accessories such as the calculator, WordPad, and WINDOSWS MEDIA PLAYER for playing video files.		
11	3	The student will be familiar with the (AUTOCAD) program, its importance, installation, operation. Getting to know the program interface and ways to access commands, opening a new file, storing and opening files, auxiliary commands DRAWING LIMITS, UNITS	AUTOCAD program: its definition, importance, installation, operation, getting to know the program interface and ways to access commands, creating a new file, storing and opening files, auxiliary commands, DRAWING LIMITS, UNITS	=	=
12	3	The student will be familiar with the commands: OSNAP, ORTHO, LWT, OTRACK, POLAR, SNAP GRID, DISTANCE, AREA	Commands: OSNAP, ORTHO, LWT, OTRACK, POLAR, SNAP GRID, DISTANCE, AREA	=	=
13	3	The student will be familiar with the display tools: commands (ZOOM, PAN, REGEN).	Display tools: Command (ZOOM, PAN, REGEN)	=	=
14-15	3	The student will be able to apply basic drawing commands: LINE, MULTILINE, CONSTRUCTION LINE, POLYLINE, POLYGON, RECTANGLE, ARC, CIRCLE, DONUT, REVCLOUD, SPLINE, ELLIPS, MAKE BLOCK, INSERT BLOCK, MBLOCK, WBLOCK, HATCH, REGION.	Basic drawing commands: LINE, MULTILINE, CONSTRUCTION LINE, POLYLINE, POLYGON, RECTANGLE, ARC, CIRCLE, DONUT, REVCLOUD, SPLINE, ELLIPS, MAKE BLOCK, INSERT BLOCK, MBLOCK, WBLOCK, HATCH, REGION	=	=
16-17	3	The student will be able to apply Modification	Modification commands: ERASE, COPY, MIRROR	=	=

		commands: ERASE, COPY MIRROR, OFFSET, ARRAY, MOVE, ROTATE, SCALE, CHAMFER, FILLET, STRETCH, TRIM, EXTEND, BREAK, EXPLODE	OFFSET, ARRAY, MOVE, ROTATE, SCALE, CHAMFER, FILLET, STRETCH, TRIM, EXTEND, BREAK, EXPLODE		
18-19		The student will be able to implement and modify writing commands: MULTILINE TEXT, SINGLE LINE TEXT, how to create new writing style forms, learn about the DESIGN CENTER, and benefit from ready-made electrical templates.	Writing commands and their modification: MULTILINE TEXT, SINGLE LINE TEXT, how to create new writing style forms, getting to know the DESIGN CENTER and benefiting from ready-made electrical templates.	=	=
20-21	3	The student will be able to understand and apply dimensions to drawing boards	DIMENSIONS	=	=
22-23	3	The student will be able to deal with the Microsoft Word program/components, the Word window, the Word interface, components and commands of the file window, open, save, close, print.	Introduction to Microsoft Word 2007/components, the Word window, Word interface, components and commands of the file window, open, save, close, print	=	=
24	3	The student will be able to handle the components and commands of the Home window, copy, cut, paste, line, paragraph, styles, edit.	Window Components and Commands Home, Copy, Cut, Paste, Line, Paragraph Styles, Edit	=	=
25-26	3	The student will be familiar with the components and commands of the Insert Window, Pages, Table Illustrations, Header and Footer, Icons, and Page Layout.	Window components and commands include insert pages, tables, illustration header and footer, icons, and page layout.	=	=
27-28	3	The student will be familiar with the	Microsoft PowerPoint interface, ways to create	=	=

		PowerPoint interface, ways to create and format presentations, change the slide show style, and how to insert a new slide	and format presentations, change the slide show style, and how to insert a new slide		
29	3	The student will be able to copy a slide, view and delete a slide, manipulate layouts, objects, sound effects, and transition between presentation slides.	Copy, view, and delete a slide. And dealing with layouts, objects, sound effects, and transitions between presentation slides.	=	=
30	3	The student will be able to customize the effects of slide contents, add a header and footer to presentation slides, and save the presentation as a web page.	Customize the effects of slide contents, add a header and footer to presentation slides, and save the presentation as a web page.	=	=

23. 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 10%	Practical 15%	Attendance, assignments and tests 10%	Practical 15%

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	The prescribed book
Main references (sources)	Computer basics and office applications/Part One second, third and fourth
Recommended books and references (scientific journals, reports...)	(scientific journals, reports)
Electronic References, Websites	Windows 7, written by Muhammad Abu Al-Ela https://www.noor-book.com/%D9%83%D8%AA%D8%A7%D8%A%D9%88%D9%8A%D9%86%D8%AF%D9%88D8%B2-7-pdf

Course Description Form

1	Course name:renewable energy	
2	Course code	
3	Semester/Year: First	
4	Date this description was prepared:31/05/2024	
5	Available attendance forms: In-person	
6	Number of study hours (total) / Number of units (total): 60 theoretical hours + 60 practical hours / (total) (ours)	
7	Name of the course supervisor (if more than one name is mentioned): Asst. Prof. Dr. Laith Hassan Jawad	
8	the name: Asst. Prof. Dr. Layth Hassan Jawad	Email : inkr.lyt@atu.edu.iq
8	Course objectives	
	Course objectives	1- Learn about new sources of energy other than traditional sources, and the importance of renewable energy and its applications, which have become one of the most important fields of discussion in the twenty-first century for economic and environmental reasons. It also highlights the importance of obtaining sustainable and clean renewable energy as a guarantee for the present and a security for the future. 2- Learn about renewable energy sources and how to utilize them to generate energy, and learn about the various systems and applications associated

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5-6	4	Calculating the solar angles required for solar energy applications	Solar angles (declination - hour angle, elevation angle - solar azimuth angle - sunrise and sunset times and day length - incidence angle)	4- Using modern teaching and presentation methods. 5- Field visits and systematic training 6- Review the latest research. 7- Self-education 8- Monitoring websites	Extracurricular activities - Practical projects and graduation research -Annual tests
7-8	4	Calculating solar radiation falling on different surfaces	Solar radiation in space - Land radiation - Total radiation on inclined surfaces		
9-10	4	Knowing the types and characteristics of fixed solar collectors	solar collectors		
11	4	Know the types and characteristics of solar tracker complexes	Sun tracking collectors (parabolic trough collectors – Fresnel collectors – sanitary parabolic trough collectors – mirror field collectors)		
12	4	Learn about the characteristics and advantages of solar heating systems.	Solar water heating systems - thermosiphon system - solar collector with connected tank		
13	4	Knowing the characteristics and advantages of direct and indirect heating systems	Direct circulation system - Indirect water heating system - Pool heating system		
14-15	4	Learn about energy storage systems	Heat storage systems (air heat storage system - liquid heat storage system) renewable		
16-17	4	Calculating the amount of hot water required and knowing the practical requirements of renewable energy systems	Practical requirements: Calculating the amount of hot water required (pipes, fixtures, insulators, pumps, valves, and other devices)		
18-19	4	Learn about solar heating processes for industrial purposes.	Heating processes for industrial purposes, solar water and air heating systems, solar systems for industrial purposes – chemical applications (filtration for steam generation – fuel, fuel cells, material processing)		
20-21	4	Learn the basics of wind energy, wind turbines, rotor aerodynamics, and wind turbines.	Rotor Design - Rotor Performance - Wind Data Analysis		
22-23	4	Know the characteristics of wind energy conversion, power curve and capacity factor in wind energy	Performance of wind energy conversion systems - Wind turbine power curve - Capacity factor		
24	4	Learn about generating	Introduction to the Water		

		energy from water with hydro turbines.	Cycle - Water Turbines		
25-26	4	Learn about the characteristics, features, and operating principle of hydroelectric power plants.	Hydropower plants (direct generation plants - energy storage plants - energy reservoir pumping stations)		
27-28	4	Knowledge of organic energy and its use in heat and power plants	Introduction to organic energy (organic masses - organic gas - organic fuels - heating with organic masses - wood as fuel - central heaters) and heat and electricity generation plants that operate on organic masses		
29	4	Learn about geothermal power plants, their characteristics and operating principles.	Introduction to Geothermal Energy - Geothermal Power Plants (Thermal Power Plants - Power Plants - Geothermal Heat Pumping System)		
30	4	Learn about tidal energy and wave energy, their characteristics and working principle.	Tidal Power - Tidal Power Plants - Wave Power - Wave Power Plants		

11. Course Evaluation

The grade is distributed out of 100 based on the tasks assigned to the student, such as daily preparation, discussion, monthly and written exams, reports, etc.

Chapter One			Chapter Two		
theoretical 10%	practical 10%	Attendance, assignments, and tests 5%	theoretical 10%	practical 10%	Attendance, assignments, and tests 5%

12. Learning and teaching resources

Required textbooks (methodology if any)	Renewable energy and climate change “ John Wiley and Sons, Ltd.
Main references (sources)	1- Renewable energy world : http://www.renewableenergyworld.com/index.html 2- Home power https://www.homepower.com/
Recommended supporting books and references (scientific journals, reports...)	(scientific journals, reports)
Electronic references, websites	1- World organization 2- Renewable energy – Related Websites and news source

Course Description Form

1. Course name English language

2. Course code

3. Semester/Year: First

4. Date this description was prepared: 1/5/2025

5. Available attendance forms: In-person

6. Number of study hours (total) / Number of units (total): 30 theoretical hours / (total) 30 (hours)

7. Name of the course supervisor (if more than one name is mentioned): Asst. Prof. Dr. Laith Hassan Jawad

the name: Asst. Prof. Dr. Layth Hassan Jawad Email : inkr.lyt@atu.edu.iq

8. Course objectives

Course objectives

1. Enabling students to Basic communication in English in common everyday situations.
2. Developing the four basic skills: Listening, speaking, reading, and writing at beginner level.
3. Building a sound linguistic foundation through learning simple vocabulary, structures, and grammar.
4. Enhance self-confidence in using English in real-life situations.
5. Encourage students to interact and collaborate using English inside and outside the classroom.

9. Teaching and learning strategies:

Strategy

1. Communicative and collaborative learning:
Enhance conversation and interaction skills through dialogues and group work.
2. Task-based learning and real-world context:
Carry out activities that simulate everyday life situations to apply the language practically.
3. Use of media and technology:
Leverage audio, video, and apps to support learning in and out of the classroom.
4. Repetition and review:
Reinforce vocabulary and grammar through repetitive activities and educational games.
5. Taking into account individual differences and skills integration:
Providing a variety of activities that take into account students' levels and integrate the four language skills.

10. Course structure

Week	watches	Required learning outcomes	Name of unit or topic	Learning method	Evaluation method
1-2	1	Introducing oneself, greetings, simple questions	Unit 1: Hello	Communication activities, dialogue, group work Communicative activities, role-play, group work	Continuous monitoring, short exercises Continuous observation, short exercises
3-4	1	Talking about countries, nationalities, jobs	Unit 2: Your world		
5-6	1	Describing personal information, spelling, numbers	Unit 3: All about you		
7-8	1	Talking about family, possessive adjectives	Unit 4: Family and friends		
9-10	1	Describing places, prepositions of place	Unit 5: Where do you live?		
11-12	1	Abilities with 'can', asking for repetition	Unit 6: Can you speak English?		
13-14	1	Talking about the past,	Unit 7: Then and now		

			regular/irregular verbs			
1	16	1	Past simple with time expressions	Unit 8: How long ago?		
1	18	1	Talking about food preferences, countable/uncountable nouns	Unit 9: Food you like!		
1	20	1	Comparatives and superlatives	Unit 10: Bigger and better!		
2	22	1	Inventions and past events	Unit 11: Things that changed the world		
2	24	1	Describing travel and experiences	Unit 12: Life's an adventure!		
2	26	1	Present perfect for experience	Unit 13: I've been everywhere!		
2	28	1	Comprehensive review of previous content Comprehensive review of all units"	Review Sessions		
2	30	1	Comprehensive assessment of learning outcomes Overall assessment of learning outcomes	Final Test		

11. Course Evaluation

The grade is distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily, oral, monthly and written exams, reports, etc.

Chapter One			Chapter Two		
theoretical 20%	practical 0%	Attendance, assignments, and tests 5%	theoretical 20%	practical 0%	Attendance, assignments, and tests 5%

12. Learning and teaching resources

Required textbooks (methodology if any)	New Headway Plus Beginner Student's Book Liz and John Soars Oxford University Press
Main references (sources)	New Headway Plus Beginner Student's Tests Liz and John Soars Oxford University Press
Recommended supporting books and references (scientific journals, reports...)	"Essential Grammar in Use" (Raymond Murphy) For basic grammar with simplified exercises. "English Vocabulary in Use (Elementary)" (McCarthy & O'Dell) To build everyday vocabulary across practical contexts. "Tactics for Listening (Basic)" (Jack C. Richards) To improve listening in real-life situations such as everyday conversations.
Electronic references, websites	British Council LearnEnglish Interactive exercises, stories, quizzes, and video lessons for beginners. BBC Learning English Short lessons (videos, texts, podcasts) focusing on everyday grammar and vocabulary.

Course Description Form

25. Course Name: The Electrical Circuits and Measurements

26. Course Code:
27. Semester / Year: First and Second Semester / First Year
28. Description Preparation Date: 15/5/2025
29. Available Attendance Forms: Daily mandatory attendance
30. Number of Credit Hours (Total) / Number of Units (Total)
90 hours (30 theoretical hours + 60 practical hours)
31. Course administrator's name (mention all, if more than one name)
Name: Amara Abdlwahhab Flaifel
Email: amara.flaihl @atu.edu.iq
32. Course Objectives
• Preparing technically qualified personnel in the field of electricity, both academically and practically, to perform operations and maintenance of electrical units in power generation, transmission, and distribution stations, as well as maintenance of devices and equipment in the department and institute facilities. • Building and preparing the student psychologically to undertake their role in the field of electricity. • Developing study curricula to meet the needs of the job market and provide quality services to the community by enhancing relations with private and government sectors
33. Teaching and Learning Strategies

Strategy	• Theoretical Lecture • Practical Lecture • Discussion among Students • Preparation of Reports and Projects related to the Lecture Material • Summer Training in Public and Private Sectors • E-Learning • Using modern methods in teaching and training students. • Forming discussion circles during lectures to discuss academic topics. • Assigning students classroom duties.
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34. Course Structure:

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	4	Understanding the System of Units and Measurement Units	The system of units used in electricity and measurement units for each material (its parts and multiples) Mathematical applications for converting values using units	Lectures presented PowerPoint format	Daily, monthly, yearly exams
			Definition of the basic units of voltage, current, and resistance - Components of the electrical circuit - Ohm's law - Factors affecting the value of resistance -		

			Specific resistance of conductive and insulating materials.		
Second and third	8	Understanding the Characteristics and Applications of Series and Parallel Connections	Direct Current (DC) Circuits including:	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
			Connecting Resistors in Series with Examples		
			Connecting Resistors in Parallel with Examples Top of Form		
			Mixed Connection of Resistors with Examples Top of Form		
			Star and Delta (Y / Δ) Connection of Resistors and Conversion from Each to the Other with Examples		
			_ Applications of series, parallel, mixed, star, and delta circuits		
Fourth and Fifth	8	Understanding Kirchhoff's Laws	Kirchhoff's Laws - Definition of Kirchhoff's Law for Current and Voltage with Problem Solving	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
			Maxwell's Circuits with		

			Examples Solution		
Sixth and Seventh and Eighth	12	Understanding Thévenin and Norton Theorems Top of Form	- Thévenin's Theorem - Definition of the Theorem - How to Apply it in Direct Current Circuits Top of Form	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
			Applications on Thévenin's Theorem Top of Form		
		Understanding the Matching Theory Top of Form	- Norton's Theorem - Definition of the Theorem - How to Apply it in Direct Current Circuits		
			Applications on Norton's Theorem		
			Theory of Superposition - Definition of the Theory - Steps to Apply it in solving Direct Current Circuits containing more than one source - Solving Examples		
Ninth	4	Identifying AC Quantities	Definition of current source and voltage source (constant power distributor) and how to convert from one to the other - Maximum power transfer theory - Definition	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

			of the theory and derivation of its specific relationships - Application examples Top of Form		
Tenth	4	Identifying Phase Representation Top of Form	Complex Quantities - Definition - Phase and Directional Representation - Phase Angle and how to find it	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
Eleventh- Thirteenth	12	Identifying Iron-Hearted Measurement Devices	-Finding the resultant of complex quantities including multiplication, division, addition, and subtraction - with application examples Top of Form	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
			Measurement Devices including - Types of measurement devices - Their working principles - Moving coil measurement devices - Their construction and use in measuring voltage and current along with mentioning their advantages, disadvantages, and device diagram.		

			Iron-core Measurement Device - Its construction and how it's used in measurement - Its advantages, disadvantages, and device diagram		
Fourteenth	4	Understanding Wattmeters - Devices	Wattmeter Measurement Devices - Their construction - Device diagram - Placement in the electrical circuit for power measurement - Torque equations - Their advantages - Their disadvantages - Oscilloscope Device - Device diagram - Its installation - How to operate and use it		Daily, monthly, yearly exams

Fifteenth	4	Understanding Alternating Quantities	An Introduction to Complex Quantities, including - Definition - Characteristics of AC current, waveform representation, and its specific relationships - Definition of Root Mean Square (RMS) value and Average value and their relationships to find the Form Factor and Crest Factor for non-sinusoidal waveforms with application examples	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
Sixteenth-Seventeenth	8	Understanding Phasor Representation Top of Form	-Alternating Quantities, including - Definition - Characteristics of Alternating Current - How Alternating Current is generated, waveform representation, and its specific relationships - Definition of Root Mean Square (RMS) value and Average value and their relationships to find the Form Factor and Crest Factor for non-sinusoidal waveforms with application examples	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

			The alternating vector quantities - their definition - their phase and directional representation - phase angle and how to find it		
			Finding the Resultant of Complex Quantities including multiplication, division, addition, and subtraction - with application examples		
Eighteenth - Nineteenth - Twentieth	12	Definition of Resistance, Capacitance, Inductance	Study the effect of alternating current on a circuit containing only resistance, a circuit containing only pure inductance, and a circuit containing only pure capacitance - Finding the phase angle between voltage and current for each circuit with solution examples.	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

			The effect of alternating current on a circuit containing resistance and inductance in series - A circuit containing resistance and capacitance in series - A circuit containing resistance, inductance, and capacitance Top of Form		
		Understanding on	The effect of alternating current on a circuit containing resistance and inductance in parallel - A circuit containing resistance and capacitance in parallel - A circuit containing resistance, inductance, and capacitance in parallel		
		Phase Angle Top of Form			

Twenty-first - twenty-fourth	16	Recognizing Electrical Power Calculation	Power in alternating current circuits and its calculation include: Circuits containing resistance only Circuits containing inductance only Circuits containing capacitance only Circuits containing resistance, inductance, and capacitance in series and parallel Definition of active power and its calculation Reactive power and its calculation	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
The twenty-fifth	4	Understanding the Calculation of Apparent Electrical Power	Apparent total power (definition) – How to draw the power triangle – Power factor – Its definition and its effect on alternating current circuits – How to improve power factor – With practical examples.	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
twenty-sixth	4	Understanding Maximum Power Transfer Calculation	The theory of maximum power transfer in alternating current circuits - Derivation of its relationships - With examples	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

The twenty-seventh	4	Understanding Methods for Measuring Resistances	Practical methods for measuring resistances of high, medium, and low values - Using the ohmmeter in series and parallel - Ammeter and voltmeter method - Substitution method - Using a Wheatstone bridge - Voltage divider method - Switching method - With examples solving for each method.	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
twenty-eighth			Three-phase alternating current circuits - its definition and how to generate alternating current: one phase - two phases - three phases - with a drawing of each circuit, star and triangle connections in three-phase alternating current circuits.		
twenty-ninth	4	Solving practical examples about three-phase alternating current.	Solving practical examples about three-phase alternating current with delta and star connections, including balanced and unbalanced loads.	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

Thirty			Methods of measuring power for three-phase loads - Wattmeter device and its connection in the circuit to measure active power - calculating reactive power and apparent power with an example solution.		
			Measuring power using a wattmeter and voltage - how to find the total power using this method and in the case of star and delta connections - using two watt meters - using three watt meters.		

35. Course Evaluation

First Semester Exams:

10 marks - Theoretical

10 marks - Practical

5 marks - Evaluation of Non-Graded Assignments and Weekly Laboratory Reports.

Second Semester Exams:

10 marks - Theoretical

10 marks - Practical

5 marks - Evaluation of Non-Graded Assignments and Weekly Laboratory Reports.

Final Exam:

40 marks - Theoretical

10 marks - Practical

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Electrical Technology (Edward Hughes)
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Main references (sources)	Basic Circuits (A.M.F Brooks) Pergaman Press.
Recommended books and references (scientific journals, reports...)	Basic Electrical Engineering (Fitzgerald & Rlginborthan (Mc – Graw – Hill
Electronic References, Websites	The source for the practical material. Basic Electrical Engineering

Course Description Form

37. Course Name:	
Computer 1	
38. Course Code:	
39. Semester / Year:	
Annual / Second	
40. Description Preparation Date:	
2024/12/15	
41. Available Attendance Forms:	
In-person	
42. Number of Credit Hours (Total) / Number of Units (Total)	
1 hour / 2 units	
43. Course administrator's name (mention all, if more than one name)	
Name: Assistant Lecturer Ahmed Hasan Radhi Email: ahmed.raddi@atu.edu.iq	
44. Course Objectives	
Course Objectives	1– Teaching and training students on computer and the use of programs and applications relevant to their studies. 2– Introducing students to the fundamentals of computers. 3– Train students to use the internet correctly to assist them in their studies and enhance their chances

			of employment after graduation.		
45. Teaching and Learning Strategies					
Strategy	1- Explanation and clarification. 2- Delivering lectures by posing questions and discussing them with the audience. 3- Self-ability to identify problems and find appropriate solutions. 4- Using visual learning tools such as Data Show and Handouts. Building the scientific researcher's personality in the recipient				
46. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	2	"The student will understand the lecture and apply	Introduction to Computers: Concepts Hardware, Software and Components. The Concept of Computing, Data and Information Applications, Connecting Input and Output Devices and Peripherals to the Central Processing Unit	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports, Quiz, Scheduled Test Theoretical and Practical Homework Assignment
3-4		"The student will understand the lecture and apply	Computer Peripheral Device Components and Input/Output Units. Types of Memory: Volatile and Non-Volatile Memory, Secondary Storage	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports, Quiz, Scheduled Test Theoretical and Practical Homework Assignment
5	1	"The student will understand the lecture and apply	Components of the Central Processing Unit (CPU): Control	Listening, Discussion, Learning,	Daily Assessment, Reports, P

			Unit (C Arithmetic and Logic Unit (ALU), and Registers.	Practical Application, PowerPoint, Questions and Answers	Quiz, Scheduled Test Theoretical and Practical Homework Assignment
6-7	2	The student will understand the lecture and apply it.	Computer Personal Computer (Features and Types). Operating System Graphical User Interface (GUI) Operating System Fundamentals Common Operating Systems; Using Interface, Using Mouse Technology	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
8-9	2	The student will understand the lecture and apply it.	"Operating System and Graphical User Interface (GUI) Using Common Icons, Status Bar Menu Usage and Selection. Concept Folders and Directories, Opening and Closing Various Windows, Creating Shortcuts	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
10	1	The student will understand the lecture and apply it.	"Operating System and Graphical User Interface (GUI) Customization Graphical User Interfaces, Accessibility Features, and User Experience (UX)	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment

11-12	2	The student understand lecture and apply it.	v t	"Word Processing Fundamentals Word Processing Basic Features Word Processing Opening and Closing Documents. Creating and Editing Text Formatting Text and Paragraphs, Using Templates to Create Documents.	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	
13-14	2	The student understand lecture and apply it.	v t	Word Processing Creating and Managing Tables Using Styles and Themes. Spelling and Grammar Checking Tools Using Headers and Footers	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
15-16	2	The student understand lecture and apply it.	v t	"Spreadsheets; Introduction Spreadsheets, Software, Creating and Formatting Worksheets. Sorting and Filtering Data Using Formulas and Functions	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
17-18	2	The student understand lecture and apply it.	v t	Spreadsheets; Using Formulas and Functions, Utilizing Pivot Tables for Data Analysis. Data Validation and Error Checking, Data Visualization: Creating Charts and Graphs	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment

19-20	2	The student understand lecture and apply it.	"Presentation Software: Introduction Presentation Programs, Overview of Communication Presentation Tools Creating a New Presentation. Using Templates and Themes, Inserting and Formatting Text and Images Transition Effects and Animations	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
21-22	2	The student understand lecture and apply it.	Using Speaker Notes (Microphone) and Timers. Advanced Features: Hyperlinks Action Buttons Issues: Communication Presentation Problems and Future Display Technologies	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
23-24	2	The student understand lecture and apply it.	"Introduction to the Internet and Web Browsers, Basic Computer Networks LAN, WAN. Concepts of the Internet and Its Applications Internet Connectivity	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical and Practical Homework Assignment
25-26	2	The student understand lecture and apply it.	Introduction to the Internet and Web Browsers: World Wide Web; Web Browsing Software and Search Engines Understanding UI	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions and Answers	Daily Assessment, Reports Practical Quiz, Scheduled Test Theoretical

			Domain Name, a IP Address	Answers	and Practic Homework Assignment
27	1	The student understand lecture and apply it.	"Communications and Email: Basics Email; Creating Email Account Sending and Receiving Email Accessing Sent Emails; Utilizing Emails; Document Collaboration	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions a Answers	Daily Assessment, Reports P Quiz, P Scheduled Test Theoretical and Practic Homework Assignment
28	1	The student understand lecture and apply it.	"Communications and Email: Sending and Receiving Emails; Accessing Sent Email Utilizing Email Document Collaboration	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions a Answers	Daily Assessment, Reports P Quiz, P Scheduled Test Theoretical and Practic Homework Assignment
29	1	The student understand lecture and apply it.	Introduction Cloud Computing and Service Definition a Concept of Cloud Computing, Cloud Based Office Suite (Office 365 a Google Workspace	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions a Answers	Daily Assessment, Reports P Quiz, P Scheduled Test Theoretical and Practic Homework Assignment
30	1	The student understand lecture and apply it.	Google Workspace Google Docs, Google Sheets, Google Drive Google Meet.	Listening, Discussion, Learning, Practical Application, PowerPoint, Questions a Answers	Daily Assessment, Reports P Quiz, P Scheduled Test Theoretical and Practic Homework Assignment

47. 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

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	1-Graham Brown ,David Watson Cambridge IGCSE Information and Communication Technology ,3rd Edition (2020) 2-Alan Evans , Kendall Martin ,Mary Ann Poatsy ,Technology In Action Complete,16th Edition (2020). 3-Ahmed Banafa , Introduction Artificial Intelligence (AI), 1st Edition (2024). 4-Microsoft Office 2019 Step 1ST Edition by Curtis Fryc &Joan Lambert 5- Computer basics 2016 Al-Khidr Ali . Khidr 6- Dr. Adel Abdel Nour, Introduction the World of Artificial Intelligence 2005
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

49.	Course Name:		
		Mathematics	
50.	Course Code:		
51.	Semester / Year:		
		Annual System 2024-2025	
52.	Description Preparation Date:		
		Start of the Academic Calendar (2024–2025)	
53.	Available Attendance Forms:		
		My presence	
54.	Number of Credit Hours (Total) / Number of Units (Total)		
55.	Course administrator's name (mention all, if more than one name)		
	Name:	Ass. Lec. Mohammed Sabih Abdul Sahab	
	Email:	mohammed.abdulsahib.ikr28@atu.edu.iq	
56.	Course Objectives		
	Course Objectives	• Understand fundamental concepts in linear algebra (determinants, matrices, vectors). • Master differentiation and integration rules and their geometric and physical applications. • Solve first-order differential equations. • Apply statistical operations in data analysis	
57.	Teaching and Learning Strategies		
	Strategy	1. Theoretical lectures. 2. Practical applications and laboratory experiments. 3. Use of modern teaching tools (multimedia, interactive methods).	

58. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduction to determinants, their definition, and their types (binary and ternary)	Determinants and Solving Linear Equations	1–Programmed Learning 2– Brainstorming 3– Lecture 4– Discussion and Dialogue	Short tests And exercise solutions
2	2	Properties of determinants and methods of calculating them (auxiliary determinants, product of diagonals)	Determinants and Solving Linear Equations	=	=
3	2	Applications of determinants in solving linear equations (Cramer's method)	Determinants and Solving Linear Equations	=	=
4	2	Solve the exercises	Determinants and Solving Linear Equations	=	=
5	2	Definition of matrices, their types (square, zero, diagonal)	Matrices and operations on them	=	=
6	2	Addition and subtraction of Matrices	Matrices and operations on them	=	=
7	2	Standard multiplication, matrix multiplication	Matrices and operations on them	=	=
8	2	Determinants and multiplicative inverse	Matrices and operations on them	=	=
9	2	Definition of vectors, scalar and directional quantities	Vectors	=	=
10	2	Representing vectors geometrically, length and direction	Vectors	=	=
11	2	Addition and subtraction of vectors, scalar multiplication	Vectors	=	=
12	2	Physics applications (forces, speed)	Vectors	=	=

13	2	Introduction to differentiation, rules of differentiation (algebraic functions)	differentiation	=	=
14	2	Derivative of exponential and logarithmic functions	differentiation	=	=
15	2	Derivative of trigonometric functions and the chain rule	differentiation	=	=
16	2	Physical applications (critical point velocity)	differentiation	=	=
17	2	Indefinite integration, basic integration laws	integration	=	=
18	2	Integration by substitution and integration by parts	integration	=	=
19	2	Definite integration and calculating areas	integration	=	=
20	2	Engineering applications (volumes of rotation)	integration	=	=
21	2	Introduction to Differential Equations, Separation of Variables	differential equations	=	=
22	2	homogeneous equations	differential equations	=	=
23	2	Physical applications (population growth, cooling)	differential equations	=	=
24	2	Comprehensive review and testing	Differential equations	=	=
25	2	Data collection and organization (frequency tables)	Statistics and data	=	=
26	2	Graph (histogram, polygon)	Statistics and data	=	=
27	2	Measures of central tendency (mean, median, mode)	Statistics and data	=	=
28	2	Measures of dispersion (variance, standard deviation)	Statistics and data	=	=
29	2	Solve integrated problems combining differentiation, integration, and matrices.	Final review and advanced applications	=	=

30	2	Displaying student projects (applications in engineering or physics)	Final review and advanced applications	=	=
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59. 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

60. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Applied Mathematics, Author: Yaqoub Sabbagh • Schaum Series (Solving Electrical Circuits) • Methods for Solving Differential Equations, Author: (Khaled Ahmed Samarrai)
Main references (sources)	• Calculus (Thomas) • Linear Algebra and Its • Applications(Gilbert Strang)
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	Paul's Online Math Notes

61. The rapporteur's name is	
Human rights and democracy	
62. Course Code	
63. Semester/ year	
Annual, first stage	
64. The date this description was prepared is	
4/5/2025	
65.A. Attendance forms available for the first stage	
weekly	
66. Number of study hours / Number of units (total)2	
2 units 30 hours	
67. Name of the course administrator (if more than one name is mentioned)	
talal muzafar ghazi	
68. objectives Course	
Knowledge of human rights, which were established by ancient laws, civilizations, and divine laws, and then knowledge of positive laws at all levels: international, regional, and national. Knowledge of public freedoms, knowledge of the democratic systems that govern the world, and also a definition of the democratic system required by most countries in the world, which guarantees rights and freedoms.	Objectives of the study subject
69. Teaching and learning strategies	
Lecture delivery strategy	The strategy

- Student group strategy
- Reports and studies strategy
- Strategy for using visual aids and digital projectors for topics that require

70. Course structure

Evaluation method	Learning method	Name of the unit or topic	Required learning outcomes	hours	the week
oral test	a lecture	rights Human Definition and objectives	knowledge And meaning And what it is human rights And her relationship With others from Threads in meaning Human rights / concept The concept of human rights throw lecture And a question Students on the topic knowledge And inquiry on to understand Students For the topic	2	1
oral test	a lecture	Human rights in ancient civilizations, especially the Mesopotamian civilization	knowledge And meaning And what it is Human rights in civilizations And her relationship With others from Threads human rights As A field Independently throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic	2	2
oral test	a lecture	Human rights in heavenly laws	knowledge Rights according to divine laws And all what Regard with it With rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To	2	3 4

			subtract questions And inquiries on the topic with to request Preparation from Students		
A written test	discussion	Human rights in Islam		2	5
oral test	a lecture	Non-governmental organizations and human rights (International Committee of the Red Cross – Amnesty – International	knowledge Human rights committees And all what Regard with it And everything related to human rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	6
oral test	a lecture	Human Rights Watch – Arab Human Rights .Organizations	knowledge Human rights organizations throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	7
oral test	a lecture	Human rights in Iraqi constitutions between theory and reality. – The Iraqi Constitution	knowledge Iraqi constitutions throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	8
oral test	a lecture	The relationship between human rights and public .freedoms	knowledge The relationship between human rights and public freedoms throw	2	9

			lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students		
oral test	a lecture	Universal Declaration of Human Rights	knowledge Universal Declaration of Human Rights and Public Freedoms throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	10
A written test	discussion	Regional charters and .national constitutions	Identify on factors Influential in National charters and constitutions throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	11
oral test	a lecture	Modern human rights	Identify on factors Influential in economic, social and cultural human rights and civil and political human (rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	12

oral test	discussion	Economic, social and cultural human rights and civil and political human (rights	Identify on Guarantees for the protection of human rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	13
oral test	a lecture	Guarantees of respect and protection of human rights at the national and .international levels	Identify on Theories of human achievement throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	14
oral test	a lecture	The general theory of freedoms: the origin of rights and freedoms – the project's position on declared rights and .freedoms	Identify Non-governmental organizations throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	15
oral test	a lecture	The role of non-governmental organizations in respecting and protecting .human rights	knowledge And meaning And what it is Democracy and its relationship With others from Threads in meaning Democracy concept, types and / characteristics Democracy throw lecture And a question Students on the topic knowledge And inquiry on to understand	2	16

			Students For the topic		
A written test	discussion	The historical development of the concept of equality. The modern development of the idea of equality	knowledge And meaning And what it is human rights And her relationship With others from Threads in meaning Human rights / concept The concept of human rights throw lecture And a question Students on the topic knowledge And inquiry on to understand Students For the topic	2	17
oral test	a lecture	Gender equality – equality between individuals according to their beliefs and race	knowledge And meaning And what it is Human rights in civilizations And her relationship With others from Threads human rights As A field Independently throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic	2	18
oral test	discussion	Equality in society	knowledge Rights according to divine laws And all what Regard with it With rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	19
oral test	a lecture	Democracy definition and types		2	20
oral test	a lecture	Democratic systems in the world	knowledge Human rights committees And all what Regard with it And everything related to human rights throw	2	21

			lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students		
oral test	a lecture	The crime of genocide	knowledge Human rights organizations throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	22
A written test	discussion	Non-governmental organizations and human rights (International Committee of the Red Cross – Amnesty – International	knowledge Iraqi constitutions throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	23
oral test	a lecture	Human Rights Watch – Arab Human Rights .Organizations	knowledge The relationship between human rights and public freedoms throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	24
oral test	discussion	Human rights in Iraqi constitutions between theory and reality. – The Iraqi Constitution	knowledge Human rights in Iraqi constitutions between theory and reality. – The	2	25

			Iraqi Constitution throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students		
oral test	a lecture	The relationship between human rights and public .freedoms	Identify on factors Influential in For human rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	26
oral test	a lecture	Universal Declaration of Human Rights	Learn about the Universal Declaration of Human Rights throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	27
oral test	a lecture	Regional charters and .national constitutions	Identify Human rights conventions throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	28

oral test	discussion	Modern human rights	Identify on Theories of human achievement throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	29
A written test	a lecture	Economic, social and cultural human rights and civil and political human (rights	Identify Human economic, social and cultural rights lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	30
oral test	a lecture	Guarantees of respect and protection of human rights at the national and .international levels	Knowledge of guarantees of respect and protection of human rights at the national and .international levels throw lecture And a question Students on the topic knowledge And inquiry on to understand Students For the topic	2	30

71. Course evaluation

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

marks monthly exam 40

marks for daily and oral preparation and report writing 10

final exam score 50

72. Learning and teaching resources

Human rights and democracy	Required textbooks (methodology, if any)
Public opinion and human rights / Dr. Amr Hassan Fayyad	Main references (sources)
Scientific journals, periodicals and research And specialty	Recommended supporting books and references (scientific journals, reports....)

Internet sites (YouTube and Google) and other media Communication in the specialty	Electronic references, Internet sites
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Course Description Form

73. Course Name:					
English Language					
74. Course Code:					
75. Semester / Year:					
Second year					
76. Description Preparation Date:					
15/9/2024					
77. Available Attendance Forms:					
Abet					
78. Number of Credit Hours (Total) / Number of Units (Total):					
30 hours					
79. Course administrator's name (mention all, if more than one name):					
Name: Asst. Prof. Dr. Hakim Tarteab Kadhim					
Email: dw.hkm@atu.edu.iq					
80. Course Objectives					
Course Objectives		The student is able to write in English The student is able to speak in English			
81. Teaching and Learning Strategies					
Strategy		Teaching with PowerPoint Using groups learning			
82. 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 p 16	Unit Two: your world , Reading and speaking p 16	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
5	1	Unit Three: all about you	Unit Three: all about you	Discussion and	Oral tests

		Negatives and questions	Negatives and questions	dialogue, group learning, PowerPoint	
6	1	Unit Three: Social expressions	Unit Three: Social expressions	Discussion and dialogue, group learning, PowerPoint	Self-evaluation and evaluation of colleague
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 and irregular verbs	Unit Ten : we had a great time! , past simple , regular and irregular verbs	Discussion and dialogue, group learning, PowerPoint	Oral tests
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

83. 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%

84. Learning and Teaching Resources					
Required textbooks (curricular books, if any)			The prescribed book (Headway)		
Main references (sources)					
Recommended books and references (scientific journals, reports...)					
Electronic References, Websites					

Course Description Form

85. Course Name:	
Ethics and Occupational Safety	
86. Course Code:	
87. Semester / Year:	
Annular / second Year	
88. Description Preparation Date:	
1/9/2024	
89. Available Attendance Forms: Daily mandatory attendance	
90. Number of Credit Hours (Total) / Number of Units (Total)	

30 hour
91. Course administrator's name (mention all, if more than one name)
M. Khalid Hatoum Swain Email: khalid.swain@atu.edu.iq

92. Course Objectives

Course Learning Objectives:

1. To introduce students to the general and specific goals: providing a clear and comprehensive image of occupational safety and protection methods to prevent and reduce workplace accidents.
2. All activities and actions aimed at providing preventive services and precautions (occupational health) to protect workers from work-related hazards and conditions surrounding the workplace, including direct injuries and occupational diseases.

93. Teaching and Learning Strategies

Strategy	1. Explanation and clarification. 2. Lecture with questions and discussions. 3. Independent ability to identify problems and find appropriate solutions. 4. Use of visual educational tools such as Data Show, Handouts. 5. Building the scientific research personality of the student.
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94. Course Structure:					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1- 2 3 - 4 - 5	2 2	The student's ability to understand the concept of occupational safety ethics The student's ability to understand the concept of occupational safety ethics	Topic: Unit 1 – Ethics: Concept, origins, general rules, sources, moral values, importance to individuals and society.	Listening, e-learning, , PowerPoint use, discussion, Q&A Listening, e-learning, , PowerPoint use, discussion, Q&A	: Daily assessments, surprise exams, predefined tests, written and practical homework. Daily assessments, surprise exams, predefined tests, written and practical homework.
			Topic: Unit 2 – Work and Profession: Importance, behaviors, definition, differences among job/work/craft, and professional standards.		
6 - 7	2	The student's ability to understand the concept of occupational safety ethics	Topic: Unit 3 – Values and Professional Ethics: Honesty, sincerity, advice, fairness, good behavior, and proficiency.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
8 - 9 10 - 11	2 2	The student's ability to understand the concept of occupational safety ethics The student's ability to understand the concept of occupational safety ethics	Topic: Unit 4 – Professional Ethics: Nature, positive impact, characteristics, traits, and steps to achieve acceptable ethics.	Listening, e-learning, , PowerPoint use, discussion, Q&A Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam,
			Topic: Unit 5 – Unethical Behavior Patterns in the Profession: Administrative corruption, bribery (definition, types, causes), fraud (definition, nature, manifestations).		

					homework
12 - 13	2	The student's ability to understand the concept of occupational safety ethics	Topic: Unit 6 – Methods to Instill Ethical Values: Tools, levels, elements of ethical charters, and reinforcement methods (per Kreitner and Kinicki).	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
14 - 15	2	The student's ability to understand the concept of occupational safety ethics.	Topic: Unit 7 – Ethics in Engineering Professions: Role of technician, ethical/technological values, professional conditions, Islamic vs Western perspectives.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
16 - 17	2	The student's ability to understand the concept of occupational safety ethics	Topic: Causes of electric shock injuries.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
18	2	The student's ability to understand the concept of occupational safety ethics	Topic: Assisting victims of electric shock – rescuing the injured.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
19	2	The student's ability to understand the concept of occupational safety ethics	Topic: Artificial respiration – treating burns.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework

20	2	The student's ability to understand the concept of occupational safety ethics	Topic: Effects of electrical current grounding.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
21 - 22	2	The student's ability to understand the concept of occupational safety ethics	Topic: Fire alarm systems – control unit.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
23	2	The student's ability to understand the concept of occupational safety ethics.	Topic: Audible alarm tools – bells and sirens.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework

24	2	The student's ability to understand the concept of occupational safety ethics	Topic: Monthly exam.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
25	2	The student's ability to understand the concept of occupational safety ethics	Topic: Occupational health and safety guidelines.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
26	2	The student's ability to understand the concept of occupational safety ethics	Topic: Reducing unsafe behaviors and practices.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
27	2	The student's ability to understand the concept of occupational safety ethics	Topic: Personal protective equipment – Eye and ear protection.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework

28	2	The student's ability to understand the concept of occupational safety ethics	Topic: Fire-fighting tools – Heat and smoke detectors.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
29	2	The student's ability to understand the concept of occupational safety ethics	Topic: Buildings that require fire alarm systems.	Listening, e-learning, , PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
30	2	The student's ability to understand the concept of occupational safety ethics	Topic: Types of electrical injuries.	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework

11- Course Evaluation

Grade distribution out of 100 according to student assignments such as daily preparation, daily and oral tests, monthly and written exams, reports, etc.

Total:	Attendance, Assignments, and Tests:		Theory:	Total:	Attendance, Assignments, and Tests:	Theory:	First Semester:
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25%	5%		20%	25%	5%	20%	Theory:
12 Learning and Teaching Resources							
Required textbooks (curricular books, if any)				Electrical Technology (Edward Hughes)			
Main references (sources)				Basic Circuits (A.M.F Brooks) Pergaman Press.			
Recommended books and references (scientific journals, reports...)				Basic Electrical Engineering (Fitzgerald & Rlginborthan (Mc – Graw – Hill			
Electronic References, Websites				The source for the practical material. Basic Electrical Engineering			

Course Description Form

96. Course Name:	
Energy Storage Systems	
97. Course Code:	
98. Semester / Year:	
Annual / second Year	
99. Description Preparation Date:	
1/9/2024	
100. Available Attendance Forms: Daily mandatory attendance	
101. Number of Credit Hours (Total) / Number of Units (Total)	
120 hour	
102. Course administrator's name (mention all, if more than one name)	
Assst Prof. Ridha Hameed Mageed inkred@atu.edu.iq	

103. Course Objectives						
Prepare the student for work in the specialized field by utilizing computer skills.						
104. Teaching and Learning Strategies						
Strategy	Prepare the student for work in the specialized field by utilizing computer skills.					
105. Course Structure:						
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method	
1	4	Student will be familiar with Energy Storage Systems (ESS), the importance of ESS, and a historical overview of ESS.	Introduction to Energy Storage Systems (ESS), Importance of ESS, Historical Overview of ESS	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	

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2-7		44	Student will be familiar with thermal energy storage systems, their types, and concepts. Student will be familiar with Mechanical Energy Storage Systems (MES), an introduction to mechanical energy storage.	Thermal Energy Storage Systems: Types and Concepts	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	
				Mechanical Energy Storage Systems (MES), Introduction to Mechanical Energy Storage	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	
8		4	Student will be familiar with Hydroelectric Energy Storage (HES) systems.	Hydroelectric Energy Storage (HES) Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	
9		4	Student will be familiar with Gravity Energy Storage systems.	Gravity Energy Storage Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	
10		4	Student will be familiar with Compressed Air Energy Storage (CAES) systems and compressed air laws.	Compressed Air Energy Storage (CAES) Systems and Compressed Air Laws	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	

11		4	Student will be familiar with Flywheel Energy Storage (FES) systems.	Compressed Air Energy Storage (CAES) Systems and Compressed Air Laws	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
12	14	4	Student will be familiar with various types of Thermochemical Energy Storage systems.	Thermochemical Energy Storage Systems: Types	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
15		4	Student will be familiar with Hydrogen Energy Storage systems.	Hydrogen Energy Storage Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
16		4	Student will be familiar with Synthetic Natural Gas (SNG) systems.	Synthetic Natural Gas (SNG) Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework
17		4	Student will be familiar with Solar Fuel (SF) systems.	Solar Fuel (SF) Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework

18-23	22-24	4 4	Student will be familiar with electrochemical energy storage systems such as Lead-acid batteries, Metal-ion batteries, Metal-air batteries, Flow batteries, Solid-state batteries, Paper batteries, and Flexible batteries. Student will be familiar with electrical energy storage systems such as capacitors and supercapacitors.	Electrochemical Energy Storage Systems such as Lead-acid batteries, Metal-ion batteries, Metal-air batteries, Flow batteries, Solid-state batteries, Paper batteries, and Flexible batteries Electrical Energy Storage Systems such as Capacitors and Supercapacitors	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework		
25		4	Student will be familiar with Superconducting Magnetic Energy Storage systems.	Superconducting Magnetic Energy Storage Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework		
26	27	4	Student will be familiar with Hybrid Energy Storage systems.	Hybrid Energy Storage Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework		

28		4	Student will be familiar with future trends and challenges in renewable energy.	Future Trends and Challenges in Renewable Energy	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework	100	Course Evaluation
29		4	Student will be familiar with energy conservation in buildings.	Energy Conservation in Buildings	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework		
30		4	Student will be familiar with comparing energy storage systems.	Comparison of Energy Storage Systems	Listening, e-learning, practical application, PowerPoint use, discussion, Q&A	Daily assessment, reports, pop quiz, pre-scheduled exam, practical exam, homework		
11	Course Evaluation							
	Grade distribution out of 100 according to student assignments such as daily preparation, daily and oral tests, monthly and written exams, reports, etc.							
	Total:	Attendance, Assignments, and Tests:		Theory:	Total:	Attendance, Assignments, and Tests:	Theory:	First Semester:

25%	5%		20%	25%	5%	20%	Theory:
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13 Learning and Teaching Resources

Required Textbooks (Curriculum, if any):		Curriculum Textbooks:
Main References (Sources):		الإدارة والخرن / أ. م. د. قاسم مهدي وادي د. طالب زيدان الموسوي
		بين الطاقة الكهربائية / د. محمد هاشم أبو الخير د. ياسر دياب
Electronic References, Internet Sites:		"Energy Storage Technology Comparison" / Johanna Gustavsson
		"HANDBOOK ON BATTERY ENERGY STORAGE SYSTEM"
		"Selected Technologies of Electrochemical Energy Storage - A Review" / Kalina Detka and Krzysztof Górecki

Course Description Form

107.	Course Name:
	Computer 2
108.	Course Code:
109.	Semester / Year:
	Annual / Second
110.	Description Preparation Date:
	2024/12/1
111.	Available Attendance Forms:
	In-person
112.	Number of Credit Hours (Total) / Number of Units (Total)
	1 hour / 2 units
113.	Course administrator's name (mention all, if more than one name)

Name: Assistant Lecturer Ahmed Hasan Radhi
Email: ahmed.raddi@atu.edu.iq

114. Course Objectives

Course Objectives	1- Teaching and training students on computer hardware malfunctions, and the use of programs and applications relevant to their studies. 2-Introducing students to the internet and ensuring its proper and safe use. 3- Training students on online communication. 4- Introducing students to artificial intelligence.
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115. Teaching and Learning Strategies

Strategy	1- Explanation and clarification. 2- Delivering lectures using a question-based approach and discussing them with the audience. 3- Utilizing visual aids such as handouts and data sheet presentations. 4-Teamwork-based activities. 5- Presenting examples of subject topics to students. 6-Scientific lessons conducted in laboratories.
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116. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	2	The student will understand networks, their types, components	Security and Networks: What is a Network? Types of Networks Basic Network Components. Basic network components.	-Listening, Discussion -E-learning Practical Application - PowerPoint -Questions and Answers	Preparing classroom and home assignments Preparing reports on the academic program Conducting surprise and scheduled exams.
3-4-5	3	The student will learn fundamentals networking,		-Listening, Discussion -E-learning Practical	Preparing classroom and home assignments Preparing reports

		network troubleshooting, and identifying common errors		Application on the academic program - PowerPoint -Questions and Answers - Conducting surprise and scheduled exams	
6-7	2	"The student will be aware of what e-commerce and banking services are and will be able to benefit from them	E-commerce: Concepts Electronic Banking Services this include Online Banking Services:ATM and Debit card services . Phone banking SMS banking ,electronic at mobile banking	-Listening, Discussion -E-learning Practical Application - PowerPoint -Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program. Conducting surprise and scheduled exams
8-9	2	"The student will be able to identify errors malfunctions	Computer Troubleshooting Introduction to Computer Troubleshooting an, Communication Hardware Issues and Solutions Diagnosing Software Problems . Hardware Components: Diagnosis and Repair, Using Safe Mode for Troubleshooting	-Listening, Discussion -E-learning Practical Application - PowerPoint -Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program. Conducting surprise and scheduled exams
10-11	2	The student will understand software issues and techniques for removing harmful viruses.	Troubleshooting Operating System issues , Identifying and resolving Blue Screen Error dealing with slow	-Listening, Discussion -E-learning Practical Application - PowerPoint	Preparing classroom and home assignments Preparing report on the academic program

			Computer Performance. virus and malware removal techniques updating drive and software."	-Questions and Answers	.Conducting surprise scheduled exams
12-13	2	"The student will be able to understand the nature of artificial intelligence	Introduction to AI; Definition of AI history of AI techniques and approaches.. KEY characteristics of AI benefits of AI challenges and ethical considerations.	-Listening, Discussion -E-learning - Practical Application - PowerPoint - Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program .Conducting surprise scheduled exams
14-15	2	The student will be able to understand the role of data in artificial intelligence systems	Challenges and Limitations of AI, The Role of Data in AI Systems. AI Tools and Frameworks."	-Listening, Discussion -E-learning - Practical Application - PowerPoint - Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program .Conducting surprise scheduled exams
16	1	The student will be able to understand mobile technology applications that rely on artificial intelligence	The Role of Artificial Intelligence in Modern Smartphones: Mobile Technologies that Rely on AI, Virtual Assistants (Google Assistant, Alexa)	-Listening, Discussion -E-learning - Practical Application - PowerPoint - Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program. Conducting surprise and scheduled exams
17-18	2	"The student will learn about real-time translation services and the challenges of applying artificial	Adaptive Learning, Real-time Translation Service The Future of Artificial	-Listening, Discussion -E-learning - Practical Application - PowerPoint	Preparing classroom and home assignments Preparing report on the academic program

		intelligence	Intelligence Smartphone Technology, Challenges of Implementation Mobile Devices	-Questions and Answer	.Conducting surprise and scheduled exams
19-20	2	The student will learn about the mechanism and applications of artificial intelligence tools in various industries.	AI Applications and Tools Overview of Various Industries, Education, Healthcare, Transportation, and Media	-Listening, Discussion -E-learning -Practical Application - PowerPoint -Questions and Answer	Preparing classroom and home assignments. Preparing report on the academic program. Conducting surprise and scheduled exams
21-22	2	The student will learn about the principle of automation as well as the use of AI in marketing	"Finance, Robotics, Automation Technologies. Artificial Intelligence Marketing: Targeting and Personalization	-Listening, Discussion -E-learning -Practical Application - PowerPoint -Questions and Answer	Preparing classroom and home assignments. Preparing report on the academic program. Conducting surprise and scheduled exams
23-24	2	The student will learn about image analysis and the concept of smart cities	Artificial Intelligence Image and Video Analysis, Smart Cities Future Trends AI Applications and Tools	-Listening, Discussion -E-learning -Practical Application - PowerPoint -Questions and Answer	Preparing classroom and home assignments. Preparing report on the academic program. Conducting surprise and scheduled exams
25-26	2	"The student will learn about the impact of artificial intelligence in enhancing public safety and exploring	AI and society Introduction to AI and its societal impact, the role of AI in enhancing public safety. Cultural Perspectives on AI Adoption, AI and	Listening, Discussion -E-learning -Practical Application - PowerPoint -Questions and Answer	Preparing classroom and home assignments. Preparing report on the academic program. Conducting surprise and scheduled exams

		perspective on AI and political implications	Governance: Political Implications		
27-28	2	The student will learn about ethical challenges artificial intelligence and transparency in systems. The student will explore the ethical implications autonomous systems and ethics in marketing and advertising	"Ethical Challenges Artificial Intelligence: Introduction to Ethics, Transparency and Explainability AI System Privacy Concerns in AI Data Usage" "Ethical Implications Autonomous Systems, Ethics AI-Based Marketing and Advertising	-Listening, Discussion -E-learning Practical Application - PowerPoint -Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program. Conducting surprise and scheduled examinations
29	1	"The student will understand ethical considerations education, human rights, and their application artificial intelligence.	Ethical Considerations Education, Human Rights, and their Application Artificial Intelligence	Listening, Discussion -E-learning Practical Application - PowerPoint -Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program. Conducting surprise and scheduled examinations
30	1	The student will be able to understand future trends artificial intelligence as well as emerging technologies	"The Future Artificial Intelligence: Future Trends AI, Research, and Emerging Technologies	Listening, Discussion -E-learning Practical Application - PowerPoint -Questions and Answers	Preparing classroom and home assignments Preparing report on the academic program. Conducting surprise and scheduled examinations

117. 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	
118. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	1-Graham Brown ,David Watson Cambridge IGCSE Information and Communication Technology ,3rd Edition (2020) 2-Alan Evans , Kendall Martin ,Mary Ann Poatsy ,Technology In Action Complete,1st Edition (2020). 3-Ahmed Banafa , Introduction to Artificial Intelligence (AI), 1st Edition (2024). 4-Microsoft Office 2019 Step 1ST Edition Curtis Fryc &Joan Lambert 5- Computer basics 2016 Al-Khidr Ali Khidr 6- Dr. Adel Abdel Nour, Introduction to the World of Artificial Intelligence 2005
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

119.	Course Name: Electrical capacity equipment
120.	Course Code:
121.	Semester / Year: First and Second Semester / second Year
122.	Description Preparation Date: 15/5/2025
123.	Available Attendance Forms: Daily mandatory attendance
124.	Number of Credit Hours (Total) / Number of Units (Total)
120 hours (60 theoretical hours + 60 practical hours)	
125.	Course administrator's name (mention all, if more than one name)
Name: Amera Abdlwahhab Flaifel	
Email: amera.flaifl @atu.edu.iq	
126.	Course Objectives

- Knowledge of sustainable energy sources
- Knowledge of electrical capacity and power
- Identifies the parts of electrical machines and transformers.
- Operate electrical machinery.
- Understand the working theory of DC and alternating current machines

127. Teaching and Learning Strategies

Strategy

- Theoretical Lecture
- Practical lecture
- Discussion with students and students among themselves
- Prepare reports and projects related to the scientific material of the lecture
- Summer internships in the private and public sector
- E-learning
- Use of modern means in teaching and training students.
 - Form discussion loops during lectures to discuss study topics.
 - Assigning students class assignments.

128. Course Structure:

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
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1st	4	Learn about sustainable forms of energy	Sustainable energy, its sources, capacity and electric power	Lectures presented PowerPoint format	Daily, monthly, yearly exams
2nd	4	Getting to know the parts of a capability system	Electrical capacity system, generation, transmission, distribution	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
3rd	4	Learn about the types of generating plants ↓	Kirchhoff's Laws - Definition of Kirchhoff's Law for Current and Voltage with Problem Solving	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
4th	4	Identify the bars used in the hydrocarbon network	The vertical bars	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
5th	4	Learn about the types of transport lines	Airlines	Lectures presented in	Daily, monthly, yearly exams

				PowerPoint format	
6th	4			Lectures presented in PowerPoint format	Daily, monthly, yearly exams
7th	4	Identify cable specifications	Underground transmission (cables)	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
8th	4	Calculate transmission line parameters	Resistance, inductance, capacitance calculations	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
9th	4	Identify components of distribution networks	Distribution network types and components	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
10th	4	Identify components of overhead distribution	Overhead distribution networks	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

11en	4	Identify components of underground distribution	Underground distribution networks	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
12ve	4	Understand solar panel connections (series, parallel, mixed)	Solar panel connections	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
13en	4	Represent a solar power plant	Practical applications	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
14en	4	Identify types of power losses	Power transmission losses	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

15en 16en	4	Understand solar power system design	Solar power system design DC machines basics and parts	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
17en	4	Understand types of DC machines	Separately and self-excited (shunt, series, compound) Measuring power using a wattmeter and voltage - how to find the total power using this method and in the case of star and delta connections - using two watt meters - using three watt meters.	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
18en	4	Understand EMF and its calculation	Factors affecting EMF	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
19en	4	Analyze magnetization curve	No-load curve, critical resistance and speed	Lectures presented in PowerPoint format	Daily, monthly, yearly exams

20ty	4	Identify types of DC motors	DC motor principles and comparison with generators	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
21	4	Speed control of DC motors	Speed control methods	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
22	4	Identify transformer types and structure	Transformers (components, operation)	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
23	4	Understand autotransformer	Properties and differences	Lectures presented in PowerPoint format	Daily, monthly, yearly exams
24	4	Identify other transformer types	Current, voltage transformers and applications	PowerPoint lectures	Daily, monthly, final exams
25	4	Understand three-phase transformers	Types of connections	PowerPoint lectures	Daily, monthly, final exams
26	4	Understand induction motors	Three-phase induction motors	PowerPoint lectures	Daily, monthly, final exams
27	4	Understand starting methods of induction motors	Start-up techniques	PowerPoint lectures	Daily, monthly, final exams
28	4	Understand synchronous generators	Types and working principle	PowerPoint lectures	Daily, monthly, final exams

29	4	Understand synchronous motors	Structure and operation	PowerPoint lectures	Daily, monthly, final exams
30	4	Power factor and its improvement	Use of synchronous motors	PowerPoint lectures	Daily, monthly, final exams

129. Course Evaluation

First Semester Exams:

10 marks - Theoretical

10 marks - Practical

5 marks - Evaluation of Non-Graded Assignments and Weekly Laboratory Reports.

Second Semester Exams:

10 marks - Theoretical

10 marks - Practical

5 marks - Evaluation of Non-Graded Assignments and Weekly Laboratory Reports.

Final Exam:

40 marks - Theoretical

10 marks - Practical

130. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Electrical Technology (Edward Hughes)
Main references (sources)	Basic Circuits (A.M.F Brooks) Pergaman Press.
Recommended books and references (scientific journals, reports...)	Basic Electrical Engineering (Fitzgerald & Rlginborthan (Mc – Graw – Hill
Electronic References, Websites	The source for the practical material. Basic Electrical Engineering

Course Description Form

131. Course Name:	
SOLAR ENERGY	
132. Course Code:	
133. Semester / Year:	
Annual (2024–2025)	
134. Description Preparation Date:	
Beginning of the academic calendar (2024–2025)	
135. Available Attendance Forms:	
Lectures + Lab	
136. Number of Credit Hours (Total) / Number of Units (Total)	
137. Course administrator's name (mention all, if more than one name)	
Name: Assist Lecturer Rassol Hamad Rasheed Email: rassol.rasheed.ikr35@atu.edu.iq	
138. Course Objectives	
Course Objectiv	1. Expanding the student's knowledge through his introduction to new sources of energy other than traditional sources. The primary objective of the course lies in the importance of renewable energy and its applications, which has become one of the most important fields proposed in the twenty-first century for economic and environmental reasons, and in the importance of obtaining renewable (sustainable) and clean energy as a guarantee for the present and security for the future. 2. Getting to know renewable energy sources and how to benefit from them to obtain energy and learn about the various application systems associated with those sources. 3. Studying traditional energy sources, sources of energy consumption, the world's energy needs, as well as environmental problems related to the use of traditional energies and studying ways and methods to reduce energy consumption.

	4. Knowledge of the basics of various renewable energy sources and the technologies required for associated energy systems. 5. Studying the types of renewable energy, its working principle, properties, applications, development prospects, and explaining the importance of using such energies from an environmental and economic perspective. 6. Providing students with scientific and applied research skills.
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139. Teaching and Learning Strategies

Strategy	1. Theoretical lectures 2. Practical application and laboratory experiments 3. Discussions, workshops and seminars 4. Using modern presentation and teaching methods 5. Field visits and professional training 6. Review the latest published research in the field of renewable energy 7. Self-education
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140. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Knowledge of renewable energy sources and their applications, and identification of environmental problems resulting from the use of traditional fuels	General introduction to renewable energy Renewable energy sources and applications Renewable Energy and environmental problems (Acid rain, Ozone layer depletion, Global climate change, Nuclear hazards)	1. Theoretical lectures 2. Practical application and laboratory experiments 3. Discussions, workshops and seminars 4. Using modern presentation and teaching	• Daily and oral tests • Monthly tests • Practical tests • Reports • Extracurricular activities • Projects • Annual tests
2	3	How to calculate the solar time	The sun Reckoning of		

		equation	time (the equation of time and longitude correction)	methods	
3	3	Calculating solar angles required for solar energy applications	Solar angles (declination, hour angle, solar altitude angle, solar azimuth angle, Sunrise and sunset times and day length, incidence angle)	5. Field visits and professional training 6. Review the latest published research in the field of renewable energy 7. Self-education	
4	3	Calculating solar radiation incident on different surfaces	Extraterrestrial solar radiation, Atmospheric attenuation, Terrestrial irradiation, Total radiation on tilted surfaces.		
5	3	Knowing the types and characteristics of fixed solar collectors	SE collectors Stationary collectors (Flat-Plate Collectors, Compound Parabolic Collectors, Evacuated Tube Collectors)		
6	3	Knowing the types and characteristics of tracking solar collectors	Sun-tracking concentrating collectors (Parabolic Trough Collectors, Fresnel collectors, Parabolic Dish Reflectors, Heliostat Field Collectors)		
7	3	Learn about the	Solar water heating systems		

		characteristics and advantages of solar heating systems	Passive systems (Thermosiphon systems, Integrated collector storage)		
8	3	Know the characteristics of features Direct and indirect heating systems	Active systems (Direct Circulation Systems, Indirect Water Heating Systems, Pool Heating Systems)		
9	3	Learn about renewable energy storage systems	Heat storage systems (Air System Thermal Storage, Liquid System Thermal Storage, and Thermal Analysis of Storage Systems).		
10	3	Learning how to design the module and array and know the auxiliary devices and equipment in renewable energy systems	Module and array design (module design, and array Design) Differential temperature controller, Placement of Sensors		
11	3	Calculating the amount of hot water required and knowing the practical requirements for renewable	Hot water demand Practical considerations (pipes, supports, insulation, pumps, valves, and		

		energy systems	instrumentation).		
12	3	Calculating the heating and cooling load of buildings	Solar Heating and Cooling Calculation of heat load		
13	3	Heating and cooling buildings with solar energy	Solar space heating and cooling (Space heating and service hot water, Air systems, Water systems, Location of auxiliary heater, Heat pump systems) Solar cooling (Adsorption units, Absorption units) Solar cooling with absorption refrigeration		
14	3	Learn about solar heating processes for industrial purposes	Industrial Process Heat (Solar industrial air and water systems, Solar steam generation systems) Chemistry Applications (Reforming of fuels, Fuel cells, Materials processing, Solar detoxification)		
15	3	Knowing the types, features	Solar Dryers (Active Solar		

		and characteristics of solar dryers and greenhouses	Energy Dryers, Passive Solar Energy Dryers Greenhouses and Greenhouse materials.		
16	3	Knowledge of the types, features and characteristics of water desalination systems and solar desalination processes	Solar Desalination Systems, Desalination processes Direct collection systems (Classification of Solar Distillation Systems, Performance of Solar Stills)		
17	3	Learn about solar cells, their working principle, and the components of the solar electrical generation system	Solar cells, Structure of Photovoltaic PV System		
18-19	3	Knowledge of the components and characteristics of the solar generation system and the hybrid system	Design of PV system Hybrid PV/T systems and applications		
20	3	Knowledge of the components, characteristics and working principle of	Solar Thermal Power Systems (Parabolic trough collector systems, Power tower systems)		

		solar thermal electricity generation systems			
21	3	Knowledge of the components, characteristics and working principles of dish collector systems and solar ponds	Solar Thermal Power Systems (Dish systems, Solar ponds)		
22	3	Learn about the basics of wind energy, wind turbines, and the aerodynamics of rotors and wind turbines	Introduction to Wind Energy Power available in the WE Wind turbine WT power and torque Classification of WTs (Horizontal axis WTs, Vertical axis WTs) Characteristics of wind rotors Aerodynamics of WTs (Airfoil, Aerodynamic theories)		
23	3	Know how to design a wind turbine rotor and how to analyze wind data	Rotor design - Rotor performance Analysis of wind data		
24	3	Learn the characteristics and advantages of wind conversion systems and	Wind energy conversion systems Wind electric generators (Tower, Rotor, Gear box, Power		

		wind generators	regulation, Safety brakes, Generator) Wind farms, Offshore wind farms Wind pumps - Wind water heater		
25	3	Know the characteristics of wind energy conversion, power curve, and capacity factor in wind energy	Performance of wind energy conversion system Power curve of wind turbine Capacity factor		
26	3	Learn about power generation from water and water turbines	Introduction, Water Cycle Water Turbines		
27	3	Identify the characteristics, features and working principle of hydropower stations	Hydropower Plants (Run - of - River Power Plants, Storage Power Plants, Pumped - Storage Power Plants) system design		
28	3	Knowledge of bioenergy and its use in heat and electricity generation plants	Tidal Power Plants, Wave Power Plants		
29	3	Learn about geothermal power plants, their characteristics	Introduction to bioenergy (biomass, biogas, biofuel) Biomass Heating		

		and the principle of their operation	(Wood as a Fuel, Fireplaces and Closed Wood burning Stoves, Wood Pellet Heating) Biomass Heat and Power Plants		
30	3	Identify tidal energy and wave energy, their characteristics, and their principle of operation	Introduction to geothermal energy Geothermal Plants (Geothermal Heat Plants, Geothermal Power Plants), Geothermal Heat pump		

141. 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

142. Learning and Teaching Resources

Required textbooks (curricular books, any)	1- Soteris Kalogirou , 2009 “ solar energy engineering – processes and systems “ 1st Ed. Elsevier Inc. , USA 2- Sathyajith Mathew, 2006 , “ Wind Energy , Fundamentals , Resource Analysis and Economics “, Springer , Netherlands . 3- Volker Quaschnig , 2010 ,” Renewable energy and climate change “ John Wiley & Sons, Ltd.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

143.	Course Name:		
	Electrical installations 2		
144.	Course Code:		
	KTED125		
145.	Semester / Year:		
	Annual (first and second semester) / second year		
146.	Description Preparation Date:		
	2025/2/28		
147.	Available Attendance Forms:		
	Daily attendance is mandatory		
148.	Number of Credit Hours (Total) / Number of Units (Total)		
	120 hours / 8 units		
149.	Course administrator's name (mention all, if more than one name)		
	Name: Zuhair Ramzi Khalil Email: zuhair.abdujaleel@atu.edu.iq		
150.	Course Objectives		
Course Objectiv	1 Knowing how to use electrical installation tools, power unit components and devices involved in the operation. Buildings such as heating, elevators, lightning rods and hazardous areas. 2 Calculating the voltage drop values in the electrical power transmission wires. 3 How to choose electrical cables and identify faults in them. 4. Knowing the methods of implementing electrical projects, preparing estimated statements, and bills of quantities.		
151.	Teaching and Learning Strategies		
Strategy	1 Theoretical lectures and practical applications 2 Presentations		

- 3 Evaluating students individually by giving them the opportunity to participate in the classroom by answering questions**
- 4 Evaluating students collectively through daily exams with practical and theoretical questions**
- 5 Exams for the first and second semesters and final exams for the first and second rounds**
- Using modern methods to present the theoretical and practical aspects, such as electronic projectors that attract the attention of students so that the idea is better conveyed to the student**
- 7. Giving students classroom assignments that require the effort of their personal and psychological skills through optional methods.**
- 8. Questioning students through discussion groups by asking intellectual questions such as how, why, when.**
- Specific topics.**
- 9.Using brainstorming and feedback to activate students' accumulated experiences, linking the subjects they have learned in previous academic stages with new ones.**
- 10. Providing students with practical skills through practical applications.**

152. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	theUnit Topic	Cables - Cable Components and Voltage Lectures + - Operation, Types of Cables According to the Type Practical Applications	Lectures + Practical Applications	Live Assessment + Exams

			Insulator))M.L.M.P.V.C.T.R.S.VRI and Paper Cables with a Lead Sheath		
2	4	the Unit Topic	Methods of cables, faults that may occur in cables, how to determine the type and location of the fault.		
3	4	the Unit Topic	Protection of electric motors, protection against overcurrents resulting from overcurrent Lectures + Practical Applications Short circuit		
4	4	the Unit Topic	Protection against overcurrents resulting from increased load		
5	4	the Unit Topic	Protection against the disappearance or loss of one of the phases and protection against voltage drops		
6	4	the Unit Topic	Reality: The electrical circuit, its types. And oil, sulfur fluoride circuit breaker. Discharge breakers, power circuit breakers)		
7	4	the Unit Topic	Substations, vertical busbars, air pressure switchboard, classification, AC control panels		
8	4	the Unit Topic	Excitation, foundations of optical engineering, light sources, lighting systems and their quality, light		

			measuring devices		
9	4	theUnit Topic	Solved questions on how to design and calculate electrical lighting for halls workshops and yards		
10	4	theUnit Topic	Grounded system and isolated system comparison in case of fault, equal		
11	4	theUnit Topic	Voltage drop in single-phase and three-phase feeders, meaning of voltage drop, causes of voltage drop, damage resulting from voltage drop, testing the sizes of cable feeders (factors on which current rates depend)		
12	4	theUnit Topic	Solved questions on voltage drop calculations		
13	4	theUnit Topic	Technical methods of wiring, study of the wiring system, wiring methods, and the methods used for that		
14	4	theUnit Topic	Establishing Dangerous Places Examples For Dangerous Places (Privacies Establishing in Dangerous Places and the Steps to Take for That		
15	4	theUnit Topic	Grounding, Types, Installation		

			Grounding Conductors for Substations and Buildings and Lightning Arrester		
16	4	theUnit Topic	Definition of electrical energy expenditures Pricing (fixed and variable costs) Energy expenditure calculation systems and pricing systems of all kinds		
17	4	theUnit Topic	Energy meters, three-phase energy meter, its internal components and errors that occur in it, methods of connecting the meter, power factor measuring device, its components and theory of operation		
18-19	4	theUnit Topic	Power factor, the importance of improving the power factor, methods of improving the power factor, solved examples on how to calculate the power factor Electric heating, general methods of heat transfer, methods of heat transfer, types of heaters, leakage through walls, heat transfer coefficient of materials, thermal insulation, points to be taken into account when calculating spaces and rooms		

20	4	theUnit Topic	Solved examples of heating		
21	4	theUnit Topic	Electric elevators, choosing the location of the elevator, choosing its type, and the tests that must be followed when choosing an elevator for a specific service (capacity, required specifications, speed), calculating travel time, elevator efficiency, and type of service.		
22	4	theUnit Topic	Types of elevators: passenger, freight, and service elevators. The main components of the elevator: the driver or the rotator, the motor, the stops, the car, the balance load, the indicators, the controllers, and the safety devices.		
23	4	theUnit Topic	Build the intake motor and reduction ratio.		
24	4	theUnit Topic	Stop group, signaling system associated with the ascent and descent of the elevator		
25	4	the Unit Topic	Types of motors used in Elevators: Specifications, Speed Regulation for AC and DC motors		
26	4	the Unit Topic	Safety Precautions and Friction Stops For sliding elevator, lower and upper springs		

			For elevator. Lighting		
27	4	the Unit Topic	Lightning arresters, how lightning occurs and is discharged, specifications for good implementation of lightning arresters, protecting buildings and facilities from lightning.		
28	4	the Unit Topic	Solved examples of circuit calculations lightning rod		
29	4	theUnit Topic	Project implementation methods, tenders and their requirements, tender analysis and the foundations on which the tender is based.		
30	4	theUnit Topic	Estimation, its types, methods of conducting it, estimating the materials needed for a foundation work and the amounts required. Factors affecting the cost of engineering work.		

153. Course Evaluation

First Semester Exams

10 marks - Theoretical

10 marks - Practical

5 marks – Evaluation

Second Semester Exams

10 marks - Theoretical

10 marks - Practical

-5- Assessment (Daily Tests)

Final Exam	
40 marks - Theoretical	
10 marks - Practical	
154. Learning and Teaching Resources	
Required textbooks (methodology any)	Methodical books
Main references (sources)	References related to the subject and available the Institute's library
Supporting books and references recommended by scientific journals, reports...)	1- Electrical wiring of buildings (by Raphael & Neidle) 2- Electrical lifts by Rs. Philips 3- Practice on low voltage switch gears (by Siemense Publication)
Electronic references, websites	Institute website, various Internet sources websites of international companies

Course description form

155.	Course name
	Baath regime crimes in Iraq
156.	Course Code
157.	Semester/ year
	Annual system
158.	The date this description was prepared is
	2025/5/4
159.	Available forms of attendance for the second stage

weekly					
160. Number of study hours / Number of units (total)					
2 units 30 hours					
161. Name of the course administrator (if more than one name is (mentioned					
Talal Muzaffar Ghazi					
162. objectives Course					
1- Enabling students to understand the crimes of the Ba'ath regime, as documented by the Iraqi Supreme Court in 2005. 2- Enabling students to understand the types of international crimes. 3- Enabling students to understand violations of Iraqi laws.			Objectives of the study subject		
163. Teaching and learning strategies					
1_ Explanation 2_ Brainstorming 3_ Dialogue and Discussion 4_ Using References and Sources 5_ Using Modern Teaching Methods					The strategy
164. Course structure					
Evaluation method	Learning method	Name of the unit or topic	Required learning outcomes	hours	the week
oral test	a lecture	Concept Crimes . And its sections	knowledge And meaning And what it is Crimes And her	2	1

			relationship With others from Threads What are the crime ?sections throw lecture And a question Students on the topic knowledge And inquiry on to understand Students For the topic		
oral test	a lecture	identification the crime language And . terminologically	knowledge And meaning And what it is identification the crime language And terminologically Independently throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic	2	2
oral test A written test	a lecture discussion	. Sections Crimes Sections and types of crimes of the Baath regime	knowledge And all what Regard with it The crimes of the Baath regime in Iraq throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2 2	3 4
oral test	a lecture	crimes System Resurrection according to documentation Law The court Criminal Iraqi Supreme 2005 – ... AD	knowledge And all what Regard with it The crimes of the Baath regime in Iraq and what are their types throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	5

oral test	a lecture	Crimes . International	crimes knowledge System Resurrection according to documentation Law The court Criminal _ Iraqi Supreme 2005 lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	6
oral test	a lecture	Species Crimes . International	knowledge International crimes throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	7
oral test	a lecture	Decisions Outgoing from The court Criminal The upper . one	Decisions knowledge Outgoing from The court Criminal The . upper one throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	8
oral test	a lecture	Crimes Mental And social And its effects, And highlighted Violations the system Baathist in Iraq	knowledge crimes Relationship In Mental And social Iraq, throwing lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request	2	9

			Preparation from Students		
A written test	discussion	Crimes Mental	knowledge Mechanisms Crimes Psychological effects Crimes Mental throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	10
oral test	a lecture	Mechanisms . Crimes Mental	Identify on factors Military Society and position the system Baathist from Debt throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	11
oral test	discussion	antiquities Crimes Mental	Violations Identify on rights Human throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	12
oral test	a lecture	Crimes Social	Political And Identify the military For system throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And	2	13

			inquiries on the topic with to request Preparation from Students		
oral test	a lecture	Militarization the society	Places Identify on Prisons And detention For system Resurrection crimes Cemeteries throwing Collective lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	14
oral test	a lecture	position the system Baathist from Debt	Crimes Identify Environmental lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	15
A written test	discussion	Violations Laws . Iraqi	pollution knowledge The warlike And radiological And an explosion Mine throw lecture And a question Students on the topic knowledge And inquiry on to understand Students For the topic	2	16
oral test	a lecture	photo Violations rights Human And . crimes Authority	knowledge And meaning And what it is Crimes And her relationship With others from Threads What are the crime ?sections throw lecture And a question Students on the topic knowledge And inquiry on to understand Students For the topic	2	17

oral test	discussion	some decisions Violations Political And the military For system . Resurrection	knowledge And meaning And what it is identification the crime language And terminologically Independently throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic	2	18
oral test	a lecture	Places Prisons And detention For system Resurrection	knowledge And all what Regard with it The crimes of the Baath regime in Iraq throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	19
oral test	a lecture	Crimes Environmental For system Resurrection in Iraq	knowledge And all what Regard with it The crimes of the Baath regime in Iraq and what are their types throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	20
oral test	a lecture	pollution The warlike And radiological And an . explosion Mines	crimes knowledge System Resurrection according to documentation Law The court Criminal _ Iraqi Supreme 2005 lecture And a question Students on the topic Subtract questions on Students and give the	2	21

			time For students To subtract questions And inquiries on the topic with to request Preparation from Students		
A written test	discussion	destruction the cities And the villages Policy the . earth Scorched	knowledge International crimes throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	22
oral test	a lecture	. drying Marshes	drying knowledge Marshes lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	23
oral test	discussion	Scrapping Orchards Palm And trees . And crops	Economic In Iraq, throwing lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	24
oral test	a lecture	crimes Cemeteries . Collective	The knowledge regime's crimes against the people are shed lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	25

oral test	a lecture	events Cemeteries Extermination Collective committed from the system Baathist in Iraq	Identify on factors Military the throw society lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	26
oral test	a lecture	Category Timeline For graves Extermination Collective in Iraq For the period 1963 AD - 2003 AD	Violations Identify on rights Human throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	27
oral test	discussion	Cemetery sites in Iraq	Cemetery Identify sites For system throw lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	28
A written test	a lecture	Preparing and distributing cemeteries in Iraq	Places Identify on Cemeteries and detention For system Resurrection crimes Cemeteries throwing Collective lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	29

oral test	a lecture	Mass graves martyrs database	Martyrs Identify cemeteries lecture And a question Students on the topic Subtract questions on Students and give the time For students To subtract questions And inquiries on the topic with to request Preparation from Students	2	30

165. Course evaluation

Distribution of the grade out of 100 according to the tasks assigned to the student, such as daily preparation, daily, oral, monthly, written exams, reports, etc

marks monthly exam 40

marks for daily and oral preparation and report writing 10

final exam score 50

166. Learning and teaching resources

Ihsan Hindi, Military Occupation	Required textbooks (methodology, if any)
undi Abdul Malik, Criminal Encyclopedia	Main references (sources)
Mass Graves in Iraq by Human Rights Watch	Recommended supporting books and references (scientific journals, reports....)
The Book: The Cognitive Foundation for Studying Baath Party Crimes in Iraq, by Dr. Qais Nasser and Professor Abdul Hadi Maatouq	Electronic references, Internet sites

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.

Educational institution	Al-Furat Al-Awsat Technical University / Karbala Technical Institute
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Scientific department/center	Renewable Energy technique - second stage
1- Course name/code	Control and Measurement
2- Instructor's name	Lect. Dr. Mohammed Omar Ali
3- Email	mohammad.ali@atu.edu.iq
4- Academic title	Lecturer
5- Attendance forms available	Attendance
6- Semester / year	Annual
7- Number of study hours (total)	120 hours (60 theoretical hours + 60 practical hours)
8- Date this description was prepared	1/9/2024

9- Course objectives:

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:

- 1- Preparing the student to recognize electronic components manufactured from semiconductor materials.
- 2- Preparing the student to learn about the analysis of electronic circuits for power electronics systems.
- 3- Identify the applied circuits of power electronics systems.
- 4- Preparing human cadres who possess technical qualifications

that enable them to enter the labor market efficiently.

- 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.
- 6- Meeting the requirements of the labor market with modern, technical methods.
- 7- The specialty aims to graduate competent personnel equipped 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	Lectures + Practical applications	Daily, monthly, and annual exams

			transistors) pevison of single-phase rectifier circuits by using diodes.		
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 the use of a transistor as a switch	Using the transistor as switch, regions of operation, transistor as a switch (cut off and saturation).	Lectures + Practical applications	Daily, 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 a separate 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 a multivibrator and a monostable multivibrator, photo conduction cells, photo diodes.	Lectures + Practical applications	Daily, monthly, and annual exams
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	Thyristor conduction methods,	Lectures +	Daily, monthly,

		thyristors	conduction throw the gate minimum gate current causing conduction, conduction time, conduction due to high forward voltage rectifier (dv/dt)	Practical applications	and annual exams
11	5	Learn about Diac and Triac	DIAC, TRIAC characteristics, practical applications, thyristor, triggering methods, triggering on DC and AC current, pulse triggering types	Lectures + Practical applications	Daily, monthly, and annual exams
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 , output voltage equations	Lectures + Practical applications	Daily, monthly, and annual exams
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 phase inverters, output voltage waveform with, triggering pulses	Lectures + Practical applications	Daily, monthly, and annual exams

			and equations.		
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	Lectures +	Daily, monthly,

			constant ratio of variation frequency and voltage.	Practical applications	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 control .	Lectures + Practical applications	Daily, monthly, and annual exams

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 & Rlginborthan) Mc – Graw – Hill المصدر للمادة العملية - Electrical Technology (Edward Huges) - Basic Electrical Engineering - الكترونييات في خدمة التطبيقات الكهربائية ترجمة

	الدكتور سمير رستم • Power electronics handbook, Third edition, Muhammad H. Rashid, Elsevier, 2011. • دليل المهندس والفني في العناصر الكهربائية والإلكترونية، محمد قاسم، شعاع للنشر والعلوم، 2012. • Power Electronics Basics, Yuriy Rozanov, Sergey E. Ryvkin, Evgeny Chaplygin, Pavel Voronin, CRC Press, 2015 • Introduction to Power Electronics, Paul H. Chappell, Artech House, 2014.
2- Electronic references and websites	• Various Internet sources
3- Recommended books and references (scientific journals, reports)	• مشروع كتاب الدوائر والقياسات • مبادئ علم الهندسة الكهربائية / دكتور محمد زكي – دكتور مظفر النعمة • ملزمة الدوائر والقياسات العملي • Advanced industrial electronics by morris • Thyristor engineering by B.B. berde • الكترونيات القدرة (تأليف الدكتور مظفر أنور النعمة)

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

Course description form

Course Description: Photovoltaic Systems

This course provides a comprehensive overview of photovoltaic (PV) systems, including the principles of solar energy conversion, PV cell and module technologies, system components, and design methods. Students will gain both theoretical understanding and practical experience through lectures and laboratory sessions focused on sizing, designing, and analyzing standalone and grid-connected PV systems.

Educational institution	Al-Furat Al-Awsat Technical University / Karbala Technical Institute
Scientific department/center	Renewable Energy technique - second stage
10- Course name/code	Photovoltaic Systems
11- Instructor's name	Lect. Dr. Mohammed Omar Ali
12- Email	mohammad.ali@atu.edu.iq
13- Academic title	Lecturer
14- Attendance forms available	Attendance
15- Semester / year	Annual
16- Number of study hours (total)	120 hours (60 theoretical hours + 60 practical hours)
17- Date this description was prepared	15/09/2024

18- Course objectives:

This course aims to provide Analyze the physical principles of PV cell operation, including the photovoltaic effect, I-V characteristics, and efficiency factors, Understand the role and specifications of system components such as PV modules, inverters, batteries, charge controllers, and mounting structures, Model and simulate PV system performance under varying environmental and load conditions using appropriate software tools. One of the objectives of this course in the educational institutions attended by students is:

- 8- Understand the fundamental physics of solar radiation and PV conversion.
- 9- Describe the construction and characteristics of PV cells and modules.
- 10- Analyze PV system components including inverters, batteries, and charge controllers.
- 11- Design and evaluate standalone and grid-connected PV systems.
- 12- Use simulation tools and perform measurements in real PV setups.

11- 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.

12- Course outcomes and teaching, learning and evaluation methods

E- Cognitive objectives:

7. A strong interest in renewable energy, particularly photovoltaic systems, with a proactive attitude toward learning new technologies and their real-world applications.
8. Ability to analyze technical problems, interpret data from PV systems, and apply engineering principles to develop effective solutions.
9. Engagement in lectures, discussions, and laboratory sessions through questioning, collaboration, and hands-on experimentation.
10. Competency in using engineering tools such as circuit simulators,

PV design software (e.g., PVsyst, MATLAB), and basic instrumentation.

11. Commitment to academic integrity, lab safety, and an ethical approach to sustainable engineering practices and environmental awareness.
12. The student will be able to present a clear and comprehensive picture of occupational safety and protection methods.

F- 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.

G- 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

H- 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	4	Introduction to Renewable energies.	Define renewable and non-renewable energy sources, Identify different types of renewable energy systems.	Lectures + Practical applications	Daily, monthly, and annual exams
2	4	Types and properties of Solar PV Cells.	Understand the working principle of a photovoltaic cell, Compare the structural, electrical, and material properties of various PV cells.	Lectures + Practical applications	Daily, monthly, and annual exams
3	4	Principle operation of PV cell.	Understand the generation of electric current in a material when exposed to light.	Lectures + Practical applications	Daily, monthly, and annual exams
4	4	Equivalent circuit of PV cell.	Analyze performance under various conditions, Simulate PV behavior in	Lectures + Practical applications	Daily, monthly, and annual exams

			software.		
5	4	Open Circuit Voltage and Short Circuit Current.	Calculate Fill Factor (FF), Estimate Maximum Power Point (MPP), Design protection devices (e.g., circuit breakers)	Lectures + Practical applications	Daily, monthly, and annual exams
6	4	Maximum Power Point (MPP).	Operating at MPP maximizes system efficiency and energy harvest, Environmental conditions constantly change (irradiance, temperature), so the MPP also shifts.	Lectures + Practical applications	Daily, monthly, and annual exams
7	4	Characteristics of PV cell (power output, efficiency and filling factor).	Plot I-V and P-V curves under different irradiance and temperature, Compare results across different PV technologies	Lectures + Practical applications	Daily, monthly, and annual exams
8	4	Parallel and Series Solar Cells.	Observe effects of partial shading on a series-connected string, Compare I-V and P-V characteristics of each configuration.	Lectures + Practical applications	Daily, monthly, and annual exams
9	4	Effect of environmental parameters on PV cell operation (solar radiation, temperature, dust and	Compare I-V curves before and after cleaning a panel, simulate shading using obstacles; measure power drop and hot spot formation.	Lectures + Practical applications	Daily, monthly, and annual exams

		shadow).			
10	4	Advantages of diodes (Bypass and blocking diodes).	Identify when and where to use bypass vs blocking diodes, Understand diode symbols, orientation, and effects in circuit diagrams.	Lectures + Practical applications	Daily, monthly, and annual exams
11,12	4	Batteries (advantage, types, connection and reasons of damage).	Stores excess energy generated during the day for use at night or during outages, Provides uninterrupted power during grid failures.	Lectures + Practical applications	Daily, monthly, and annual exams
13,14	4	Inverter (principle, on grid, off grid, and grid tied with battery backup.	Synchronizes with the utility grid and feeds excess solar power back to the grid.	Lectures + Practical applications	Daily, monthly, and annual exams
15	4	Solar controller charger (principle, MPPT, PWM, Built in).	The primary function of a solar charge controller is to regulate the voltage and current coming from the solar panels to ensure that the batteries are charged in the most efficient and safe manner.	Lectures + Practical applications	Daily, monthly, and annual exams
16	4	Solar Cables (types and selection).	Selecting the right cables is crucial to the overall performance,	Lectures + Practical applications	Daily, monthly, and annual

			efficiency, and safety of a photovoltaic system.		exams
17	4	Saving of PV system components (saving modules, inverter, charger and battery).	Proper cleaning of the solar panels to prevent dust, debris, and dirt buildup which can reduce efficiency, Use of protective coatings or installation methods to safeguard against environmental wear such as moisture, hail, or extreme weather.	Lectures + Practical applications	Daily, monthly, and annual exams
18	4	PV module, PV array and Photovoltaic System Types.	Understand the construction and function of PV modules, distinguish between different types of PV technologies, classify various types of PV systems based on their configuration and application.	Lectures + Practical applications	Daily, monthly, and annual exams
19,20	4	Standalone Systems (Off grid) or Isolated Systems.	Understand the structure and function of standalone PV systems, Apply sizing techniques	Lectures + Practical applications	Daily, monthly, and annual exams

			and safety standards for isolated installations.		
21,22	4	Network Connected Home Systems (Possibility for Own Consumption).	Understand the architecture and function of home-based grid-connected PV systems, Design PV systems optimized for residential consumption with or without storage.	Lectures + Practical applications	Daily, monthly, and annual exams
23,24	4	Network-Connected Photovoltaic Systems (On grid).	Understand the configuration and components of on-grid PV systems, Assess the economic and environmental benefits of on-grid systems.	Lectures + Practical applications	Daily, monthly, and annual exams
25,26	4	Hybrid Systems. Independent Systems for Economic Purposes.	Differentiate between standalone, hybrid, and grid-connected PV systems, Understand the design and components of hybrid renewable energy systems.	Lectures + Practical applications	Daily, monthly, and annual exams
27,28	4	Network Connected Solar Power Plants (Farms).	Understand the design and operation of large-scale grid-connected solar farms, Explain the technical	Lectures + Practical applications	Daily, monthly, and annual exams

			requirements for interconnecting solar farms to the grid.		
29,30	4	Power Factor calculation and improvement.	Define power factor and explain its significance in electrical systems, Identify causes of low power factor in PV and conventional systems.	Lectures + Practical applications	Daily, monthly, and annual exams

14- Course structure	
4- Main references (sources)	• James P. Dunlop, <i>Photovoltaic Systems</i>, American Technical Publishers, Latest Edition. • A widely used textbook that covers PV fundamentals, components, and system design with practical examples. • Roger A. Messenger and Jerry Ventre, <i>Photovoltaic Systems Engineering</i>, CRC Press, 3rd Edition. • Focuses on the engineering aspects of PV systems, including performance analysis and design. • Solar Energy International (SEI), <i>Solar Electric Handbook: Photovoltaic Fundamentals and Applications</i>, SEI, Latest Edition.

	• A practical guide with a strong focus on real-world PV installation and system design practices. • Duffie, J. A., & Beckman, W. A., <i>Solar Engineering of Thermal Processes</i>, Wiley, 4th Edition. • Useful for understanding solar radiation and energy modeling concepts.
5- Electronic references and websites	• Various Internet sources
6- Recommended books and references (scientific journals, reports)	• Solar Energy – Elsevier • Publishes research articles on solar radiation, materials for solar cells, and system performance. • Progress in Photovoltaics: Research and Applications – Wiley • High-impact journal covering advanced research in PV technologies and applications. • Renewable Energy – Elsevier • Covers broader renewable topics, including photovoltaic systems and hybrid energy solutions. • IEEE Journal of Photovoltaics – IEEE • Peer-reviewed journal focused on the science and engineering of PV systems.

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