

**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**

2026

## **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: Southern Technical University.....

Faculty/Institute: Technical Institute of Amara....

Scientific Department: Electronic and communications technologies .....

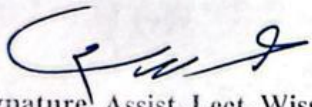
Academic or Professional Program Name: Diploma in electronics and communications technology.

Final Certificate Name: Diploma in electronic and communications technolog.

Academic System: quarterly

Description Preparation Date: 5/10/2025

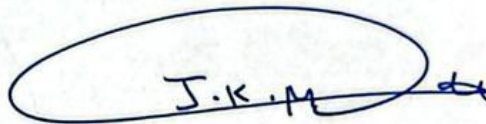
File Completion Date: 26/6/2026



Signature: Assist. Lect. Wissam Raheem  
Rasan

Head of Department Name:

Date: 11/8/2026



Signature: Dr. Jihad Kadhim  
Mohammed

Scientific Associate Name:

Date: 11/8/2026

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department: Assist. Lect.

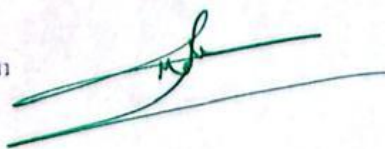
Akram Kareem Khudair

Date: 11/8/2026

Signature:



Approval of the Dean



### **1. Program Vision**

Forming a scientific or human base in the field of maintenance, programming and upkeep of electronic devices and computer applications. It seeks to prepare plans to develop staff and curricula to ensure that the requirements of quality standards are met, in addition to keeping pace with development and ready-made applications in order to contribute to achieving part of them, and for the department to be a distinguished scientific research edifice in its programs and curricula. And his scientific research.

### **2. Program Mission**

The department seeks to prepare specialized staff with a high level of professionalism to deal with electronic and information software and work to provide appropriate opportunities to develop the community's capabilities in investing in the developments in technology and meeting their needs in the field of computers, and providing training consulting services.

### **3. Program Objectives**

- 1- Preparing qualified technical personnel to maintain electronic equipment and devices.
- 2- Preparing and verifying the data and entering it into the computer.
- 3- Participate in testing, auditing and debugging programmed systems.
- 4- Participation in preparing communications system designs.

#### 4. Program Accreditation

None

#### 5. Other external influences

1-Application + research projects + ongoing workshops for students.

2- Also, external influences contribute to solving many of the dilemmas related to approved studies.

3- Labor market needs, quality of graduates, and support of students' skills.

#### 6. Program Structure

| Program Structure        | Number of Courses                  | Credit hours | Percentage | Reviews*                   |
|--------------------------|------------------------------------|--------------|------------|----------------------------|
| Institution Requirements | 16 The first stage                 | 50 units     | 46%        | Specialization + assistant |
|                          | 18The second stage                 | 58 units     | 54%        |                            |
| Summer Training          | For two months for the first stage |              |            |                            |
| 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 |
| 2025/2026<br>The first stage<br>Chapter I       | ELCCF11     | Computer Fundamentals/ 1       | 0            | 2         |
|                                                 | ELCMT11     | mathematics                    | 2            | 0         |
|                                                 | ELCPE11     | Principles of electronics      | 2            | 2         |
|                                                 | ELCDC11     | DC Electrial Circuits          | 2            | 2         |
|                                                 | ELCDG11     | Principles of digital circuits | 2            | 2         |
|                                                 | ELCDE11     | Engineering Drawing            | 0            | 3         |
|                                                 | ELCWK11     | The workshop                   | 0            | 4         |
|                                                 | ELCHe11     | Human rights and democracy     | 2            | 0         |
| المجموع                                         | 25          |                                | 10           | 15        |
| 2025/2026<br>The first stage<br>Chapter II      | ELCEL12     | English language (1)           | 2            | 0         |
|                                                 | ELCwo12     | The workshop                   | 0            | 4         |
|                                                 | ELCEL12     | Electronics                    | 2            | 2         |
|                                                 | ELCAC12     | AC Electrial Circuits          | 2            | 2         |
|                                                 | ELCDA12     | Digital circuit applications   | 2            | 2         |
|                                                 | ELCDE12     | Electrical Drawing (AUTOCAD )  | 0            | 3         |
|                                                 | ELCOS12     | Occupational safety            | 2            | 0         |
|                                                 | ELCAL12     | Arabic Language /1             | 2            | 0         |
| المجموع                                         | 25          |                                | 12           | 13        |
| 2025/2026<br>The second<br>phase<br>Chapter one | ELCEC21     | Electronic circuits (1)        | 2            | 2         |
|                                                 | ELCMF21     | Measurements Fevices/1         | 2            | 2         |
|                                                 | ELCMic21    | Microcomputer                  | 2            | 2         |
|                                                 | ELCCOM21    | Communications (1)             | 2            | 2         |

|                                                 |          |                                    |    |    |
|-------------------------------------------------|----------|------------------------------------|----|----|
|                                                 | ELCEL21  | Maintenance Workshop               | 0  | 4  |
|                                                 | ELCEL21  | Arabic Language (2)                | 2  | 0  |
|                                                 | ELCPC21  | Programing Logic Control           | 2  | 2  |
|                                                 | ELCCB21  | Crimes of the Baath regime in Iraq | 2  | 0  |
| المجموع                                         | 28       |                                    | 14 | 14 |
| 2025/2026<br>The second<br>phase<br>Chapter Two | ELCEC22  | Electronic circuits (2)            | 2  | 2  |
|                                                 | ELCMF22  | Measurements Fevices/2             | 2  | 2  |
|                                                 | ELCCOM22 | Digital communications             | 2  | 2  |
|                                                 | ELCMW22  | Maintenance Workshop               | 0  | 4  |
|                                                 | ELCCS22  | Control systems                    | 2  | 2  |
|                                                 | ELCCF22  | Computer Fundamentals/2            | 0  | 2  |
|                                                 | ELCAVI22 | Auduo and visual icstruments       | 2  | 2  |
|                                                 | ELCEL22  | English language (2)               | 2  | 0  |
|                                                 | ELCGP22  | Graduation Project                 | 0  | 1  |
| المجموع                                         | 29       |                                    | 12 | 17 |

Number of theoretical hours for the two years = 48

Percentage of theoretical hours = 46%

Number of practical hours for two years = 59

Percentage of practical hours = 54%

Total graduation units for the two years = 108

## 8. Expected learning outcomes of the program

### Knowledge

A1- Introducing the student to the design of electronic circuits and the extent of their realistic implementation.

A2- Teaching the student the basics of electronics.

A3- Providing the student with the skills to implement and install electronic

|                                                                                                                                                                                                                                                                                                                                                                                     |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>equipment and devices.</p> <p>A4- The student's knowledge of digital and logical circuits and their implementation areas.</p> <p>A5- The student's knowledge of the labor market and changes in the fields of electronics.</p> <p>A6- The student's knowledge of how to conduct laboratory experiments and how to analyze and apply the results.</p>                             |  |
| <b>Skills</b>                                                                                                                                                                                                                                                                                                                                                                       |  |
| <p>B1 - Carrying out periodic and emergency maintenance work for electronic equipment and devices.</p> <p>B2 - Installing electronic devices and their components and implementing maintenance methods for them.</p> <p>B 3- Maintaining electronic devices and ensuring their durability.</p> <p>B4- Installing, maintaining and operating communications and digital devices.</p> |  |
| <b>Ethics</b>                                                                                                                                                                                                                                                                                                                                                                       |  |
| <p>C1- Introducing the graduate into the labor market and spreading the spirit of fair competition.</p> <p>C2- Competition among undergraduate students for the purpose of completing higher university studies.</p> <p>C3- The ability to analyze, deduce, and practice professional ethics in all</p>                                                                             |  |

circumstances.

C4- Working under pressure, adopting equality and justice, and working as a member of one team.

## 9. Teaching and Learning Strategies

- Education strategies:

Teaching strategies are the methods and approaches followed by the professor in communicating educational goals to students. Below are some of the teaching strategies:

1- Lecture or delivery strategy: In which the professor presents information, facts, and other ideas to the students related to the topic at hand.

2- Discussion strategy: In this type of teaching strategy, the professor determines the topic that will be discussed in the lecture

3- Problem-solving strategy: In this strategy, the cognitive environment of students is activated through problem-solving activities, through most positive processes and activities that stimulate thinking and raise motivation to learn.

4-Project-based learning strategy: This strategy relies on design work that requires applied work. Students are assigned an applied project for the activity, and they are forced to research, read, and use books and all cognitive sources in order to accomplish what is required.

-Learning strategies:

These are the methods that the student follows in order to get the best benefit from the educational material, and the most important strategies are:

1- Conducting daily exams for students before the start of the lecture in order to remember previous lectures and information.

2-One of the best types of learning methods is (studying), through which the student can memorize any electronic design circuit or law.

3- Inference, that is, teachers can reinforce this strategy by asking inferential questions after each lecture.

## 10. Evaluation methods

Tests of both written and oral, in-person and electronic, daily, semester and final examinations, in addition to daily examinations, writing reports, discussing experiments and analyzing results.

## 11. Faculty

### Faculty Members

| Academic Rank                       | Specialization  |                     | Special Requirements/<br>Skills (if applicable) |  | Number of the teaching staff |          |
|-------------------------------------|-----------------|---------------------|-------------------------------------------------|--|------------------------------|----------|
|                                     | General         | Special             |                                                 |  | Staff                        | Lecturer |
| 1- A.P.DR. Muhsin Jabbar Kabayan    | communication   | Networks            | Giving awareness                                |  | Personnel                    |          |
| 2- A.L. Wissam Rahim Rassan         | electricity     | Power Systems       | lectures                                        |  | personnel                    |          |
| 3- A.L. Ru'aa Na'ma Haidar          | Arabic Language | Literature          | Holding workshops                               |  | personnel                    |          |
| 4- A.L. Muhammad Abdul-Hassan Abdul | electricity     | Control Engineering | and seminars                                    |  | personnel                    |          |

|                                 |                        |                       |  |  |           |          |
|---------------------------------|------------------------|-----------------------|--|--|-----------|----------|
| 5- A.L. Iman Majbal<br>Muhammad | Applied<br>Mathematics | Numerical<br>Analysis |  |  | personnel |          |
| 6-A.L. Sarah Subaih<br>Badai    | Calculators            | Calculators           |  |  |           | lecturer |
|                                 |                        |                       |  |  |           |          |

## Professional Development

### Mentoring new faculty members

- 1- Holding workshops, seminars and seminars on developments in the field of electronics and information technology for reliability.
- 2- Put them in courses to develop administrative skills, time management, and smart skills.
- 3- Keeping pace and following up on the implementation of the government program and income.

### Professional development of faculty members

The focus in the Department of Electronic and Communications Technologies in general is on continuous improvement. The department always seeks to improve the scientific and administrative process and overcome all the difficulties and obstacles that hinder the educational program by developing human resources for personal and professional development.

The following procedures explain the steps implemented or in the process of implementation in this area:

**D1. Continuous improvement and development of faculty members through training**

programs and workshops inside and outside the department, university and country.

D2. Increasing extracurricular activities, such as holding conferences, scientific seminars, and personal and sports creativity, locally, regionally, and internationally.

D3. Encouraging faculty members to obtain the highest academic and administrative ranks through promotions.

D4. Providing modern scientific sources and books for the department's library to keep pace with continuous progress.

## **12. Acceptance Criterion**

1-Acceptance rates obtained by students in vocational preparatory school.

2-The institute's examinations for the department and the student's desire.

3- Examining the student's fitness and mental ability.

4- Central admission issued by the Ministry of Higher Education.

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

- The curriculum approved by the Ministry of Higher Education and Scientific Research and its guidelines.

- Decisions and recommendations of the scientific committees at the Southern Technical University.

- Courses in teaching methods.

- Self-assessment report (SAR) for previous years.

- Description of courses.

- Courses in civil society organizations.

- **Conferences, seminars, workshops and panel discussions.**
- **Relevant state institutions.**
- **Internet searches for similar experiences.**
- **Personal experiences**
- **Labor market needs**

#### **14. Program Development Plan**

- 1- Adding materials that keep pace with the change and development taking place in various electronic and communications technologies.**
- 2- Deleting and creating old materials while preserving the basics and their continuity.**
- 3- Stimulating and encouraging scientific and practical visits to laboratories, operating companies and government departments.**
- 4- Developing curricula to keep pace with the times, technology and globalization.**
- 5- Opening specialized branches in the field of measurement, control, and network maintenance according to the needs of the labor market.**
- 6-Use and develop comprehensive virtual laboratories.**

| 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 |
| The First              |             | Principles of electronics | Specialized       | √                                  | √  | √  |    | √      | √  | √  | √  | √      | √  | √  | √  |
|                        |             | Digital circuits          | Specialized       | √                                  | √  | √  | √  | √      | √  | √  | √  | √      | √  | √  | √  |
|                        |             | Electrical circuits       | Specialized       | √                                  | √  | √  |    | √      | √  | √  | √  | √      | √  | √  | √  |
|                        |             | The workshop              | Specialized       | √                                  | √  | √  | √  | √      | √  | √  | √  | √      | √  | √  | √  |
|                        |             | mathematics               | assist            | √                                  | √  | √  | √  | √      |    | √  |    | √      | √  | √  | √  |
| The Second             |             | Electronic circuits       | Specialized       | √                                  | √  | √  |    |        | √  | √  | √  | √      | √  | √  | √  |
|                        |             | Microcomputers            | Specialized       | √                                  | √  | √  | √  | √      | √  | √  | √  | √      | √  | √  | √  |
|                        |             | Telecommunications        | Specialized       | √                                  | √  | √  | √  | √      | √  | √  | √  |        |    | √  | √  |

|  |  |                      |             |   |   |   |   |   |   |   |   |   |   |  |   |
|--|--|----------------------|-------------|---|---|---|---|---|---|---|---|---|---|--|---|
|  |  | Control systems      | Specialized | √ | √ | √ |   | √ | √ | √ |   | √ | √ |  | √ |
|  |  | English language (2) | General     | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |  | √ |

- Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

## Course Description Form

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Principles of Digital Circuits (Phase1 )                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2. Course Code:                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| ELCDG11                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 3. Semester / Year:                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| The first song: My chapter....(Chapter 1 + Chapter 2)                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4. Description Preparation Date:5/10/2025                                                                                                                                                                                                                                                                                                                                                                                                                          |
| This description was prepared by the committee placed in the electronics department                                                                                                                                                                                                                                                                                                                                                                                |
| 5. Available Attendance Forms:                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| In-person + electronic + integrated                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 6. Number of Credit Hours (Total) / Number of Units (Total)                                                                                                                                                                                                                                                                                                                                                                                                        |
| 60 hours per semester. 4 hours per week / 60 units                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 7. Course administrator's name (mention all, if more than one name)                                                                                                                                                                                                                                                                                                                                                                                                |
| Name: A.L. Mohammed Abdulhassan Abdul ...Email: <a href="mailto:m.a.abd@stu.edu.iq">m.a.abd@stu.edu.iq</a>                                                                                                                                                                                                                                                                                                                                                         |
| 8. Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>1- Teaching the student the concept of measuring devices and the conditions for indicating them and teaching them.</p> <p>2-Devices for measuring various electrical quantities, both electronic and digital.</p> <p>3- Measuring pressure and temperature with electrical and non-electrical devices.</p> <p>4 Elements of power transformers, their types, and their use in measuring bridges.</p> <p>5- Elements of registration and environmental visa.</p> |

## 9. Teaching and Learning Strategies

### Strategy

#### **- Education strategies:**

Teaching strategies are the methods and approaches followed by the professor in communicating educational goals to students. Below are some of the teaching strategies:

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- 4- Project-based learning strategy: This strategy relies on design work that requires applied work. Students are assigned an applied project for the activity, and they are forced to research, read, and use books and all cognitive sources in order to accomplish what is required.

#### **-Learning strategies:**

These are the methods that the student follows in order to get the best benefit from the educational material, and the most important strategies are:

- 1- Conducting daily exams for students before the start of the lecture in order to remember previous lectures and information.
- 2-One of the best types of learning methods is (studying), through which

the student can memorize any electronic design circuit or law.

3 - Conclusion, that is, teachers can reinforce this strategy by asking inferential questions after each lecture.

## 10. Course Structure:

### Principles of Digital Circuits(First semester) (first stage)

### Digital Circuit Applications (second semester) (first stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                                                                                                                                    | Unit or subject name                                                                        | Learning method                                 | Evaluation method             |
|------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|
| 1    | 4 hours | <b>1- Teaching the student the basics of logical circuits in electronic computers and how to</b><br><br><b>2- Build simple digital circuits using Truth tables</b><br><br><b>Teaching the student swing circles</b><br><br><b>Counters, addition circuits, and registers.</b> | General idea of numerical systems (types and details)                                       | <b>lecture</b><br><br><b>And the laboratory</b> | <b>Oral and written tests</b> |
| 2    | 4 hours |                                                                                                                                                                                                                                                                               | 2-Transfer between the numerical systems                                                    |                                                 |                               |
| 3    | 4 hours |                                                                                                                                                                                                                                                                               | 3- Logic gates (types, working principle, truth tables, logical symbol)                     |                                                 |                               |
| 4    | 4 hours |                                                                                                                                                                                                                                                                               | How to connect the logic gates to form logic circuits                                       |                                                 |                               |
| 5    | 4 hours |                                                                                                                                                                                                                                                                               | Boolean algebra and the rule of de-Morgan                                                   |                                                 |                               |
| 6    | 4 hours |                                                                                                                                                                                                                                                                               | Simplification of logical equations using Boolean algebra and the laws of De Morgan's laws  |                                                 |                               |
| 7    | 4 hours |                                                                                                                                                                                                                                                                               | The design of the logical gates using NOR and NAND circuits                                 |                                                 |                               |
| 8    | 4 hours |                                                                                                                                                                                                                                                                               | 8-Ways of writing the equation from truth table (POS, SOP)                                  |                                                 |                               |
| 9    | 4 hours |                                                                                                                                                                                                                                                                               | Karnaugh Map (for two variables, the three variables, the four variables)                   |                                                 |                               |
| 10   | 4 hours |                                                                                                                                                                                                                                                                               | Simplification of logical equations using Karnaugh Map                                      |                                                 |                               |
| 11   | 4 hours |                                                                                                                                                                                                                                                                               | 11-Calculations in the binary system (addition, subtraction, subtraction using complements) |                                                 |                               |
| 12   | 4 hours |                                                                                                                                                                                                                                                                               | 12-Logic circuit applications (half adder, full adder, parallel adder circuits)             |                                                 |                               |
| 13   | 4 hours |                                                                                                                                                                                                                                                                               | Binary subtractor circuits                                                                  |                                                 |                               |
| 14   | 4 hours |                                                                                                                                                                                                                                                                               |                                                                                             |                                                 |                               |
| 15   | 4 hours |                                                                                                                                                                                                                                                                               |                                                                                             |                                                 |                               |

|          |    |         |                                                                                                                                                                                                                                                                                    |  |  |
|----------|----|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Vacation |    |         | (half subtractor,full subtractor,parallel subtractor) circuit using the der circuit by method of 1s complements<br>14-The circuit of digital comparator ( one stage and two stages)<br>15-The circuit of decoder size of 2:4 ,3:8 and 4:10<br>.....<br><b><u>second course</u></b> |  |  |
|          | 1  | 4 hours | 1-The circuit of encoder size of 4:2, 8:3 and 10:4                                                                                                                                                                                                                                 |  |  |
|          | 2  | 4 hours | 2-Introduction to sequential logic circuits, a general idea                                                                                                                                                                                                                        |  |  |
|          | 3  | 4 hours | of the Flip Flop, flip flop type (S-R)                                                                                                                                                                                                                                             |  |  |
|          | 4  | 4 hours | 3-The flip flop type J-K and master slave flip flop                                                                                                                                                                                                                                |  |  |
|          | 5  | 4 hours | 4-The D- flip flop and T flip flop                                                                                                                                                                                                                                                 |  |  |
|          | 6  | 4 hours | 5-The registers, design of registers, enter the information and output from registers                                                                                                                                                                                              |  |  |
|          | 7  | 4 hours | 6-The shift register, shift to left, shift to right                                                                                                                                                                                                                                |  |  |
|          | 8  | 4 hours | 7-The counter-Asynchronous counter                                                                                                                                                                                                                                                 |  |  |
|          | 9  | 4 hours | 8-The synchronous counter- the cycle counter                                                                                                                                                                                                                                       |  |  |
|          | 10 | 4 hours | 9-The multiplexer and its applications                                                                                                                                                                                                                                             |  |  |
|          | 11 | 4 hours | 10-The code convertor -the application of code convertor                                                                                                                                                                                                                           |  |  |
|          | 12 | 4 hours | 11-Programmable logic array Concepts of programmable logic array(PLA);Concepts of programmable array (logic(PAL                                                                                                                                                                    |  |  |
|          | 13 | 4 hours | 12-Buffers, Non inverting buffers, inverting buffers, Tri-state buffers, transmission gates                                                                                                                                                                                        |  |  |
|          | 14 | 4 hours | 13-Introduction to sequential logic latches and flip flops, Latches-Edgetriggered flip flop, Flip-flop operating characteristics, Flip-flop applications                                                                                                                           |  |  |
|          | 15 | 4 hours | 14-Introduction To State Machine Design<br>15-State diagram and State table                                                                                                                                                                                                        |  |  |

## 11. Course Structure:

### DC Electrical Circuits (First semester)(first stage)

### AC Electrical Circuits (second semester)(first stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                                                                                                                                                                                    | Unit or subject name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Learning method                                 | Evaluation method             |
|------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------|
| 1    | 4 hours | <p>The student will be able to:</p> <p>1- Get to know</p> <p>Measuring devices</p> <p>different and their uses</p> <p>2- Get to know</p> <p>Printed electronic boards and dealing with her</p> <p>3- Being able to build various electronic circuits on</p> <p>Printed board and</p> <p>Learn how to examine and test it.</p> | <p>11-Electric units system- Mathematic applications- definition of basic units of voltage, current and resistance electric circuit components- ohm law- factors effecting on resistance-resistivity of conductors and insulators- effect of temp. on resistance- temp. Coeff. of resistance- Examples :DC current circuits includes series connection of resistances - and examples parallel connection of resistances and examples combine connection of resistances and examples and delta connection of resistances, conversion between star and delta with examples applications on series, parallel, combine and star-delta connections Kirchhoff Laws- Kirchhoff current and voltage laws with examples Maxwell's law with Examples definition of Thevenin's theorem- How to apply in dc current definition of Norton's theorem- How to apply in dc current examples on Thevenin's and Norton's theorems Definition of Superposition theorem-application of it in dc current-examples- Max. power transfer theorem with examples AC quantities-definition of AC circuit characteristics – generation of AC current with waveform drawing- RMS value-Form factor – examples Vector of AC quantities-</p> | <p>lecture</p> <p>And the</p> <p>laboratory</p> | <p>Oral and written tests</p> |
| 2    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 3    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 4    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 5    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 6    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 7    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 8    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 9    | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 10   | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 11   | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 12   | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 13   | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 14   | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |
| 15   | 4 hours |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                 |                               |

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|----------|----|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Vacation |    |         | <p>definition of it – Phasor representation of its- phase angle- resultant of vector AC add., Subt., multiply, division with examples</p> <p>Effect of AC current on only resistance circuit-only inductance circuit- only capacitor circuit- phase angle between voltage and current with examples.....</p> <p><b><u>second course</u></b></p> <p>1- The previous work is Effect of current on resistance and inductance in series circuit resistance and capacitor in series resistance and inductance and capacitor in series- phase angle total impedance with examples</p> <p>Effect of AC current on resistance and inductance in parallel circuit-resistance and capacitor in series- resistance and inductance and capacitor in series- phase angle- total impedance with examples</p> <p>Using j-operator to find total impedance- total admittance- current, voltage and phase angle for impedances in series and parallel with examples</p> <p>Series and Parallel resonance circuits- calculation of voltage, current, impedance, phase angle and frequency at resonance with examples</p> <p>Applications of Thevenin's, Norton's and superposition theorems with examples</p> <p>Calculation of power in AC circuits-only resistance circuit-only inductance circuit-only capacitor circuit- resistance, inductance and capacitor in series and parallel-active and reactive power</p> <p>Complex power- power triangle</p> <p>Power factor correction</p> <p>Max. power transfer in AC circuits- with examples</p> <p>Networks analysis using Nodal analysis-number of nodal equations</p> <p>Examples on Networks analysis using Nodal analysis</p> <p>AC three phase circuits- generation of 1-phase, 2-phase and three phase current-star delta connection-phase power-line power- total power-examples</p> |  |  |
|          | 1  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 2  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 3  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 4  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 5  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 6  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 7  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 8  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 9  | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 10 | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 11 | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 12 | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 13 | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 14 | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|          | 15 | 4 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |

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|  |  |  | <p>examples on AC three phase circuits with star delta connections</p> <p>methods of power measurement</p> <p>three phase loads-wattmeter- two wattmeter-three wattmeter</p> <p>transient cases in circuits- DC transient – RL-RC-RLC transient</p> <p>Transient AC currents–</p> <p>cosoidal Transient currents in RL-RC-RLC circuits</p> <p>induction of coil- equation of self induction- mutual induction :between two coils</p> <p>Progressive Series connection -</p> <p>Reverse Series connection -</p> <p>transformers- structure-drawing-characteristics- its operation and relationships- types of its- examples</p> <p>curves of current in induction circuit- current drawing and calculation of time constant- charge, discharge the capacitors- time constant effect- examples</p> |  |  |
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## 12. Course Structure:

### Laboratories/electronic workshop(first stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                                                                                              | Unit or subject name                                                                                                        | Learning method                          | Evaluation method             |
|------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------|
| 1    | 4 hours | <p>The student will be able to:</p> <p>1- Get to know Measuring devices different and their uses</p> <p>2- Get to know Printed electronic boards and dealing with them</p> <p>3- Being able to build various electronic circuits on</p> | 1-How to use measuring devices                                                                                              | <p>lecture</p> <p>And the laboratory</p> | <p>Oral and written tests</p> |
| 2    | 4 hours |                                                                                                                                                                                                                                         | various tools in the workshop, such as (amphimeter, oscilloscope, power supply,...).                                        |                                          |                               |
| 3    | 4 hours |                                                                                                                                                                                                                                         | 2-How to use caustics – types                                                                                               |                                          |                               |
| 4    | 4 hours |                                                                                                                                                                                                                                         | caustics used in the workshop - training on caustic welding.                                                                |                                          |                               |
| 5    | 4 hours |                                                                                                                                                                                                                                         | 3-How to use a soldering iron - a soldering iron, such as a soldering iron                                                  |                                          |                               |
| 6    | 4 hours |                                                                                                                                                                                                                                         | (solder sucker), solder remover, Training on some electronic components and placing them on printed board, caustics used in |                                          |                               |
| 7    | 4 hours |                                                                                                                                                                                                                                         | soldering integrated electronic circuits - the correct method for soldering an IC - how to remove                           |                                          |                               |
| 8    | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |
| 9    | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |
| 10   | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |
| 11   | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |
| 12   | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |
| 13   | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |
| 14   | 4 hours |                                                                                                                                                                                                                                         |                                                                                                                             |                                          |                               |

|    |         |                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
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| 15 | 4 hours | Printed board and Learn how to examine and test it. | <p>solder from the ends of an electronic circuit and remove it from the circuit.</p> <p>4-Different printed electronic circuits - learning how to perforate them and install various electronic components on them.</p> <p>5-The different types of resistors<br/>Where the material the resistors made of - the capacity that each resistance can withstand - How to read resistor values using methods<br/>Various - variable resistors and Special (VDR, PTC, NTC)<br/>And how to check it.</p> <p>6- Make a circuit to connect the resistors to straight<br/>Make a circuit to connect the resistors to Parallelism<br/>Make a circuit to connect the resistors to Series and parallel within a circuit</p> <p>7-The different types of expanders<br/>Where is the type of insulator used?<br/>Panels and the voltage they bear -<br/>Reading capacitor values using different methods -<br/>How to check capacitors and ways to replace them -<br/>Making circuits to connect capacitors to Series, parallel, and mixed connectivity<br/>In the printed board with the examination.</p> <p>8-Different types of keys used in electronic devices and methods of testing them - the current they can withstand<br/>Each key - use each type.</p> <p>9-Types of fuses used in electronic circuits - types and amperes of wires used in fuses<br/>The current that each type can withstand -<br/>How to repair fuses.<br/>-Files - types - methods<br/>Examination - uses - identification<br/>Wires - reading file types that use color codes and numbering.<br/>Electrical transformers - their types -<br/>Methods of examining it - determining the type of transformer<br/>- Autotransformation - the difference between</p> |  |  |
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|          |         |  | <p>Autotransformers and transformers<br/>Ordinary.</p> <p>10-Different types of quasi Connectors<br/>(Diode, transistor, etc.) from where it is manufactured and the materials<br/>methods used in its manufacture<br/>Number them and find their equivalents.</p> <p>11- Inspection of faulty semiconductors (diode, transistor, etc.)<br/>Valid for a group of them.</p> <p>12- Integrated Circuits -<br/>Identify the numbering of parties to several<br/>Types of these circuits - how<br/>Manufacture of these circuits - components<br/>involved in manufacturing.</p> <p>13- Showing a scientific film about how<br/>electronic components industry<br/>resistors, capacitors, transistors, etc.).</p> <p>14- How to read electronic maps and trace circuits to determine the location of the fault<br/>Its causes.</p> <p>15- The student learned how<br/>design electronic circuits on the board and install the electronic components on it - how<br/>solder these components to the board<br/>(simple circuit).</p> <p>.....</p> <p><b><u>second course</u></b></p> <p>1- The previous work is repeated by standing up<br/>The student designs a more complex circuit.</p> <p>2- Examination of semiconductors - transistors and diodes that are faulty and valid for the assembly<br/>Of which.</p> <p>3- A field visit to one of the industrial facilities in the socialist sector.</p> <p>4- Building complex and simple electronic circuits on printed boards<br/>Learn how to check it and testing it is like a filter circuit.</p> <p>5- Construct a half-wave unified circuit<br/>On the printed board and identification<br/>How to examine and test it.</p> <p>6- Construct the full wave</p> |  |  |
| vacation |         |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
|          | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 1        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 2        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 3        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 4        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 5        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 6        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 7        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 8        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 9        | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 10       | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 11       | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 12       | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 13       | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 14       | 4 hours |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
| 15       |         |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |

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|  |  |  | <p>circuit on<br/>e printed board and learn how<br/>to inspect and test it.</p> <p>7- Build a full-wave voltage<br/>multiplier circuit on a printed<br/>ard and learn how to examine<br/>and test it.</p> <p>8- Construct a circle of<br/>ppers on the printed board and<br/>identify<br/>How to inspect and test it.</p> <p>9-Using a Zener Diode as a<br/>voltage regulator circuit<br/>On the board<br/>Print and learn how<br/>Checked and tested.</p> <p>10- Construct a transistor<br/>amplifier circuit<br/>On the printed board and<br/>identification<br/>n how to examine and test it<br/>(based on<br/>ctical common emitter amplifier<br/>circuit.</p> <p>11- Construct a two-stage<br/>amplifier circuit<br/>Printed board and learn how<br/>Checked and tested.</p> <p>12- Build a push-pull<br/>amplifier circuit<br/>printed board and learn how to<br/>inspect and test it.</p> <p>Build an RC Oscillator circuit on<br/>rinted board and learn how to<br/>examine and test it.</p> <p>14- Build a Hartley circuit<br/>a printed board and learn how<br/>Checked and tested.</p> <p>15- Build a circuit with a<br/>riable DC voltage supply on the<br/>printed board<br/>Learn how to check it and<br/>Test it.</p> |  |  |
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### 13. Course Structure:

#### Principles of Electronics (first semester)

#### Electronics (second semester )(first stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                                                                                                                                  | Unit or subject name                                                                                                                                                     | Learning method    | Evaluation method      |
|------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------|
| 1    | 4 hours | Introducing the student to:<br><br>Electronic components manufactured from semiconductors of various types - composition - properties - uses<br><br>In circles<br><br>Electronic applications and analysis<br><br>Its electronic circuits. Giving the student an idea about | 1- Semiconductor theory- Atomic structure-levels<br>Energy-Crystals-Conduction in Crystals - gap current - how to Move gaps.                                             | lecture            | Oral and written tests |
| 2    | 4 hours |                                                                                                                                                                                                                                                                             | 2- Grafting-positive crystal type                                                                                                                                        | And the laboratory |                        |
| 3    | 4 hours |                                                                                                                                                                                                                                                                             | -type N-current negative crystal                                                                                                                                         |                    |                        |
| 4    | 4 hours |                                                                                                                                                                                                                                                                             | Electrons and gap current                                                                                                                                                |                    |                        |
| 5    | 4 hours |                                                                                                                                                                                                                                                                             | -Total resistance.                                                                                                                                                       |                    |                        |
| 6    | 4 hours |                                                                                                                                                                                                                                                                             | 3-4- Semiconductor diodes-                                                                                                                                               |                    |                        |
| 7    | 4 hours |                                                                                                                                                                                                                                                                             | N connection—Evacuation zone configuration                                                                                                                               |                    |                        |
| 8    | 4 hours |                                                                                                                                                                                                                                                                             | -Barrier Voltage- Power Hill- Thermal Effects - Duo                                                                                                                      |                    |                        |
| 9    | 4 hours |                                                                                                                                                                                                                                                                             | Biased-biasForward-biased                                                                                                                                                |                    |                        |
| 10   | 4 hours |                                                                                                                                                                                                                                                                             | Inverse-isotropy curves in                                                                                                                                               |                    |                        |
| 11   | 4 hours |                                                                                                                                                                                                                                                                             | forward and reverse directions - crossing current - ephemeral current                                                                                                    |                    |                        |
| 12   | 4 hours |                                                                                                                                                                                                                                                                             | Minority carriers – permissive leakage current                                                                                                                           |                    |                        |
| 13   | 4 hours |                                                                                                                                                                                                                                                                             | Breaking voltage - breakdown voltage - is greatest                                                                                                                       |                    |                        |
| 14   | 4 hours |                                                                                                                                                                                                                                                                             | forward current - greatest reverse current - equivalent circuit of the diode.                                                                                            |                    |                        |
| 15   | 4 hours |                                                                                                                                                                                                                                                                             | 5- The diode as a current amplifier - a half-wave unifier - the average - the continuous value of the current and its calculation - the effective - the output frequency |                    |                        |
|      |         | 6- Full-wave unification using a center-branch transformer entry combiner - calculating the continuous and effective values of voltages and currents - output frequency. Comparison between half-wave and full-wave unification - comparison between full-wave unifiers.    |                                                                                                                                                                          |                    |                        |
|      |         | 7- Filters - filtering using capacitance - (LC) and (RC) filters - output voltages - ripple - voltage                                                                                                                                                                       |                                                                                                                                                                          |                    |                        |

|          |    |                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|----------|----|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Vacation |    | optoelectronics, its components, integrated circuits, and simplified applications for an amplifier<br>Processes . | <p>multipliers - trimming circuits - positive trimming - negative trimming - compound trimming - peak-to-peak detector - positive and negative clamps.</p> <p>8-9 - The zener diode - its structure - its symbol - its forward and reverse properties - breakdown and breaking voltages - reverse impedance - power tolerance - temperature effects - zener approximation - constant voltage regulation - constant voltage source circuit - variable capacitance diode and its applications.</p> <p>10-11- Bipolar transistor - structure - symbol - properties - bias - definition (Bdc) - definition (Cdc) - the relationship between them - definition of important areas</p> <p>On the characteristic curves.</p> <p>transistor bias circuits - base bias - emitter bias - collector bias. - approximation in the transistor and the equivalent circuit.</p> <p>Transistor characteristic curves work areas-Definition of <math>I_{cbo}</math> and <math>I_{ceo}</math>-Current gain curve-The relationship between <math>I_{cbo}</math> and <math>I_{ceo}</math></p> <p>13-Transistor bias circuits- Base bias-emitter bias.</p> <p>14-15- The collector's bias Self-biasing back feed - voltage divider bias—practical examples.</p> <p>.....</p> <p><b><u>second course</u></b></p> |  |  |
|          | 1  | 4 hours                                                                                                           | 1- Action points - rest point - applied examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|          | 2  | 4 hours                                                                                                           | - The continuous equivalent circuit of the transistor - the continuous load line -.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|          | 3  | 4 hours                                                                                                           | 3- Using the transistor to amplify small signals - the equivalent alternating circuit -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
|          | 4  | 4 hours                                                                                                           | current gain - voltage gain - power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|          | 5  | 4 hours                                                                                                           | 1. - ideal approximation - hybrid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|          | 6  | 4 hours                                                                                                           | constants - equivalent circuit using                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |
|          | 7  | 4 hours                                                                                                           | h coefficients - voltage gain -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|          | 8  | 4 hours                                                                                                           | current gain - power gain - input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|          | 9  | 4 hours                                                                                                           | and output resistors - signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
|          | 10 | 4 hours                                                                                                           | amplifiers Small-base market-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
|          | 11 | 4 hours                                                                                                           | emitter market.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|          | 12 | 4 hours                                                                                                           | 4- Using a transistor to regulate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|          | 13 | 4 hours                                                                                                           | voltage-series regulator-parallel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|          | 14 | 4 hours                                                                                                           | regulator -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|          | 15 | 4 hours                                                                                                           | constant voltage source circuit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|--|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |  |  | <p>theory</p> <p>- FET bias circuits - constant current source bias - working point self-bias - FET equivalent circuit - using FET in small signal amplification - comparison between types of FET - (MOSFET, FET). (BJT)</p> <p>7- Light dependent resistor - light-emitting diode - photodiode - phototransistor - breakout board</p> <p>Seven - its composition and applications.</p> <p>8-9-10-11-12-</p> <p>Controlled silicon modules</p> <p>current (thyristor) - installation types - Properties - Theory of operation - Triacs - Dayaks - Their Symbol - Their Properties</p> <p>-Theory of their operation-comparison between thyristors, DACs and TRIACs-Thyristor protection</p> <p>from a change in voltage, from a change in current).</p> <p>13-14-15-</p> <p>Integrated circuits - its meaning - advantages and disadvantages - comparison between it and discrete components - an idea about its manufacture - operational amplifier 741 - its symbol - its terminals - its uses - applications of operational amplifiers - small signal amplification - addition of signals - subtraction of signals - examples.</p> |  |  |
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#### 14. Course Structure:

##### Engineering drawing (First Semester)

##### Electrical drawing(Second Semester) (first stage)

| Week | Hours   | Required Learning Outcomes                                    | Unit or subject name                                                                        | Learning method | Evaluation method      |
|------|---------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------|------------------------|
| 1    | 3 hours | 1- Student training On the foundations of engineering drawing | 1- Advantages of computer drawing, basic components of the Auto CAD program And turn it on. | lecture         | Oral and written tests |
| 2    | 3 hours |                                                               | 2- How to activate and run a program                                                        | And the         |                        |
| 3    | 3 hours |                                                               | Auto CAD, program interface,                                                                |                 |                        |
| 4    | 3 hours |                                                               |                                                                                             |                 |                        |
| 5    | 3 hours |                                                               |                                                                                             |                 |                        |

|          |    |         |                       |                                                                                                                                                                                                                                                                                        |            |  |
|----------|----|---------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|
| Vacation | 6  | 3 hours | drawing and read      | Hide bars, activate bars,                                                                                                                                                                                                                                                              | laboratory |  |
|          | 7  | 3 hours | electronic and electr | Hide an icon, activate an icon.                                                                                                                                                                                                                                                        |            |  |
|          | 8  | 3 hours | maps.                 | A detailed explanation of the components of a bar                                                                                                                                                                                                                                      |            |  |
|          | 9  | 3 hours |                       | Draw                                                                                                                                                                                                                                                                                   |            |  |
|          | 10 | 3 hours | Train the student     | Tools Bar, Modify Tools                                                                                                                                                                                                                                                                |            |  |
|          | 11 | 3 hours | make him able to:     | Bar,                                                                                                                                                                                                                                                                                   |            |  |
|          | 12 | 3 hours | a-Using engineer      | Status Tools Bar                                                                                                                                                                                                                                                                       |            |  |
|          | 13 | 3 hours | drawing equipment     | 4- Learn about the types of drawing lines in the Auto                                                                                                                                                                                                                                  |            |  |
|          | 14 | 3 hours | tools, understand     | CAD program and how to download                                                                                                                                                                                                                                                        |            |  |
|          | 15 | 3 hours | maps, and drawing th  | the types of lines and create lines                                                                                                                                                                                                                                                    |            |  |
|          |    |         | engineering views     | 5- How to draw Line, Circle, Arc in their different ways.                                                                                                                                                                                                                              |            |  |
|          |    |         | projections.          | 6- How to draw Polygon, Rectangle, Multilin, Polyline                                                                                                                                                                                                                                  |            |  |
|          |    |         | b-Distinguishing      | 7- Add dimensions and texts in                                                                                                                                                                                                                                                         |            |  |
|          |    |         | between electro       | Auto CAD program in its ways different.                                                                                                                                                                                                                                                |            |  |
|          |    |         | components, read      | 8- Carrying out engineering operations, drawing                                                                                                                                                                                                                                        |            |  |
| Vacation |    |         | projecting and draw   | A triangle with its three sides, straight drawing                                                                                                                                                                                                                                      |            |  |
|          |    |         | electrical maps       | Parallel to a known straight line at a given distance                                                                                                                                                                                                                                  |            |  |
|          |    |         | Electronic circuits.  | Draw a circle that passes through the vertices of a triangle is known that drawing a circle touching sides                                                                                                                                                                             |            |  |
|          |    |         |                       | Known triangle.                                                                                                                                                                                                                                                                        |            |  |
|          |    |         |                       | 9- Dividing a straight line to a number of equal sections, drawing a five-sided polygon with a known radius, fitting two perpendicular lines to an internal arc of known radius, fitting two right lines that make an acute or obtuse angle with each other to an arc of known radius. |            |  |
|          |    |         |                       | 10- Projections, how to draw projections, how to implement projections in a program                                                                                                                                                                                                    |            |  |
|          |    |         |                       | Auto CAD                                                                                                                                                                                                                                                                               |            |  |
|          |    |         |                       | 11-12-13-14- practical applications on project drawing                                                                                                                                                                                                                                 |            |  |
|          |    |         |                       | 15- How to draw and create 3D graphics in a program                                                                                                                                                                                                                                    |            |  |
|          |    |         |                       | .....                                                                                                                                                                                                                                                                                  |            |  |
|          |    |         |                       | <u>second course</u>                                                                                                                                                                                                                                                                   |            |  |
|          | 1  |         |                       | 1-2-3-4-                                                                                                                                                                                                                                                                               |            |  |
|          | 2  | 3 hours |                       | How to draw and create 3D                                                                                                                                                                                                                                                              |            |  |
|          | 3  | 3 hours |                       | drawings in Auto CAD                                                                                                                                                                                                                                                                   |            |  |
|          | 4  | 3 hours |                       | Electrical symbols, electronic symbols, general appearance                                                                                                                                                                                                                             |            |  |
|          | 5  | 3 hours |                       |                                                                                                                                                                                                                                                                                        |            |  |
|          | 6  | 3 hours |                       | 6-Block,                                                                                                                                                                                                                                                                               |            |  |
|          | 7  | 3 hours |                       | Attribute Block,Insert                                                                                                                                                                                                                                                                 |            |  |
|          | 8  |         |                       | - How to insert electrical and                                                                                                                                                                                                                                                         |            |  |

|    |         |  |                                    |  |  |
|----|---------|--|------------------------------------|--|--|
| 9  | 3 hours |  | Electronic symbols into the Auto   |  |  |
| 10 | 3 hours |  | CAD program interface.             |  |  |
| 11 | 3 hours |  | 8- Connecting electrical and       |  |  |
| 12 | 3 hours |  | Electronic symbols using lines and |  |  |
| 13 | 3 hours |  | practical applications.            |  |  |
| 14 | 3 hours |  | 9-10-11-12-                        |  |  |
| 15 | 3 hours |  | practical applications for drawing |  |  |
|    | 3 hours |  | electrical circuits.               |  |  |
|    | 3 hours |  | 13-14-15-                          |  |  |
|    | 3 hours |  | practical applications for drawing |  |  |
|    | 3 hours |  | electronic circuits                |  |  |

## 15. Course Structure:

### Human Rights (First semester)

### Occupational safety ( second semester) (first stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                              | Unit or subject name                                                                                                                                                                                                      | Learning method               | Evaluation method             |
|------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|
| 1    | 3 hours | <p>The purpose of the rights article</p> <p>Human: He</p> <p>Providing the possibility of development</p> <p>The individual and society</p> <p>Complete development</p> | 1- Human rights - their definition and their goals                                                                                                                                                                        | <p>lecture</p> <p>And the</p> | <p>Oral and written tests</p> |
| 2    | 3 hours |                                                                                                                                                                         | 2- The roots of human rights and their development in human history - human rights in ancient and medieval times.                                                                                                         |                               |                               |
| 3    | 3 hours |                                                                                                                                                                         | 3- Human rights in civilizations Ancient, especially the Wadi civilization Mesopotamia.                                                                                                                                   |                               |                               |
| 4    | 3 hours |                                                                                                                                                                         | 4- Human rights in divine laws, with a focus on human rights in Islam.                                                                                                                                                    |                               |                               |
| 5    | 3 hours |                                                                                                                                                                         | 5- Human rights in the Middle Ages                                                                                                                                                                                        |                               |                               |
| 6    | 3 hours |                                                                                                                                                                         | Human rights in doctrines, schools and political theories - Human rights                                                                                                                                                  |                               |                               |
| 7    | 3 hours |                                                                                                                                                                         | On corporations, their declarations, revolutions, and constitutions (English documents)                                                                                                                                   |                               |                               |
| 8    | 3 hours |                                                                                                                                                                         | American Revolution - French Revolution - Russian Revolution                                                                                                                                                              |                               |                               |
| 9    | 3 hours |                                                                                                                                                                         | Human rights in contemporary - 20th century modern history - international recognition of human rights since World War I and beyond - the (United Nations)                                                                |                               |                               |
| 10   | 3 hours |                                                                                                                                                                         | 7- Regional recognition of human rights - the European Convention on Human Rights 1950 - the American Convention on Human Rights 1969 - the African Charter on Human Rights 1981 - the Arab Charter on Human Rights 1994. |                               |                               |
| 11   | 3 hours |                                                                                                                                                                         | 8- Non-governmental organizations and human rights (International Committee of the Red Cross -                                                                                                                            |                               |                               |
| 12   | 3 hours |                                                                                                                                                                         |                                                                                                                                                                                                                           |                               |                               |
| 13   | 3 hours |                                                                                                                                                                         |                                                                                                                                                                                                                           |                               |                               |
| 14   | 3 hours |                                                                                                                                                                         |                                                                                                                                                                                                                           |                               |                               |
| 15   | 3 hours |                                                                                                                                                                         |                                                                                                                                                                                                                           |                               |                               |

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| <p><b>Vacation</b></p> | <p>1 3 hours<br/>2 3 hours<br/>3 3 hours<br/>4 3 hours<br/>5 3 hours<br/>6 3 hours<br/>7 3 hours<br/>8 3 hours<br/>9 3 hours<br/>10 3 hours<br/>11 3 hours<br/>12 3 hours<br/>13 3 hours<br/>14 3 hours<br/>15 3 hours</p> |  | <p>Amnesty International - Human Rights Watch)<br/>9 National human rights organizations<br/>10- Human rights in Iraqi constitutions between theory and reality<br/>11-12- The relationship between human rights and Public freedoms:<br/>* 1- In the Universal Declaration of Human Rights<br/>Human.<br/>* 2- In regional charters and national constitutions.<br/>13- Necessary human rights and collective human rights.<br/>-Economic, social and cultural human rights and civil and political human rights<br/>15-Modern human rights: facts in development - the right to a clean environment - the right to true solidarity<br/>.....<br/>The second choleric<br/><br/>1- Occupational safety - its necessity -<br/>Its goals - its returns<br/>2- Occupational safety in terms of its impact<br/>On the person, family, department and<br/>Establishment, society and national economy<br/>3- Occupational safety, why, the essential factor, law enforcement, skills preservation, economic factor<br/>4- Maintenance organizations, comparison between them, how to perform preventive and curative systems<br/>5- Maintenance regulations, comparison between them, how to perform preventive and curative systems<br/>6-Formations of occupational health and safety departments<br/>7-8- General occupational health and safety program: protecting the work site, protecting work methods, protecting the worker<br/>9- Occupational health and safety programme, specialization, traffic accident prevention, accident statistics<br/>10- Firefighting and fire equipment<br/>11- Causes of industrial accidents, the importance</p> |  |  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

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|  |  |  | and reasons for registering occupational accidents<br>12- Encouraging interest in occupational health and safety, mechanical risks<br>13- Electrical accidents, ways to prevent electrical accidents<br>14- Chemical risks, and ways to prevent chemical accidents<br>15-Protective and personal equipment |  |  |
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## 16. Course Structure:

### Electronic circuits1(first semester)

### Electronic circuits2(second semester) (second stage)

| Week            | Hours   | Required Learning Outcomes                                                                                                    | Unit or subject name                                                  | Learning method                          | Evaluation method             |
|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------|-------------------------------|
| 1               | 3 hours | : Definition of the student<br>Basic electronic circuits, methods of designing them<br>Use it in Practical applications many. | -1-2-3- Class A power amplifiers                                      | lecture<br><br>And the<br><br>laboratory | Oral and<br><br>written tests |
| 2               | 3 hours |                                                                                                                               | Class B power amplifiers                                              |                                          |                               |
| 3               | 3 hours |                                                                                                                               | Class C power amplifiers                                              |                                          |                               |
| 4               | 3 hours |                                                                                                                               | 4- Power equipment                                                    |                                          |                               |
| 5               | 3 hours |                                                                                                                               | 5- Using voltage regulators                                           |                                          |                               |
| 6               | 3 hours |                                                                                                                               | variable resistor, Zener diode,                                       |                                          |                               |
| 7               | 3 hours |                                                                                                                               | series and parallel transistor, Darlington                            |                                          |                               |
| 8               | 3 hours |                                                                                                                               | 6- Thyristor Ways to turn                                             |                                          |                               |
| 9               | 3 hours |                                                                                                                               | on and off the thyristor Ways to                                      |                                          |                               |
| 10              | 3 hours |                                                                                                                               | on the gate in an (AC) circuit, (DC), pulses,                         |                                          |                               |
| 11              | 3 hours |                                                                                                                               | applications for silicon modules                                      |                                          |                               |
| 12              | 3 hours |                                                                                                                               | 7-8 - Oscillators and their                                           |                                          |                               |
| 13              | 3 hours |                                                                                                                               | definition - back feed and their                                      |                                          |                               |
| 14              | 3 hours |                                                                                                                               | es, drawing their diagrams and finding the mathematical               |                                          |                               |
| 15              | 3 hours |                                                                                                                               | relationships for the final amplification of the system               |                                          |                               |
| <b>vacation</b> |         |                                                                                                                               | forward gain - back gain - return (uit) - conditions of oscillation - |                                          |                               |
| 1               | 3 hours |                                                                                                                               | amples of oscillator circuits (LC                                     |                                          |                               |
| 2               | 3 hours |                                                                                                                               | oscillator - Hartley oscillator -                                     |                                          |                               |
| 3               | 3 hours |                                                                                                                               | bits oscillator - shift oscillator (phase)                            |                                          |                               |
| 4               | 3 hours |                                                                                                                               | 9-10-11 - The transistor as                                           |                                          |                               |
| 5               | 3 hours |                                                                                                                               | a switch - Specifications of its operation on the load line - Its     |                                          |                               |
| 6               | 3 hours |                                                                                                                               | response to a rectangular input wave, transformation times -          |                                          |                               |
| 7               | 3 hours |                                                                                                                               | orators and their different types                                     |                                          |                               |
| 8               | 3 hours |                                                                                                                               | (unstable, unstable - bistable)                                       |                                          |                               |
| 9               | 3 hours |                                                                                                                               | Mathematical relationships -                                          |                                          |                               |

|          |    |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|----------|----|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| vacation | 10 | 3 hours | <p>lector and base resistors - Input and output waveforms, their circuits - Their idea - Idea Its ration - protection - overcoming possible distortions in the output signals - pulse width control.</p> <p>12-13 – Operationa</p> <p>amplifier - Typical diagram - emplate input - Non-template it - Input impedance - Template mplifier circuit output - Non-mplate amplifier gain - Voltage wer and amplification equation Host - Equation for adding N mber of inputs - Non-template host.</p> <p>4-15 - The inverter collector cuit and the output equation - e non-inverting collector circuit and the output equation - Mathematical examples.</p> <p>16- Subtractor circuit and lculatation equations to subtract ut voltages <math>V_O = V_2 - V_1</math> - applied circuit.</p> <p>17- Applications of the operational amplifier - The integrator and its circuit - vation of its equation - Example sserting a square wave into the tegrator circuit and finding its out wave - Example - Inserting a pulse wave into the integrator uit and finding the output wave - Example - The effect of the integrator voltage - Solving exercises.</p> <p>18- The comparator - its circuit - the idea of the work - roducing a triangle wave to the gular input and connecting the on-standard input to ground - roducing a triangle wave to the rmal input and connecting the n-standard input to a positive reference voltage.</p> <p>19- Nonlinear applications of the op-amp - the rectifier mple - the idea of using the op-amp in rectifier circuits - its vantages over circuits without op-amp a comparison between ideal and non-ideal properties he rectifier - the ideal half-wave ectifier circuit - the idea of its rk - the ideal full-wave rectifier circuit - the idea the job.</p> <p>20- Schmidt switch - False nsformation in the comparator and how to prevent it from appening - Example - Schmidt switch circuit, drawing its version properties - Example - troducing a random wave into he Schmidt switch circuit and drawing the output voltage - Solving exercises</p> |  |  |
|          | 11 | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|          | 12 | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|          | 13 | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|          | 14 | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|          | 15 | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
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|  |  |  | <p>21- Wave generators using an op-amp - square wave generator - its circuit - derivation of the equation for the frequency of output wave - modulating the circuit to give a rectangular wave - example - circuit design.</p> <p>22- Monostable vibrating pulse generator, its circuit - working idea - drawing waves - derivation of the equation for the output pulse width - example - circuit design.</p> <p>23- Triangle wave generator circuit - working idea - drawing waves - derivation of the equations for this - derivation of the frequency equation for the output wave</p> <p>24- The analog calculator - design - solved examples - timer - its construction - diagrams for use in vibrators - equations for calculating pulse width time - solved examples.</p> <p>25- Effective RC filters - their advantages - properties - - HPF-LPF- (Features - Properties - Equations - Response Curves - Mathematical Examples)</p> <p>26- Effective RC filters- - BSFBPF their advantages- properties- - (Features - properties - equations - response curves - mathematical examples)</p> <p>27- Basic methods for manufacturing integrated circuits (single-crystalline, thin-film and thick-film)</p> <p>28-29-30- Manufacture of an integrated circuit for an NPN transistor - Manufacture of integrated resistors and capacitors - Manufacture of an integrated circuit for a simple electronic circuit</p> |  |  |
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## 17. Course Structure:

### Microcomputers (second stage)

| Week | Hours   | Required Learning Outcomes | Unit or subject name            | Learning method | Evaluation method |
|------|---------|----------------------------|---------------------------------|-----------------|-------------------|
| 1    | 3 hours | 1- Student training        | 1- Introducing the              |                 |                   |
| 2    | 3 hours | On the correct             | abulary of the academic subject | lecture         | Oral and          |

|          |         |                      |                                   |                           |               |
|----------|---------|----------------------|-----------------------------------|---------------------------|---------------|
| 3        | 3 hours | foundations of       | and distributing exam grades -    | And the<br><br>laboratory | written tests |
| 4        | 3 hours | engineering drawing  | numerical systems - the decimal   |                           |               |
| 5        | 3 hours | drawing and reading  | stem - the binary system - the    |                           |               |
| 6        | 3 hours | electronic and       | ctal system - the hexadecimal     |                           |               |
| 7        | 3 hours | electrical maps.     | system and its importance for     |                           |               |
| 8        | 3 hours |                      | microcomputers - conversions      |                           |               |
| 9        | 3 hours | Train the student    | between systems.                  |                           |               |
| 10       | 3 hours | and make him able    | 2- Introducing                    |                           |               |
| 11       | 3 hours | to:                  | microcomputers, their types, and  |                           |               |
| 12       | 3 hours | 1-Using engineering  | their relationship to other       |                           |               |
| 13       | 3 hours | drawing equipment    | electronic computers.             |                           |               |
| 14       | 3 hours | and tools,           | 3- Definitions of                 |                           |               |
| 15       | 3 hours | understanding maps   | microcomputer terms:              |                           |               |
| vacation |         | and drawing their    | Byte-Nibble-Word-Instruction-     |                           |               |
| 1        | 3 hours | engineering views    | gram-Software-Structures-Level    |                           |               |
| 2        | 3 hours | and projections.     | Languages                         |                           |               |
| 3        | 3 hours | 2-Distinguishing     | Higher-low-level languages-       |                           |               |
| 4        | 3 hours | between electronic   | assembly language-machine         |                           |               |
| 5        | 3 hours | components,          | language.                         |                           |               |
| 6        | 3 hours | reading, projecting  | 4- Microcomputer                  |                           |               |
| 7        | 3 hours | and drawing          | architecture - block diagram -    |                           |               |
| 8        | 3 hours | electrical maps      | at unit - keyboard - mouse - two  |                           |               |
| 9        | 3 hours | Electronic circuits. | es of mouse and a comparison      |                           |               |
| 10       | 3 hours |                      | between them - input port.        |                           |               |
| 11       | 3 hours |                      | 5- Transport system - data        |                           |               |
| 12       | 3 hours |                      | carrier - carrier                 |                           |               |
| 13       | 3 hours |                      | Addresses - lines of              |                           |               |
| 14       | 3 hours |                      | command and control - the         |                           |               |
| 15       | 3 hours |                      | usefulness of each -              |                           |               |
|          |         |                      | Compare them.                     |                           |               |
|          |         |                      | 6- The output unit - the          |                           |               |
|          |         |                      | een - the difference between a    |                           |               |
|          |         |                      | puter screen and a TV screen -    |                           |               |
|          |         |                      | the output port.                  |                           |               |
|          |         |                      | 7- Memory - main                  |                           |               |
|          |         |                      | memory - read-only memory -       |                           |               |
|          |         |                      | ad-write memory - comparison      |                           |               |
|          |         |                      | ween them - auxiliary memories    |                           |               |
|          |         |                      | and the difference between them   |                           |               |
|          |         |                      | and main memory.                  |                           |               |
|          |         |                      | 8- The central processing         |                           |               |
|          |         |                      | unit - the microprocessor - its   |                           |               |
|          |         |                      | definition - a block diagram      |                           |               |
|          |         |                      | showing the architecture of the   |                           |               |
|          |         |                      | microprocessor - the 8085         |                           |               |
|          |         |                      | microprocessor - a diagram of the |                           |               |
|          |         |                      | minals and its block diagram -    |                           |               |
|          |         |                      | ata bus buffers - address bus     |                           |               |
|          |         |                      | fers and a comparison between     |                           |               |
|          |         |                      | them.                             |                           |               |
|          |         |                      | 9- Public Records - Register      |                           |               |
|          |         |                      | A (Accumulator) -                 |                           |               |
|          |         |                      | ithmetic and Logic Unit - Flags   |                           |               |
|          |         |                      | Record -                          |                           |               |
|          |         |                      | 85 microprocessor notification -  |                           |               |
|          |         |                      | Computational example             |                           |               |
|          |         |                      | to determine the status of each   |                           |               |
|          |         |                      | flag and its interpretation       |                           |               |
|          |         |                      | status-Utility of Flags Register. |                           |               |
|          |         |                      | 10- The information of the        |                           |               |
|          |         |                      | Z-80 microprocessor and its       |                           |               |
|          |         |                      | parison with the information of   |                           |               |
|          |         |                      | the 8085 microprocessor -         |                           |               |
|          |         |                      | arithmetic example - the PC       |                           |               |
|          |         |                      | rogram counter, the SP stack      |                           |               |
|          |         |                      | nter - the instruction register - |                           |               |
|          |         |                      | the instruction decoder - the     |                           |               |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|--|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|  |  |  | <p>control unit.</p> <p>11- Instructions for the 8085-Z80 microprocessor - mnemonic codes used - machine language - comparison between them - how to extract codes in machine language from the instruction table.</p> <p>12- Data transfer group instructions and their types - solving examples - writing an application program.</p> <p>13- Input and output instructions and their relationship with data transfer group instructions - examples Applied.</p> <p>14- A group of arithmetic instructions and their types - solving examples - their use in amplifying the digital signal with an applied example.</p> <p>15- A group of logical instructions and their types - applied examples - and their use in solving digital circuits.</p> <p>16- A group of branching instructions and their types - conditional and unconditional and their dependence on flags - applied examples - the importance of these Group in writing programs.</p> <p>17-18- Programs for performing mathematical operations: addition - subtraction - multiplication - division - what is meant by addressing and its types in the 8085 processor</p> <p>19- The stages of executing an instruction - the instruction cycle - the machine cycle - the timing chart for executing an instruction (an instruction to store contents of the accumulator in a memory location, for example) - how the microprocessor reads data in memory.</p> <p>20- Configure repetition loops - time delay loops - one loop - two loops - three loops - application programs for each of them.</p> <p>21- Generating pulses with required frequency and a known duty cycle compared to pulse generators that use integrated circuits.</p> <p>22- Practical examples showing how to exploit time delay loops in industrial and domestic fields.</p> <p>23- Write a program for an</p> |  |  |
|--|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|

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|  |  |  | <p>ending counter - with an applied example.</p> <p>24- Write a program for a countdown timer - with an applied example.</p> <p>25- Write a program for an ascending/descending counter - with an applied example.</p> <p>26- Microprocessor 8086 - specifications - architecture - terminal diagram.</p> <p>27- Types of addressing for the 8086 microprocessor - data transfer instructions - multiplication and division instructions - examples of other instructions.</p> <p>28- A comparison between eight-threaded microprocessors such as the 8085 (Z80) and sixteen-threaded ones, such as the 8086.</p> <p>29- Microprocessors with ranks and their most prominent specifications - microprocessors used in Pentium computers.</p> <p>30- A general review of the curriculum vocabulary.</p> |  |  |
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## 18. Course Structure:

### communications (first semester)

### Digital communications(second semester) (second stage)

| Week            | Hours   | Required Learning Outcomes                                                                                                                                           | Unit or subject name                                                                                                                                                                                                                                                                                                                                                                                                                        | Learning method                                 | Evaluation method                    |
|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------|
| 1               | 3 hours | <p>-: Providing the student with basic information about telecommunications systems.</p> <p>2-Systems and structures of radio, television and telephone systems.</p> | <p>1- BSF)-(RC))- (LPF)-(HPF)-(BPF) Filters</p> <p>2-( BSF) - LPF)-(HPF)-(BPF) Active filters</p> <p>3- Modulation,types,AM modulation,wave analysis</p> <p>4- Spectrum frequency,power distributed,calculate modulation index</p> <p>5- Types of AM with its spectrum</p> <p>6- Types of modulation used to generate AM</p> <p>7- Detector of AM-distortion in demodulation circuits- Envelope Detector – Synchronous Detector - ((AGC</p> | <p>lecture</p> <p>And the</p> <p>laboratory</p> | <p>Oral and</p> <p>written tests</p> |
| 2               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 3               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 4               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 5               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 6               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 7               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 8               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 9               | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 10              | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 11              | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 12              | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 13              | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 14              | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| 15              | 3 hours |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |
| <b>vacation</b> |         |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                 |                                      |

|    |         |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|----|---------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1  |         | 3-Methods of transferring information in communications systems, their specifications, features, and the operations that take place on them. | 8- Block diagram for transmitting and receiving AM-sensitivity of receiving .device<br>9- FM modulation-PM modulation-mathematic analysis for modulated waves-modulation ratio- .frequency deviation<br>10- The width of spectrum frequency for FM and PM<br>11- Types of FM generation- (Stereo FM)- Stereo<br>12- Some types of Detector of FM<br>13- Coding-Sampling- Quantization-coding .transform<br>14- PM-PCM-PPM-PDM and PAM<br>15- Multiplexing) –(FDM) – (TDM)<br>16- PSK-FSK-ASK modulation<br>17- Transmission information- signal to noise ratio-noise<br>18- Mobile-FDMA-TDMA- CDMA<br>19- Teleprinters-telegraph<br>20- Facsimile Transmission) – (Fax-Receiver)-(Telex)<br>21- Optic fiber-types- properties<br>22- Types of antenna- fundamentals of antenna- factor of antenna<br>23- Propagation of radio signal<br>24- Some types of antenna<br>25- Using of Microwave in communications<br>26- Satellite-properties and advances-receiving and transmitting-orbits of satellite-multiple access<br>27- Microwaves- generations-frequency spectrum<br>28- Mobile-introduction- principles-technics-wireless technics<br>29- GSM-functions-structure<br>30- Thuraya device |  |  |
| 2  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 3  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 4  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 5  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 6  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 7  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 8  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 9  | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 10 | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 11 | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 12 | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 13 | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 14 | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| 15 | 3 hours |                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |

## 19. Course Structure:

Measurements Fevices/1 **(first semester)**

Measurements Fevices/2 **(second semester) (second stage)**

| Week     | Hours   | Required Learning Outcomes | Unit or subject name              | Learning method                          | Evaluation method             |
|----------|---------|----------------------------|-----------------------------------|------------------------------------------|-------------------------------|
| 1        | 3 hours | Student acquisition        | 1- Metrology - the                | lecture<br><br>And the<br><br>laboratory | Oral and<br><br>written tests |
| 2        | 3 hours | Skill in the field         | international system of units of  |                                          |                               |
| 3        | 3 hours | Use of devices             | measurement - basic units of      |                                          |                               |
| 4        | 3 hours | Measurement                | measurement - derived units of    |                                          |                               |
| 5        | 3 hours | And electrical             | asurement - decimal multiples     |                                          |                               |
| 6        | 3 hours | different.                 | and parts of multiples -          |                                          |                               |
| 7        | 3 hours | And knowledge              | asurement errors - examples       |                                          |                               |
| 8        | 3 hours | Basic ingredients          | 2- The galvanometer -             |                                          |                               |
| 9        | 3 hours | for these devices          | sensitivity of the galvanometer   |                                          |                               |
| 10       | 3 hours | And how                    | he final deviation - the kinetic  |                                          |                               |
| 11       | 3 hours | Use it                     | havior - the decay mechanism.     |                                          |                               |
| 12       | 3 hours | In the correct way         | Examples                          |                                          |                               |
| 13       | 3 hours | And away from the          | 3- Classification of              |                                          |                               |
| 14       | 3 hours | risks in working on it.    | measuring devices - Indicating    |                                          |                               |
| 15       | 3 hours | And get to know            | ices and the foundations relied   |                                          |                               |
| vacation |         | How to calibrate           | on - Types of effective torques - |                                          |                               |
| 1        | 3 hours | Measuring devices          | ection torque - Control torque -  |                                          |                               |
| 2        | 3 hours | Analogue                   | Decreasing torque                 |                                          |                               |
| 3        | 3 hours | And digital. And also      | 4- Moving coil measuring          |                                          |                               |
| 4        | 3 hours | Recognition                | evices - installation - working   |                                          |                               |
| 5        | 3 hours | Factors affecting          | nciple - moment equations - -     |                                          |                               |
| 6        | 3 hours | reading accuracy and       | advantages - disadvantages        |                                          |                               |
| 7        | 3 hours | how                        | measuring devices with a moving   |                                          |                               |
| 8        | 3 hours | Device selection           | on - attractive type - repulsive  |                                          |                               |
| 9        | 3 hours | appropriate to measure     | type - installation - working     |                                          |                               |
| 10       | 3 hours | So that the student can    | principle - advantages -          |                                          |                               |
| 11       | 3 hours | use the devices            | disadvantages.                    |                                          |                               |
| 12       | 3 hours | Different                  | 6- Types of resistors in          |                                          |                               |
| 13       | 3 hours | measurements after         | ms of their values - Methods of   |                                          |                               |
| 14       | 3 hours | graduation with a          | asuring electrical resistance -   |                                          |                               |
| 15       | 3 hours | picture                    | meter and voltmeter method -      |                                          |                               |
|          |         | Correct in                 | mmeter device - Series type -     |                                          |                               |
|          |         | work fields                | Parallel type - Examples          |                                          |                               |
|          |         | different.                 | 7- The micrometer                 |                                          |                               |
|          |         |                            | evice for measuring insulation    |                                          |                               |
|          |         |                            | and high-value resistances -      |                                          |                               |
|          |         |                            | omponents - electrical circuit    |                                          |                               |
|          |         |                            | diagram - working principle       |                                          |                               |
|          |         |                            | 8- Direct current                 |                                          |                               |
|          |         |                            | lges - Whetstone direct current   |                                          |                               |
|          |         |                            | bridge to measure unknown         |                                          |                               |
|          |         |                            | istance - working principle -     |                                          |                               |
|          |         |                            | te of equilibrium - unbalance -   |                                          |                               |
|          |         |                            | erivation of the equilibrium      |                                          |                               |
|          |         |                            | ation for the bridge - examples - |                                          |                               |
|          |         |                            | double Kelvin bridge              |                                          |                               |
|          |         |                            | 9- Direct current                 |                                          |                               |
|          |         |                            | meter - resistance in parallel -  |                                          |                               |
|          |         |                            | erivation of the equation for     |                                          |                               |
|          |         |                            | culating resistance in parallel - |                                          |                               |
|          |         |                            | multi-range ammeter - safety      |                                          |                               |
|          |         |                            | asures when using - examples      |                                          |                               |
|          |         |                            | 10 - Direct current               |                                          |                               |
|          |         |                            | voltmeter - series resistance -   |                                          |                               |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |
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|  |  |  | <p>derivation of the equation for calculating series resistance - multi-range voltmeter - safety measures when using - examples</p> <p>11- A multimeter – a differential diagram - a circuit for a current and voltage meter - a circuit for a single-range direct current, voltage and resistance meter - calibration of direct current meters - calibration of voltmeters and ammeters.</p> <p>12- Wayne bridge to measure frequency, unbalances, how to balance the bridge</p> <p>13- Devices for measuring alternating current, electro-dynamometer, structures, moment equation</p> <p>14- Mobile steel measuring devices, structures, moment equations, advantages and disadvantages.</p> <p>15- Uniform type measuring devices - full-wave integrator - half-wave integrator - examples.</p> <p>16- The use of electro-dynamometers in measuring single-phase power, structures, and the deflection angle equation.</p> <p>17- Frequency scale, compositions and working principle</p> <p>18- Thermal devices, thermocouple device for measuring non-granular shapes.</p> <p>19- Signal oscilloscope, block diagram, cathode ray diode, assembly, screen, factors for selecting screens, types of screens, optical grid.</p> <p>20- Vertical deflection system, block diagram, input function, generator, vertical amplifier, delay line, function and types of delay line.</p> <p>21-22- Horizontal deflection system, basic sweep generator, step synchronization, magnetic sweep, horizontal amplifier, signal oscilloscope figures, passive and active voltage figures, current figures, high voltage figures, various shapes, phase calculation, frequency calculation</p> <p>23- The dual-beam signal generator, your head is the signal keeper.</p> <p>24- Electronic measuring devices, electronic voltmeter, basic transistor circuit.</p> <p>25- Considerations for using an analog voltmeter, input impedance, voltage range, decibels, sensitivity, versus tape width, measuring current.</p> <p>26-27- Digital voltmeter,</p> |  |  |
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|  |  |  | neral specifications, regression<br>e, integration type, continuous<br>uilibrium type, and successive<br>approximation type.<br>28-29-30- Simple frequency<br>ounter, display counters, time<br>e, signal processing, measuring<br>e expansion of the frequency<br>nge of the counter, automatic<br>counters and calculators. |  |  |
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## 20. Course Structure:

### Auduo and visual icstruments (second stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                                                                                                                                                                                                                                                                                             | Unit or subject name                                                          | Learning method    | Evaluation method      |
|------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------|------------------------|
| 1    | 3 hours | 1-: Student education Fundamentals and theory Broadcast television signal with Providing him with a comprehensive idea of broadcast systems Transmission and reception And regarding the stages of the future, In addition to Providing him with information about video recording.<br><br>2-: Teaching the student: the principle of broadcast transmission Visual and stages Broadcasting offices and Its international systems, and | 1- How to use the measuring devices used in the audiology laboratory          | lecture            | Oral and written tests |
| 2    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2- Identifying the stages                                                     | And the laboratory |                        |
| 3    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | the television set (reading the p) and placing the dots on the television set |                    |                        |
| 4    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3-4-5-6--The power                                                            |                    |                        |
| 5    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | supply stage (measuring the                                                   |                    |                        |
| 6    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | ply voltage to operate the TV -                                               |                    |                        |
| 7    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | w to convert it from AC to DC -                                               |                    |                        |
| 8    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | drawing signals at inspection                                                 |                    |                        |
| 9    | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | points using an oscilloscope -                                                |                    |                        |
| 10   | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | asuring the voltages entering the                                             |                    |                        |
| 11   | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | llator - measuring the voltages                                               |                    |                        |
| 12   | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | ning out of the power supply -                                                |                    |                        |
| 13   | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | rawing the signals Out of phase                                               |                    |                        |
| 14   | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | using the oscilloscope                                                        |                    |                        |
| 15   | 3 hours |                                                                                                                                                                                                                                                                                                                                                                                                                                        | Osloscope                                                                     |                    |                        |
|      |         | 7-8- Horizontal deflection                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                    |                        |
|      |         | ase. Measurement of voltages                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                               |                    |                        |
|      |         | ntering and exiting the phase                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                               |                    |                        |
|      |         | 9-10- The vertical                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                               |                    |                        |
|      |         | eflection phase measures the                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                               |                    |                        |
|      |         | tages entering and exiting the                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                               |                    |                        |
|      |         | phase                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                               |                    |                        |
|      |         | 11-12- Drawing the signals                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                    |                        |
|      |         | ering and exiting the horizontal                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                               |                    |                        |
|      |         | vertical stages using the signal                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                               |                    |                        |
|      |         | oscilloscope device                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                               |                    |                        |
|      |         | 13- Create an RF stage for                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                    |                        |

|                 |    |                                                                          |                                                                                                                                                                              |  |  |
|-----------------|----|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <b>vacation</b> |    | Dealing with signal components before transmission. Stages of the device | the stage and measure the input stages and plot the input signals using a signal oscilloscope device.                                                                        |  |  |
|                 |    | Reception and processing of the received signal                          | 14- Create an RF stage for the stage and measure the outgoing voltages and plot the incoming signals using a signal oscilloscope and an oscilloscope device.                 |  |  |
|                 |    | To be regenerated, signals examined and learned                          | 15- Make an IF stage for the stage and measure the input stages and plot the input signals using a signal oscilloscope device.                                               |  |  |
|                 |    | Control methods and organization                                         | 16- Make an IF phase (for the phase) and measure the outgoing voltages and plot the incoming signals using a signal oscilloscope.                                            |  |  |
|                 |    | Picture and sound information                                            | 17- Create an AGC stage for the stage and measure the input voltages and plot the input signals using a signal oscilloscope device.                                          |  |  |
|                 | 1  | 3 hours                                                                  | 18- Create an AGC phase for the phase and measure the outgoing voltages and plot the incoming signals using a signal oscilloscope.                                           |  |  |
|                 | 2  | 3 hours                                                                  | 19-20- The stage of image control operations, measuring input voltages and plotting signals entering the stage using a signal oscilloscope and an oscilloscope device.       |  |  |
|                 | 3  | 3 hours                                                                  | 21-22- The stage of image control operations, measuring the input voltages of the equipment plotting the signals coming out of the stage using a signal oscilloscope device. |  |  |
|                 | 4  | 3 hours                                                                  | 23-24 - Sound stage, measuring the input and output voltages of the equipment, and plotting the signals using a signal oscilloscope, an oscilloscope device.                 |  |  |
|                 | 5  | 3 hours                                                                  | 25-26- Color amplifiers, measuring supply voltages for input and output, and plotting signals using an oscilloscope.                                                         |  |  |
|                 | 6  | 3 hours                                                                  | 27-28- How to control the intensity of lighting. Measure the supply voltages for input and output while plotting signals using a signal oscilloscope.                        |  |  |
|                 | 7  | 3 hours                                                                  | 29-30- Identifying modern devices and keeping up with the development taking place in them in terms of installation                                                          |  |  |
|                 | 8  | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 9  | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 10 | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 11 | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 12 | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 13 | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 14 | 3 hours                                                                  |                                                                                                                                                                              |  |  |
|                 | 15 | 3 hours                                                                  |                                                                                                                                                                              |  |  |

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## 21. Course Structure:

Programing Logic Control (PLC), (first semester)

Control systems, (second semester) (second stage)

| Week | Hours   | Required Learning Outcomes                                                                                                                                                                                                                                                                                           | Unit or subject name                         | Learning method                                 | Evaluation method                    |
|------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------|--------------------------------------|
| 1    | 3 hours | <p>The purpose of PLC material</p> <p>1:-General objective:<br/>Definition of student With Hawakam components<br/>Programmed and how Programming and uses.<br/>Special objective:-<br/>Recognition<br/>On the controllers<br/>Digital retractable Programmable (PLC)<br/>And how to deal With it and programmed.</p> | 1- Introduction                              | <p>lecture</p> <p>And the</p> <p>laboratory</p> | <p>Oral and</p> <p>written tests</p> |
| 2    | 3 hours |                                                                                                                                                                                                                                                                                                                      | 2-3- Sensors with programmable controller(he |                                                 |                                      |
| 3    | 3 hours |                                                                                                                                                                                                                                                                                                                      | pressure,motion ..etc)                       |                                                 |                                      |
| 4    | 3 hours |                                                                                                                                                                                                                                                                                                                      | 4- Electrical switch, electrical             |                                                 |                                      |
| 5    | 3 hours |                                                                                                                                                                                                                                                                                                                      | contact                                      |                                                 |                                      |
| 6    | 3 hours |                                                                                                                                                                                                                                                                                                                      | 5- Introduction of ladder                    |                                                 |                                      |
| 7    | 3 hours |                                                                                                                                                                                                                                                                                                                      | language                                     |                                                 |                                      |
| 8    | 3 hours |                                                                                                                                                                                                                                                                                                                      | 6- Logic circuit                             |                                                 |                                      |
| 9    | 3 hours |                                                                                                                                                                                                                                                                                                                      | (AND,OR,NOT,etc.) using lad                  |                                                 |                                      |
| 10   | 3 hours |                                                                                                                                                                                                                                                                                                                      | language                                     |                                                 |                                      |
| 11   | 3 hours |                                                                                                                                                                                                                                                                                                                      | 7- Timers and its types-                     |                                                 |                                      |
| 12   | 3 hours |                                                                                                                                                                                                                                                                                                                      | simulation using ladder                      |                                                 |                                      |
| 13   | 3 hours |                                                                                                                                                                                                                                                                                                                      | language                                     |                                                 |                                      |
| 14   | 3 hours |                                                                                                                                                                                                                                                                                                                      | 8- The signal in ladder langu                |                                                 |                                      |
| 15   | 3 hours |                                                                                                                                                                                                                                                                                                                      | 9- Digital counter in ladder                 |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | language with examples.                      |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | 10- Example of (changeover                   |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | circuit) using ladder language               |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | 11- Example of traffic light                 |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | 12- Application example for                  |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | open and close the door using                |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | motion sensor.                               |                                                 |                                      |
|      |         |                                                                                                                                                                                                                                                                                                                      | 13- Operating circuit of singl               |                                                 |                                      |

|          |    |         |                                                                                                                                                                                                     |  |  |
|----------|----|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| vacation |    |         | phase motor by switch (motor starter) using ladder language<br>14- Operating circuit of three phase motor(delta-star)<br>15-Application example for electrical lift<br>.....<br>The second choleric |  |  |
|          | 1  |         | 1- Introduction to control systems                                                                                                                                                                  |  |  |
|          | 2  | 3 hours | 2- Open-circuit and closed-circuit control systems                                                                                                                                                  |  |  |
|          | 3  | 3 hours | 3- Converting electrical signals into mechanical ones and vice versa, converting electrical signals into pneumatic ones and vice versa.                                                             |  |  |
|          | 4  | 3 hours | 4- Error sensing devices used in control, their types                                                                                                                                               |  |  |
|          | 5  | 3 hours | 5- Electrical components to be used in control systems                                                                                                                                              |  |  |
|          | 6  | 3 hours | 6- Control motors - electric - pneumatic - hydraulic                                                                                                                                                |  |  |
|          | 7  | 3 hours | 7- pickup - timer - switches - pusher - specific switches                                                                                                                                           |  |  |
|          | 8  | 3 hours | 8- The four variables (temperature - pressure - flow - level measurement) in control systems                                                                                                        |  |  |
|          | 9  | 3 hours | 9- Controlling the switching on and off of a single phase induction motor using 1- electromagnetic pickup B- thyristor-TRIAC)                                                                       |  |  |
|          | 10 | 3 hours | 10- Complementing the applied systems                                                                                                                                                               |  |  |
|          | 11 | 3 hours | 11- Digital systems in control                                                                                                                                                                      |  |  |
|          | 12 | 3 hours | 12- Methods of measuring temperature, pressure, flow level                                                                                                                                          |  |  |
|          | 13 | 3 hours | 13- The various elements of pneumatic control systems                                                                                                                                               |  |  |
|          | 14 | 3 hours | 14- Applied systems in pneumatic control                                                                                                                                                            |  |  |
|          | 15 | 3 hours | 15- Use the analog calculator in control<br>16- How to represent digital circuits in control<br>The use of electronic calculators in applied control systems                                        |  |  |

## 1. Course Evaluation

Distribution as follows:

Any subject in which theory and practical are the same, whether in the first or second stage, the distribution of grades is as follows

Example: The first stage

1- Digital Circuits: 50% = 20 practical + 20 theoretical + 10 year's work + final exam 50% = 40 n + 10 n.

2- Electrical Circuits and Measurements 50% = 20 practical + 20 theoretical + 10 year's work + final exam 50% = 40 n + 10 n.

3- Laboratories/electronic workshop Continuous evaluation: 50% electronic workshop and 50% electrical workshop

4- The course fee is 50% = the mid-term exam is 30% + the year's work is 20% = the final exam is 50%

\*There are subjects that end with the first semester and begin with another subject

## 2. Learning and Teaching Resources

- 1– **Electrical Technology**(Edward Hughes).
- 2– **Basic Circuit**(A.M.Brooks).pergaman press
- 3– **Introduction To Electric Circuit**  
(M.Romanwiltz) John Willey .
- 4– **Basic Electrical Engineering**(Fitzgerald& Rlgginbothan).Graw

|                                                                                                                                                                                                                                                                                                          |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                                                                                                                                          |  |
| <p>1- Programmable Controllers Theory and Implementation, Second Edition, by L. Bryan &amp; E. A. Bryan, © 1988, 1997 Industrial Text Company Published Industrial Text Company.</p> <p>2- MITSUBISHI ELECTRIC, FX-TRN-BE E, USER'S MANUAL, Manual number JY997D02901 Manual revision: E, July 2015.</p> |  |
| <p>1- التأسيسات الصناعية تأليف : (سلطان حسين - جاسم عصري)</p> <p>D.C Motors speed control By :Servo system</p>                                                                                                                                                                                           |  |
| <p><a href="https://www.academicinfo.net/subject-guides">https://www.academicinfo.net/subject-guides</a></p> <p><a href="https://dcaclab.com/">https://dcaclab.com/</a></p> <p><a href="http://electrical-engineering-portal.com/">http://electrical-engineering-portal.com/</a></p>                     |  |