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


# Academic Program and Course Description Guide

**2024**

# 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 System

Description Preparation Date: 27/03/2024

File Completion Date: 31/03/2024

Signature:

Head of Department Name:

Asst. Prof. Dr. Hakim Tarteeb Kadhim

Date: 31.3.2024

Signature:

Scientific Associate Name:

Asst. Prof. Dr. Layth Hasan Jawad

Date: 31.3.2024

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Asst. Prof. Ali Neamah Hasan

Date:

Signature:

Fadhil M Dahir

3-4-2024

Approval of the Dean

Prof. Dr. Fadhil M. Dahir

## 1. Program Vision

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

## 2. Program Mission

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

## 3. Program Objectives

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

## 4. Program Accreditation

NON

## 5. Other external influences

NON

## 6. Program Structure

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

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

## 7. Program Description

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

| 8. Expected learning outcomes of the program | |
|---|---|
| **Knowledge** | |
| Learning Outcomes 1 | Learning Outcomes Statement 1 |
| **Skills** | |
| Learning Outcomes 2 | Learning Outcomes Statement 2 |
| Learning Outcomes 3 | Learning Outcomes Statement 3 |
| **Ethics** | |
| Learning Outcomes 4 | Learning Outcomes Statement 4 |
| Learning Outcomes 5 | Learning Outcomes Statement 5 |

| 9. Teaching and Learning Strategies |
|---|
| There are several strategies followed in the department, which are: Developed lecture - brainstorming - in-person and electronic education - discussion circles - exploration education - discussion strategy - cooperative education - public speaking strategy - human development courses for students |

| 10. Evaluation methods |
|---|
| Daily exams – questions during the lecture – extracurricular activities – final exams |

**11. Faculty**

**Faculty Members**

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

| | | | | | | |
|---|---|---|---|---|---|---|
| | كيماوية | هندسية | | | | |
| مدرس | **مكائن والات زراعية** | **مكائن والات زراعية** | | | 1 | |
| مدرس مساعد | ميكانيك قوى | حراريات | | | 1 | |
| مدرس مساعد | علم فيزياء | بصريات الكترونية | | | 1 | |
| مدرس مساعد | هندسة ميكانيكية | مكائن هيدروليكية | | | 1 | |
| مدرس مساعد | علوم سياسية | علاقات دولية | | | 1 | |
| مدرس مساعد | هندسة كهربائية | قدرة | | | 1 | |
| مدرس مساعد | هندسة كهربائية | اتصالات | | | 1 | |

| **Professional Development** |
|---|
| **Mentoring new faculty members** |
| The number of teachers in the department is 9 with different academic titles, and there is a part-time teacher |
| **Professional development of faculty members** |
| The department's need for postgraduate studies, master's or doctoral studies, is updated annually according to the department's plan |

| 12. **Acceptance Criterion** |
|---|
| Central admission – scientific academy |

| 13. **The most important sources of information about the program** |
|---|
| Scientific Division |

| 14. Program Development Plan |
| --- |
| 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 | | Electronic | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | Mathematic | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | | English Language | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Second stage | | Power electronics | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

- **learning outcomes under evaluation.**

# Course Description Form

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

| | |
|---|---|
| **Strategy** | **1- Acquiring the ability and skill to recognize and deal with mathematical expressions and sentences.**<br>**2- Introducing students to the principles of applying exercise solutio and mental development while working.**<br>**3- Acquiring the skill of distinguishing between relationships and functions and linking them.**<br>**4- Dealing with arrays.**<br>**5- Using counting principles.** |

| | |
|---|---|

## 10. Course Structure

| Week | Hours | Required Learning Outcomes | Unit or subject name | Learning method | Evaluation method |
|---|---|---|---|---|---|
| first 1 | 2 hours | **The student's ability to understand problem solving and apply it in the field of w** | **Matrices / determinants / and their properties** | Theoretical | By understanding t material, solving exercises, general questions, and discussion. |
| first 2 | 2 hours | **The student's ability to understand problem solving a apply it in the field of work** | Solving linear equations - Cramer's method - applications to determinants | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 3 | 2 hours | **The student's ability to understand problem solving and apply it in the field of work** | **Use the compensation method to find the value of currents in a multi-sourc electrical circuit.** | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 4 | 2 hours | **The student's ability to understand problem solving and apply it in the field of work** | Vectors / Vector analysis / Vector and scalar quantities / Vector algebra (direct and scalar multiplication. | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 5 | 2 hours | **The student's ability to understand problem solving and apply it in the field of work** | Scalar multiplication of vectors using angle/scalar multiplication | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 6 | 2 hours | **The student's ability to understand problem solving and apply it in the field of work** | **For vectors using coordinates Function/trigonometric functions Calculating angles between vectors** | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 7 | 2 hours | **The student's ability to understand problem solving and apply it in the field of work** | **Trigonometric relations/logarithmic functions** | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 8 | 2 hours | **The student's ability to understand problem solving and apply it in the field of w** | Exponential function/hyperbolic functions Objectives / Objectives of algebraic and trigonometric functions | Theoretical | By understanding the material, solving exercises, general questions, and discussion. |
| first 9 | 2 hours | **The student's ability understand problem sol and apply it in the field of w** | Applications to goals. Differentiation/derivative/derivative of algebraic functions | Theoretical | By understanding the material, solving exercises, general |

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

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

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

## 11. Course Evaluation

1- Daily surprise and continuous weekly tests.

2- Exercises and activities in the classroom.

3- Directing students to some websites to benefit from them.

4- Daily exam by solving exercises.

5- Semester exam.

6- Weekly duties.

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

## 1. Learning and Teaching Resources

| | |
|---|---|
| Required textbooks (curricular books, if any) | ● Applied Mathematics Author: Yacoub Sabba<br>● Schaum series (solving electrical circuits).<br>• Methods of solving differential equatio Author: (Khaled Ahmed Al-Samarei |
| Main references (sources) | ● Calculus (Thomas)<br>● Laplace Transformation)<br>• Various Internet sources |
| Recommended books and references (scientific journals, reports…) | |
| Electronic References, Websites | |

# Course Description Form

| |
|---|
| 1. Course Name: |
| Electronics |
| 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<br>Email ali.shakir@atu.edu.iq |
| 8. Course Objectives |

| | |
|---|---|
| **Course Objectives** | Make the student know<br>• Atomic structure of materials<br>• Knowing the transfer of electrons between energy Bands<br>• 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<br>- cooperative education –<br>public speaking strategy<br>Human development courses for students |

10. Course Structure

| Week | Hours | Required Learning Outcomes | Unit or subject name | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 2-1 | 3 | The student should know the atomic structure and semiconductors | Semiconductor theory and atomic structure | listen 'debate Blended learning - da questions | Assess daily homework Reports Exams |
| 4-3 | 3 | The student knows energy | Energy levels and conductivity | listen 'debate Blended learning - da | Assess da homework Reports |

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

| | | | | | |
|---|---|---|---|---|---|
| 16-15 | 3 | The student shoul know how a zener diode works and how it differs from diode Ordinary du | zener diode and application | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 18-17 | 3 | The student shoul know Emitting dio To the light and th recipient of the lig | Emitting diode To the light and the recipient of the ligh | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 20-19 | 3 | To know the stude The mechanism o action of the Schottky, tunnel and pin valve | Schottky diode And the tunnel and the pin | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 22-21 | 3 | The student shoul know the structure Transistor And als Aries line | Transistor and equivalent circuit - Continuous load lir | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 24-23 | 3 | To know the stude Use of transistor i Magnify small signals How to connect the equivalent alternating circuit | transistor in Magni small signals How connect the equivalent alternating circuit | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 26-25 | 3 | To know the stude Using a transistor voltage regulation | transistor in voltage regulation | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 28-27 | 3 | The student shoul know how to connect bias circu | Bias circuits Practical examples | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| 30-29 | 3 | To know the stude Phototransistor structure, operatic and practical applications | Phototransistor structure, operation and practical applications | listen 'debate Blended learning - da questions | Assess da homework Reports Exams |
| | | | | | |

| 11.Course Evaluation | |
|---|---|
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | |
| First semester | Second semester |

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

# Course Description Form

1. Course Name: English Language

2. Course Code:

3. Semester / Year: First year

4. Description Preparation Date: 25/12/2023

5. Available Attendance Forms: Abet

6. Number of Credit Hours (Total) / Number of Units (Total): 30 hours

7. Course administrator's name (mention all, if more than one name):

Name: Asst. Prof. Dr. Hakim Tarteeb Kadhim
Email: dw.hkm@atu.edu.iq

8. Course Objectives

| | |
|---|---|
| **Course Objectives** | The student is able to write in English<br>The student is able to speak in English |

9. Teaching and Learning Strategies

| | |
|---|---|
| **Strategy** | Teaching with PowerPoint<br>Using groups learning |

10. Course Structure

| Week | Hours | Required Learning Outcomes | Unit or subject name | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1 | 1 | Unit One : Hello , Greetings | Unit One : Hello , Greetings | Discussion and dialogue, group learning, PowerPoint | Oral tests |
| 2 | 1 | Unit One : Am, are, is , you, your , This is with practice in work | Unit One : Am, are, is , you, your , This is with practice in work | Discussion and dialogue, group learning, PowerPoint | Self-evaluati and evaluati of colleague |
| 3 | 1 | Unit Two: your world , Countries , adjectives, h she , it | Unit Two: your world , Countries , adjectives, h she , it | Discussion and dialogue, group learning, PowerPoint | Self-evaluati and evaluati 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-evaluati and evaluati of colleague |
| 5 | 1 | Unit Three: all about yo Negatives and questions | Unit Three: all about yo Negatives and questions | Discussion and dialogue, group learning, PowerPoint | Oral tests |
| 6 | 1 | Unit Three: Social expressions | Unit Three: Social expressions | Discussion and dialogue, group learning, | Self-evaluati and evaluati of colleague |

| | | | | | |
|---|---|---|---|---|---|
| | | | | PowerPoint | |
| 7 | 1 | Unit Four: Family and friends , Possessive ’s | Unit Four: Family and friends , Possessive ’s | Discussion and dialogue, group learning, PowerPoint | Self-evaluati and evaluati 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-evaluati and evaluati 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 an nationalities | Unit Five: the way I live Articles , Languages an 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 c frequency | Unit six: every day , present simple adverbs c 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 favorites 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 liv 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 grea time! , past simple , regu | Unit Ten : we had a grea time! , past simple , | Discussion and dialogue, group | Oral tests |

| | | | | | |
|---|---|---|---|---|---|
| | | and irregular verbs | regular and irregular ver | learning, PowerPoint | |
| 21 | 1 | Unit Ten: Speaking , Sport and leisure | Unit Ten: Speaking , Sport and leisure | Discussion and dialogue, group learning, PowerPoint | Oral and written tests |
| 22 | 1 | Unit Eleven: I can do tha , Can \ can't | Unit Eleven: I can do th , Can \ can't | Discussion and dialogue, group learning, PowerPoint | Self-evaluati and evaluati of colleague |
| 23 | 1 | Unit Eleven: I can do tha , Adverbs \ requests | Unit Eleven: I can do th , Adverbs \ requests | Discussion and dialogue, group learning, PowerPoint | Oral tests |
| 24 | 1 | Unit Twelve: please and thank you! , I'd like, son and any | Unit Twelve: please and thank you! , I'd like, son 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 continuou | Unit Thirteen: here and now , Present continuou | 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-evaluati and evaluatio of colleague |
| 28 | 1 | Unit Fourteen: It's time go , Future plans | Unit Fourteen: It's time go , Future plans | Discussion and dialogue, group learning, PowerPoint | Oral tests |
| 29-30 | 1 | Unit Fourteen: it's time go , Revision writing em and information letter | Unit Fourteen: it's time go , Revision writing en and information letter | Discussion and dialogue, group learning, PowerPoint | Oral tests |

| 11. Course Evaluation | | | | | |
|---|---|---|---|---|---|
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc | | | | | |
| First semester | | | Second semester | | |
| Attendance, assignments an tests 5% | Theoretical 20% | Practical 0% | Attendance, assignments and tes 5% | Theoretical 20% | Practical 0% |

| 12. Learning and Teaching Resources | |
|---|---|
| Required textbooks (curricular books, if any) | The prescribed book (Headway) |
| Main references (sources) | |
| Recommended books and references (scientific journals, reports...) | |

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| Electronic References, Websites | |

# 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.

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

| | |
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| **7- Number of study hours (total)** | **120 hours (60 theoretical hours + 60 practical hours)** |
| **8- Date this description was prepared** | **27/02/2024** |

## 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 transistors) pevison of single-phase rectifier circuits by using diodes. | Lectures + Practical applications | Daily, monthly, and annual exams |
| 2 | 5 | Identify three-phase rectifier circuits | Three phase rectifier circuits by using diodes, output voltage waveform, diode current waveform, output voltage equation in case of resistance lode. | Lectures + Practical applications | Daily, monthly, and annual exams |
| 3 | 5 | Learn about | Using the transistor | Lectures | Daily, |

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

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

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

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

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

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

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| | | | **control .** | **applications** | **annual exams** |

| **13- Course structure** | |
|---|---|
| 1- Main references (sources) | • Electrical Technology (Edward Hughes)<br>• Basic Circuits (A.M.F Brooks) Pergaman Press.<br>• Introduction to Electric circuits (M. Romanwitz) John Willy<br>• Basic Electrical Engineering (Fitzgerald & Rlgginborthan) Mc – Graw – Hill<br>• المصدر للمادة العملية<br>• Electrical Technology (Edward Huges)<br>• Basic Electrical Engineering<br>• الكترونيات في خدمة التطبيقات الكهربائية ترجمة الدكتور سمير رستم<br>• Power electronics handbook, Third edition, Muhammad H. Rashid, Elsevier,2011.<br>• دليل المهندس والفني في العناصر الكهربائية والالكترونية، محمد قاسم، شعاع للنشر والعلوم، 2012.<br>• Power Electronics Basics, YuriyRozanov, Sergey E. Ryvkin, EvgenyChaplygin, Pavel |

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| | Voronin, CRC Press, 2015<br>• 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<br>• مبادئ علم الهندسة الكهربائية / دكتور محمد زكي – دكتور مظفر النعمة<br>• ملزمة الدوائر والقياسات العملي<br>• Advanced industrial electronics by morris<br>• Thyristor engineering by B.B. berde<br>• 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