

**Ministry of Higher Education and Scientific Research**  
**Scientific supervision and evaluation**  
**Department of Quality Assurance and Academic Accreditation**  
**The Accreditation Section**



**University Name: Northern Technical University**

**Kirkuk Polytechnic College**

**Department of Power Mechanics Technologies | Refrigeration and Air Conditioning Branch**

**Description of the academic program and course**  
**Department of Power Mechanics Techniques**

**Refrigeration and Air Conditioning Branch**

**2026-2025**

Ministry of higher education and scientific research  
Scientific supervision and evaluation directorate  
Quality assurance and academic accreditation

## ACADEMIC PROGRAM SPECIFICATION FORM

University: Northern Technical University

College: Kirkuk Polytechnic College

Department: Power Mechanics Technologies| Refrigeration and Air Conditioning Branch

Date of form: 1/10/2025



Prof. Dr. Ashty M. Arif

The Dean

Date: 1 / 10 /2025



Asist. prof. Zuhair shakur

Dean's Assistant for scientific Affairs

Date: 1 /10 /2025



Asist. lecturer. Mohammad Sabah Hassan

Head of Department:

Date: 1 /10 /2025



Asist. lecturer. Alaa AbdulWahhab Aziz

Quality Assurance And University Performance Manager

Date: 1 / 10 /2025

### **1. Vision of the program**

Excellence in Power Mechanics Technologies – Refrigeration and Air Conditioning specialization, through the preparation of highly qualified technical cadres capable of keeping pace with rapid technological advancements and responding to labor market demands in accordance with quality assurance and academic accreditation standards, thereby contributing to community service and sustainable development.

### **2. Mission of the program**

The Department of Power Mechanics Technologies – Refrigeration and Air Conditioning specialization seeks to prepare scientifically and practically qualified technical personnel through advanced educational and training programs grounded in quality assurance and academic accreditation standards. The department promotes applied research and innovation skills in alignment with technological advancements, meets labor market needs, and contributes to community service

### **3. Objectives of the program**

-  Develop curricula in alignment with academic standards and labor market requirements.
-  Strengthen the practical and applied components within laboratories and workshops to enhance students' professional competencies.
-  Support applied research and innovation in the fields of refrigeration, air conditioning, and energy.
-  Enhance graduates' training and employment opportunities through effective collaboration with relevant private sector institutions.
-  Institutionalize a culture of quality assurance and academic accreditation across all departmental activities.
-  Develop students' skills in occupational safety, teamwork, and lifelong learning.
-  Contribute to providing technical consultations and services that serve the local community

### **4. Program appropriation**

The department is in the process of preparing the program accreditation requirements of the Ministry of Higher Education and Scientific Research.

### **5. Other external influences**

- Labor market demands and technological advancements in the fields of refrigeration, air conditioning, energy, and mechanical systems.
- Academic standards and quality and program accreditation requirements issued by the Ministry of Higher Education and relevant authorities.
- Training programs and collaborations with the public and private sectors and relevant industrial and service institutions.
- Occupational health and safety requirements, environmental sustainability, and feedback from employers and graduates to contribute to developing learning outcomes and improving academic performance.

| 6. Structure of the program                  |                       |               |            |                            |
|----------------------------------------------|-----------------------|---------------|------------|----------------------------|
| Structure of the program                     | Number of curriculums | Unit of study | Percentage | Observations               |
| Requirements of the institution (university) | 10                    | 20            | 17.1%      | Compulsory + 1 is elective |
| Requirements of the Institute                | 3                     | 7             | 6%         | Compulsory                 |
| Requirements of the section                  | 27                    | 98            | 76.9%      | Compulsory + 3 elective    |
| Summer training                              | There it is           | Complete only |            | Compulsory                 |
| Other                                        | There is none         |               |            |                            |

| 7. Description of the program |                              |                      |                                                           |                     |           |       |
|-------------------------------|------------------------------|----------------------|-----------------------------------------------------------|---------------------|-----------|-------|
| Educational level             | Type of curriculum           | Symbol of curriculum | Name of Curriculum                                        | Credit hours        |           |       |
|                               |                              |                      |                                                           | Theoretical         | Practical | Total |
| The first level               | University courses           | NTU100               | Democracy and Human Rights (compulsory)                   | 2                   | ---       | 2     |
|                               |                              | NTU101               | English Language (compulsory)                             | 2                   | -         | 2     |
|                               |                              | NTU102               | Computer (compulsory)                                     | 1                   | 1         | 2     |
|                               |                              | NTU103               | Arabic Language (compulsory)                              | 2                   | -         | 2     |
|                               |                              | NTU104               | Sports (elective)                                         | 2                   | -         | 2     |
|                               |                              | NTU107               | French Language (elective)                                | 2                   | -         | 2     |
|                               | Curriculums of the Institute | TIK110               | Principles of Mathematics (compulsory)                    | 2                   | ---       | 2     |
|                               |                              | TIK111               | Applied Mathematics (compulsory)                          | 2                   | ---       | 2     |
|                               |                              | TIK112               | Mechanical Workshops(compulsory)                          | ---                 | 3         | 3     |
|                               | Curriculums of the section   | PMTR136              | Principles of Air Conditioning (compulsory)               | 2                   | 2         | 4     |
|                               |                              | PMTR137              | Principles of Thermodynamics (compulsory)                 | 2                   | 2         | 4     |
|                               |                              | PMTR138              | Principles of Refrigeration (compulsory)                  | 2                   | 2         | 4     |
|                               |                              | PMTR139              | Applied thermodynamics (compulsory)                       | 2                   | 2         | 4     |
|                               |                              | PMTR140              | Fluid mechanics (compulsory)                              | 2                   | 2         | 4     |
|                               |                              | PMTR141              | Refrigeration and air conditioning Workshops (compulsory) | ---                 | 3         | 3     |
|                               |                              | PMTR142              | Principles of Electrical Technology (compulsory)          | 2                   | 2         | 4     |
|                               |                              | PMTR143              | Principles of engineering drawing (compulsory)            | ----                | 3         | 3     |
|                               |                              | PMTR144              | Advanced engineering drawing (compulsory)                 | ----                | 3         | 3     |
|                               |                              | PMTR145              | Engineering Mechanic (elective)                           | 2                   | 2         | 4     |
|                               |                              | PMTR146              | Advanced Electrical Technology (compulsory)               | 2                   | 2         | 4     |
| Total in hours                |                              |                      |                                                           | 31                  | 29        | 60    |
| Total for the level           |                              |                      |                                                           | 60 * 15 = 900 hours |           |       |
| Summer training               |                              |                      |                                                           | 270 hours           |           |       |

| Educational level | Type of curriculum         | Symbol of curriculum | Name of Curriculum                                                                      | Credit hours        |           |       |
|-------------------|----------------------------|----------------------|-----------------------------------------------------------------------------------------|---------------------|-----------|-------|
|                   |                            |                      |                                                                                         | Theoretical         | Practical | Total |
| The Second level  | University courses         | NTU200               | English Language (compulsory)                                                           | 2                   | -         | 2     |
|                   |                            | NTU201               | Computer (compulsory)                                                                   | 1                   | 1         | 2     |
|                   |                            | NTU202               | Arabic Language (compulsory)                                                            | 2                   | -         | 2     |
|                   |                            | NTU203               | Crimes of the Baath regime in Iraq (compulsory)                                         | 2                   | -         | 2     |
|                   |                            | NTU204               | Profession Ethics (compulsory)                                                          | 2                   | -         | 2     |
|                   | Curriculums of the section | PMTR240              | Fundamentals of Refrigeration Systems (compulsory)                                      | 2                   | 2         | 4     |
|                   |                            | PMTR241              | Fundamentals of air conditioning (compulsory)                                           | 2                   | 2         | 4     |
|                   |                            | PMTR242              | Fundamentals of heat transfer (compulsory)                                              | 2                   | 2         | 4     |
|                   |                            | PMTR243              | Maintenance fundamentals of Refrigeration and air conditioning equipment ( compulsory ) | 2                   | 4         | 6     |
|                   |                            | PMTR244              | Fundamentals of Control Systems (compulsory)                                            | 2                   | 2         | 4     |
|                   |                            | PMTR245              | Fundamentals design of conditioning systems (compulsory)                                | ---                 | 3         | 3     |
|                   |                            | PMTR246              | Advanced Refrigeration Systems (compulsory)                                             | 2                   | 2         | 4     |
|                   |                            | PMTR247              | Applied heat transfer (compulsory)                                                      | 2                   | 2         | 4     |
|                   |                            | PMTR248              | Advanced Refrigeration and Air Conditioning Maintenance (compulsory)                    | 2                   | 4         | 6     |
|                   |                            | PMTR249              | Project 1 (compulsory)                                                                  | ---                 | 1         | 1     |
|                   |                            | PMTR250              | Renewable energy (elective)                                                             | 2                   | ---       | 2     |
|                   |                            | PMTR251              | Advanced design of airconditioning systems (compulsory)                                 | ---                 | 3         | 3     |
|                   |                            | PMTR252              | Advanced Air Conditioning (compulsory)                                                  | 2                   | 2         | 4     |
|                   |                            | PMTR253              | Advanced control systems (compulsory)                                                   | 2                   | 2         | 4     |
|                   |                            | PMTR254              | Project 2 (compulsory)                                                                  |                     | 2         | 2     |
|                   |                            | PMTR255              | Management and Occupational Safety (elective)                                           | ---                 | 2         | 2     |
|                   | Total in hours             |                      |                                                                                         | 31                  | 36        | 67    |
|                   | Total for the level        |                      |                                                                                         | 60 * 15 = 900 hours |           |       |
|                   | Summer training            |                      |                                                                                         | 270 hours           |           |       |

| <b>8. Expected learning outcomes of the program</b>                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A.knowledge objectives</b>                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                            |
| <p>1. Provide the student with theoretical and applied knowledge in the design of models of refrigeration and air conditioning devices</p> <p>2. Contribute to the provision of technology to qualify the implementation of graduation projects and the requirements of the labor market.</p>                                                                                           | <p>3. Identify how to calculate the refrigeration and air conditioning loads of buildings and identify the types of fluids used in refrigeration systems and their impact on the environment</p> <p>4. Study of control systems of their types and uses in refrigeration and air conditioning devices.</p> |
| <b>B.skills objectives of the program</b>                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                            |
| <p>1. It aims to prepare qualified technical staff to practice the work of refrigeration and air conditioning equipment scientifically, professionally and technically.</p> <p>2. Preparing high-tech cadres for skill in the field of installation and maintenance of refrigeration and air conditioning devices and the use of AutoCAD software in industrial drawings and plans.</p> | <p>3. The department qualifies as an effective cadre to detect and maintain hardware failures and the welding types of pipes used in refrigeration systems</p> <p>4. Acquire skills in clarifying theoretical and practical information about refrigeration and air conditioning systems</p>               |
| <b>C.emotional and value goals</b>                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                            |
| <p>1. Inculcating the spirit of citizenship and promoting the values of functional affiliation and establishing the principles of honesty and loyalty while working in the institution.</p> <p>2. Establish the principle of preserving public property and public money</p>                                                                                                            | <p>3. Guiding the student on the correct educational treatment with the professor and cooperation between the students.</p> <p>4. Taking care of students and putting them on the right path and rejecting extraneous habits and warning them of societal pests such as addiction and anomaly.</p>         |
| <p>1. Encourage students to integrate into the labor market and transfer the academic aspect to a practical application.</p> <p>2. Urge to keep pace with the scientific development, especially in practical applications in line with the progress made in the world, especially the international companies specialized in refrigeration and air conditioning.</p>                   | <p>3. Developing the teaching and technical aspect by involving them in specialized courses and preparing seminars in relation to modern scientific developments and participating in scientific conferences to exchange experiences.</p> <p>4. Computer and Internet work should be a priority.</p>       |

| 9. Teaching and learning strategies                                                                                                                                                                    |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------|---------------|
| 1. Explain the scientific material to students in detail.                                                                                                                                              |                |              | 6. The strategy of interactive and direct education and the development of the capabilities of students and to help them in the delivery of the scientific material acquire the ability of the student to learn self and skill in the application of what has been learned in new areas. |  |                |               |
| 2. Participation of students in solving mathematical problems                                                                                                                                          |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| 3. Discussion and discussion on relevant topics                                                                                                                                                        |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| 4. Use visual aids (such as data show)                                                                                                                                                                 |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| 5. Preparation of weekly and Semester reports                                                                                                                                                          |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| 10. Methods of evaluation                                                                                                                                                                              |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| Semester exams (theoretical + practical) attendance or electronic. Electronic and verbal tests . Daily and electronic assessment. Laboratory reports. Practical exam attendance. Final entrance exams. |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| 11.Teaching staff                                                                                                                                                                                      |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| Teaching staff                                                                                                                                                                                         |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| Scientific level                                                                                                                                                                                       | Specialization |              | Special requirements/skills (if any)                                                                                                                                                                                                                                                     |  | Teaching staff |               |
|                                                                                                                                                                                                        | General        | Specific     |                                                                                                                                                                                                                                                                                          |  | employed       | Not– employed |
| assistant professor                                                                                                                                                                                    | law            | Criminal law |                                                                                                                                                                                                                                                                                          |  | 1              |               |
| Assistant Lecturer                                                                                                                                                                                     | Mechanic       | thermal      |                                                                                                                                                                                                                                                                                          |  | 3              |               |
| Professional development                                                                                                                                                                               |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |
| Professional development of faculty members                                                                                                                                                            |                |              |                                                                                                                                                                                                                                                                                          |  |                |               |

First: Orienting New Faculty Members

1. Organizing training courses in their field of specialization to enhance their scientific and practical skills and keep them abreast of modern developments.

2. Conducting courses and workshops on teaching and learning methodologies and the mechanisms for preparing and publishing scientific research in reputable journals.

#### Second: Professional Development of Faculty Members

1. Engaging faculty members in specialized courses and training programs to develop their scientific and technical skills.
2. Developing scientific research and academic publishing skills through workshops and courses on research methodology and publishing in international databases.

### **12. Standard of Acceptance**

Students are admitted to the Power Mechanics Technology Department according to the central admission criteria approved by the Ministry of Higher Education and Scientific Research, and in accordance with the department's capacity. Admission includes graduates of preparatory studies in its scientific (applied and biological) and vocational (industrial) branches, as well as those with equivalent specializations, according to applicable regulations.

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

- Approved textbooks and scientific references in the fields of refrigeration and air conditioning, heat transfer, thermodynamics, fluid mechanics, and control, as prescribed by the academic department.
- Modern international references, reputable scientific journals, and electronic databases such as Springer, Elsevier, and IEEE, in addition to digital resources approved by the Ministry of Higher Education and Scientific Research.
- Educational kits, engineering laboratories, and specialized software used in teaching core courses, such as AutoCAD, MATLAB, and refrigeration and air conditioning system simulation programs.
- International technical standards and specifications issued by ASHRAE, AHRI, and ISO related to refrigeration, air conditioning, and energy systems.

### **14. Program development plan**

- Conducting a student survey for each course.
- Developing a proposal to improve no more than 20% of the course content, submitted by experienced instructors.
- These surveys and proposals will be discussed by the department's academic committee and then forwarded to the college council and subsequently to the university council for review by the relevant committees.
- Enhancing the proposals with the latest global resources and research.

- Strengthening cooperation with industrial and service institutions to provide field training opportunities and develop students' skills, thereby achieving the learning outcomes of the academic program.
- Utilizing feedback from the labor market, employers, and graduates to develop curricula and update required skills and knowledge to meet the needs of both the public and private sectors.

| The curriculum skills scheme                     |                                |                        |                      |     |     |     |                              |     |     |     |                           |     |     |     |                                 |     |     |     |
|--------------------------------------------------|--------------------------------|------------------------|----------------------|-----|-----|-----|------------------------------|-----|-----|-----|---------------------------|-----|-----|-----|---------------------------------|-----|-----|-----|
| Department of Power Mechanics Techniques/level I |                                |                        |                      |     |     |     |                              |     |     |     |                           |     |     |     |                                 |     |     |     |
| Learning outcomes required from the program      |                                |                        |                      |     |     |     |                              |     |     |     |                           |     |     |     |                                 |     |     |     |
| Symbol of curriculum                             | Name of Curriculum             | Compulsory or Elective | Knowledge objectives |     |     |     | Skill targets Of the program |     |     |     | Emotional goals And value |     |     |     | General and transferable skills |     |     |     |
|                                                  |                                |                        | A 1                  | A 2 | A 3 | A 4 | B 1                          | B 2 | B 3 | B 4 | C 1                       | C 2 | C 3 | C 4 | D 1                             | D 2 | D 3 | D 4 |
| NTU100                                           | Human Rights and Democracy     | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         | √   | √   | √   |                                 | √   | √   | √   |
| NTU101                                           | English                        | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         |     | √   | √   |                                 | √   |     |     |
| NTU102                                           | Computer                       | Compulsory             | √                    |     |     | √   | √                            |     |     | √   |                           |     |     | √   | √                               | √   | √   | √   |
| NTU103                                           | Arabic Language                | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         |     | √   | √   |                                 | √   |     |     |
| NTU104                                           | Sports                         | Elective               |                      |     |     |     |                              |     |     | √   | √                         |     | √   | √   |                                 | √   |     |     |
| NTU107                                           | French Language                | Elective               |                      |     |     |     |                              |     |     | √   | √                         |     | √   | √   |                                 | √   |     |     |
| TIK110                                           | Principles of Mathematics      | Compulsory             |                      |     | √   | √   |                              |     |     | √   |                           |     |     | √   |                                 |     |     | √   |
| TIK111                                           | Applied Mathematics            | Compulsory             |                      |     | √   | √   |                              |     |     | √   |                           |     |     | √   |                                 |     |     | √   |
| TIK112                                           | Mechanical workshops           | Compulsory             | √                    | √   | √   | √   |                              | √   | √   | √   |                           |     |     | √   |                                 |     |     | √   |
| PMTR136                                          | Principles of Air Conditioning | Compulsory             | √                    | √   | √   | √   |                              |     | √   | √   |                           |     |     |     | √                               | √   |     |     |

|                                                    |                                              |            |   |   |   |   |   |   |   |   |   |  |  |   |  |   |   |   |
|----------------------------------------------------|----------------------------------------------|------------|---|---|---|---|---|---|---|---|---|--|--|---|--|---|---|---|
| PMTR137                                            | Principles of Thermodynamics                 | Compulsory | √ | √ |   |   |   |   |   | √ |   |  |  |   |  |   | √ | √ |
| <b>Learning outcomes required from the program</b> |                                              |            |   |   |   |   |   |   |   |   |   |  |  |   |  |   |   |   |
| PMTR138                                            | Principles of Refrigeration                  | Compulsory | √ | √ | √ | √ |   |   |   | √ | √ |  |  |   |  | √ | √ |   |
| PMTR139                                            | Applied thermodynamics                       | Compulsory | √ | √ |   |   |   |   |   | √ |   |  |  |   |  |   | √ | √ |
| PMTR140                                            | Fluid mechanics                              | Compulsory | √ | √ |   | √ |   |   |   | √ |   |  |  |   |  | √ |   | √ |
| PMTR141                                            | Refrigeration and air conditioning workshops | Compulsory | √ | √ | √ | √ |   | √ | √ | √ |   |  |  | √ |  |   |   | √ |
| PMTR142                                            | Principles of Electrical Technology          | Compulsory | √ |   |   | √ |   |   | √ | √ |   |  |  | √ |  |   | √ | √ |
| PMTR143                                            | Principles of engineering drawing            | Compulsory | √ |   |   |   | √ |   |   | √ |   |  |  | √ |  |   | √ | √ |
| PMTR144                                            | Advanced engineering drawing                 | Compulsory | √ |   |   |   | √ |   |   | √ |   |  |  | √ |  |   | √ | √ |
| PMTR145                                            | Engineering Mechanic                         | Elective   | √ | √ |   | √ |   |   |   | √ |   |  |  |   |  | √ |   | √ |
| PMTR146                                            | Advanced Electrical Technology               | Compulsory | √ |   |   | √ |   |   | √ | √ |   |  |  | √ |  |   | √ | √ |

| Symbol of curriculum | Name of Curriculum                                                       | Compulsory or elective | Knowledge objectives |     |     |     | Skill targets Of the program |     |     |     | Emotional goals And value |     |     |     | General and transferable skills |     |     |     |
|----------------------|--------------------------------------------------------------------------|------------------------|----------------------|-----|-----|-----|------------------------------|-----|-----|-----|---------------------------|-----|-----|-----|---------------------------------|-----|-----|-----|
|                      |                                                                          |                        | A 1                  | A 2 | A 3 | A 4 | B 1                          | B 2 | B 3 | B 4 | C 1                       | C 2 | C 3 | C 4 | D 1                             | D 2 | D 3 | D 4 |
| NTU200               | English Language                                                         | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         |     | √   | √   |                                 | √   |     |     |
| NTU201               | Computer                                                                 | Compulsory             | √                    |     |     | √   | √                            |     |     | √   |                           |     |     | √   | √                               | √   | √   | √   |
| NTU202               | Arabic Language                                                          | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         |     | √   | √   |                                 | √   |     |     |
| NTU203               | Crimes of the Baath regime in Iraq                                       | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         | √   | √   | √   | √                               | √   |     |     |
| NTU204               | Profession Ethics                                                        | Compulsory             |                      |     |     |     |                              |     |     | √   | √                         | √   | √   | √   | √                               | √   |     |     |
| PMTR240              | Fundamentals of Refrigeration Systems                                    | Compulsory             | √                    | √   | √   | √   |                              | √   | √   | √   |                           |     |     | √   | √                               | √   | √   | √   |
| PMTR241              | Fundamentals of air conditioning                                         | Compulsory             | √                    | √   | √   | √   |                              |     | √   | √   |                           |     |     | √   | √                               | √   | √   | √   |
| PMTR242              | Fundamentals of heat transfer                                            | Compulsory             | √                    | √   | √   | √   |                              | √   | √   | √   |                           |     |     | √   | √                               | √   | √   | √   |
| PMTR243              | Maintenance fundamentals of refrigeration and air conditioning equipment | Compulsory             | √                    | √   | √   | √   |                              | √   | √   | √   | √                         | √   | √   | √   |                                 | √   | √   | √   |
| PMTR244              | Fundamentals of Control Systems                                          | Compulsory             | √                    | √   | √   | √   |                              | √   | √   | √   |                           |     |     | √   | √                               | √   | √   | √   |

|         |                                                         |            |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---------|---------------------------------------------------------|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PMTR245 | Fundamental design of Conditioning systems              | Compulsory | √ |   | √ | √ | √ |   |   | √ |   |   |   |   |   | √ | √ | √ |
| PMTR246 | Advanced Refrigeration Systems                          | Compulsory | √ | √ | √ | √ |   | √ | √ | √ |   |   |   | √ | √ | √ | √ | √ |
| PMTR247 | Applied heat transfer                                   | Compulsory | √ | √ | √ | √ |   | √ | √ | √ |   |   |   | √ | √ | √ | √ | √ |
| PMTR248 | Advanced Refrigeration and Air Conditioning Maintenance | Compulsory | √ | √ | √ | √ |   | √ | √ | √ | √ | √ | √ | √ |   | √ | √ | √ |
| PMTR249 | Project 1                                               | Compulsory | √ | √ | √ | √ |   | √ | √ | √ |   |   |   | √ | √ | √ | √ | √ |
| PMTR250 | Renewable energy                                        | Elective   | √ | √ |   |   |   |   | √ | √ |   |   |   | √ |   | √ | √ |   |
| PMTR251 | Advanced design of airconditioning systems              | Compulsory | √ |   | √ | √ | √ |   |   | √ |   |   |   |   |   | √ | √ | √ |
| PMTR252 | Advanced Air Conditioning                               | Compulsory | √ | √ | √ | √ |   |   | √ | √ |   |   |   | √ | √ | √ | √ | √ |
| PMTR253 | Advanced control systems                                | Compulsory | √ | √ | √ | √ |   | √ | √ | √ |   |   |   | √ | √ | √ | √ | √ |
| PMTR254 | Project 2                                               | Compulsory |   |   |   |   |   |   |   |   | √ | √ | √ | √ | √ | √ | √ |   |
| PMTR255 | Management and Occupational Safety                      | Elective   | √ | √ | √ | √ |   | √ | √ | √ |   |   |   | √ | √ | √ | √ | √ |

## Fluid Mechanics ( compulsory) - PMTR140 - level I

Course Description: Fluid mechanics is a branch of physics that studies the behavior of liquids, gases, and plasmas under the influence of forces and pressure. This course focuses on the applications of fluid mechanics in fields such as mechanical and chemical engineering.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Fluid Mechanics (compulsory) - PMTR140 - level I                        |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | First semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. مها حسن غفور<br>maha_kirkuk@ntu.edu.iq                             |

### 8- Course Objectives

- To provide students with theoretical and applied knowledge in the field of fluid mechanics, including the analysis of liquids, gases, and plasmas.
- To develop students' skills in using mathematical, numerical, and experimental tools to solve problems and practical cases in fluid mechanics.
- To enhance students' critical, creative, and innovative thinking abilities in fluid mechanics and the design of related systems, machines, and products.
- To improve students' communication, presentation, evaluation, collaboration, and lifelong learning skills in fluid mechanics.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures to explain the fundamental concepts and laws of fluid mechanics and their connection to engineering applications.
- Problem-based learning through the analysis of mathematical problems related to fluid flow, pressure loss, and measuring devices.
- Practical and laboratory learning through conducting experiments, measuring various variables, and comparing theoretical and experimental results.

- Collaborative learning through assigning students group tasks and activities to develop teamwork skills.
- Using modern educational tools and computer simulations to illustrate fluid behavior and related phenomena.
- Self-directed learning through assigning students reports, completing exercises, and consulting approved academic references.
- Continuous assessment and feedback through quizzes, class discussions, and homework

| 10. Structure of the curriculum |                |                                                                                                                                |                                              |                         |                          |
|---------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------|--------------------------|
| The week                        | Hours          | Required learning outcomes                                                                                                     | Name of unit or subject                      | Method of education     | Method of assessment     |
| 1 – 6                           | 4 hours a week | Understand the basic characteristics of fluids                                                                                 | Introduction to mechanics of fluid mechanics | Theoretical + Practical | Oral and practical exams |
| 7 – 9                           | 4 hours a week | Understand how pressure is distributed within the liquid, Pascal's principle, surfactant tension and the phenomenon of poetics | Fluid static                                 | Theoretical + Practical | Reports and projects     |
| 10 – 12                         | 4 hours a week | Use pressure measuring devices                                                                                                 | Pressure measurements                        | Theoretical + Practical | Theoretical exams        |
| 13-15                           | 4 hours a week | Understand and apply the continuity equation, calculating the volumetric flow rate                                             | Dynamic fluid/ Continuity equation           | Theoretical + Practical | Daily tests              |

assignments to enhance students' understanding of the material.

## 11- Course Assessment

- Daily Attendance, Participation, and Preparation: 5 marks.
- Quizzes and Oral Exams: 5 marks.
- Lab Reports and Assignments: 10 marks.
- Monthly Practical Exam: 10 marks.
- Monthly Theory Exam 1: 10 marks.
- Monthly Theory Exam 2: 10 marks.
- Final Midterm: 50 marks.
- Final Exam: 50 marks.

## 12. the infrastructure

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>1-Fluid Mechanic by streeter</b><br><b>2- Fluid mechanics by Donglas</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Books and references (scientific journals, reports,...)</b> | <ul style="list-style-type: none"><li>• Fundamentals and Applications, Fourth Edition, Yunus A. Singel, McGraw-Hill, 2018.</li><li>• Fundamentals and Applications, Second Edition, John M. Simbaloka and Alison P. Fraser, Cambridge University Press, 2017.</li><li>• Fundamentals and Applications, Third Edition, Frank M. White, Kangaré, 2016.</li><li>• Fundamentals and Applications, Fifth Edition, Robert W. Fox, Alan T. McDonald, Philip J. Brett, Wiley, 2011.</li><li>• Fundamentals and Applications, Sixth Edition, Bruce R. Munson, Crawford, 2012.</li><li>• Fundamentals and Applications, seventh Edition, Victor L. Streeter way. Benjamin Whittle, Clarendon,</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>E-referencing, Web sites</b>                                | <ul style="list-style-type: none"><li>• Fluid Mechanics website: A website that contains educational, training, interactive materials, simulations, games and tests in the field of fluid mechanics. The website can be visited at <a href="https://www.efluids.com/">https://www.efluids.com/</a></li><li>• The Fluid Mechanics website on YouTube: Is a video channel that offers explanations, examples, applications and experiments in the field of fluid mechanics in a simplified and fun way. The channel can be viewed at <a href="https://www.youtube.com/channel/ucqo9j4rsca1fewogtdcnq">https://www.youtube.com/channel/ucqo9j4rsca1fewogtdcnq</a></li><li>• Coursera's Fluid Mechanics website: A website that offers online courses in the field of fluid mechanics from recognized universities and institutions. You can register and learn in the courses at: <a href="https://www.coursera.org/courses?query=fluid%20mechanics">https://www.coursera.org/courses?query=fluid%20mechanics</a></li><li>• Fluid Mechanics website on Wikipedia: A site that provides information, history, development, classification, branches, applications and references in the field of fluid mechanics. You can read this at <a href="https://ar.wikipedia.org/wiki/%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83%d8%a7_%d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%a6%d8%b9">https://ar.wikipedia.org/wiki/%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83%d8%a7_%d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%a6%d8%b9</a></li></ul> |

## Engineering Mechanics ( elective) - PMTR145- level I

Course Description: Also known as strength of materials, this field of study focuses on the relationship between the mechanical behavior of materials and their internal properties. Mechanics of materials covers many important concepts and topics.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Materials Mechanics (elective) - PMTR145 - level I                      |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م.مها حسن غفور<br>maha_kirkuk@ntu.edu.iq                              |

### 8- Course Objectives

- Understanding Mechanics and Materials Concepts:
- Introducing students to the concepts of mechanics and materials, including stress, strain, and forces acting on materials.
- Understanding the importance of studying the behavior of materials under different loads.
- Stress and Strain Analysis:
- Teaching students how to calculate stress and strain in materials.
- Understanding the relationship between stress, strain, tension, and compression.

### 9- Teaching and Learning Strategies

- Employing interactive theoretical lectures to explain the fundamental principles of engineering mechanics and their applications in mechanical systems.
- Using problem-solving techniques to develop analytical and deductive reasoning skills and the application of laws and theories to real-world problems.
- Cooperative learning and classroom discussions by assigning students individual and group activities and assignments to enhance communication and teamwork skills.

- Utilizing modern educational tools and engineering software to clarify concepts and analyze mechanical problems.
- Self-directed learning by assigning students reports, completing exercises, and consulting approved scientific references.
- Continuous assessment and feedback through quizzes, homework, and classroom discussions to measure the achievement of learning outcomes.

| 10 the structure of the curriculum |                |                                                                                                    |                                                                                                     |                         |                          |
|------------------------------------|----------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------|--------------------------|
| The week                           | Hours          | Required learning outcomes                                                                         | Name of unit or subject                                                                             | Method of education     | Method of assessment     |
| 1 – 6                              | 4 hours a week | Understand the basic characteristics of materials mechanics                                        | Mechanical properties of materials                                                                  | Theoretical + Practical | Oral and practical exams |
| 7 – 9                              | 4 hours a week | Stress and stress Emotion<br>Internal forces and external forces<br>Axial and accidental pregnancy | Stress and stress, Emotion<br>Internal forces and external forces<br>Axial load and tangential load | Theoretical + Practical | Reports and projects     |
| 10 – 12                            | 4 hours a week | Use the concepts of angular load and torque<br>Curving and cutting                                 | Angular load and moment<br>Bending and shearing                                                     | Theoretical + Practical | Theoretical exams        |
| 13-15                              | 4 hours a week | Understand and apply the critical stress and breakdown equation<br>Thermal properties of materials | Critical stress and collapse<br>Thermal properties of materials                                     | Theoretical + Practical | Daily tests              |

## 11- Course Assessment

- Daily Attendance, Participation, and Preparation: 5 marks.
- Quizzes and Oral Exams: 5 marks.
- Lab Reports and Assignments: 10 marks.
- Monthly Practical Exam: 10 marks.
- Monthly Theory Exam 1: 10 marks.
- Monthly Theory Exam 2: 10 marks.
- Final Midterm: 50 marks.
- Final Exam: 50 marks.

| 12 the infrastructure                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A. prescribed books and main references                 | <p><b>“Mechanics of Materials” للمؤلفين Ferdinand P. Beer و E.R. Johnson</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Books and references (scientific journals, reports,...) | <ul style="list-style-type: none"> <li>• Fundamentals and Applications, Fourth Edition, Younes A. Singel, McGraw-Hill, 2018.</li> <li>• Fundamentals and Applications, Second Edition, John M. Simbaloka and Alison P. Fraser, Cambridge University Press, 2017.</li> <li>• Fundamentals and Applications, Third Edition, Frank M. White, Kangaré, 2016.</li> <li>• Fundamentals and Applications, Fifth Edition, Robert W. Fox, Alan T. McDonald, Philip J. Brett, and Ellie, 2011.</li> <li>• Fundamentals and Applications, Sixth Edition, Bruce R. Munson, Crawford, 2012.</li> <li>• Fundamentals and Applications, seventh Edition, Victor L. Streeter way. Benjamin Whittle, Clarendon,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| E-referencing, Web sites                                | <ul style="list-style-type: none"> <li>• <a href="https://bing.com/search?q=%d9%85%d8%b1%d8%a7%d8%ac%d8%b9+%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83+%d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%af">https://bing.com/search?q=%d9%85%d8%b1%d8%a7%d8%ac%d8%b9+%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83+%d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%af</a></li> <li>• <a href="https://ar.wikipedia.org/wiki/%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83%d8%a7 %d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%af">https://ar.wikipedia.org/wiki/%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83%d8%a7 %d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%af</a></li> <li>• <a href="https://www.noor-book.com/%d9%83%d8%aa%d8%a7%d8%a8-%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83%d8%a7-%d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%af-%d8%a7%d9%84%d8%ac%d8%b2%d8%a1-%d8%a7%d9%84%d8%a7%d9%88%d9%84-mechanics-of-materials-part-one-pdf">https://www.noor-book.com/%d9%83%d8%aa%d8%a7%d8%a8-%d9%85%d9%8a%d9%83%d8%a7%d9%86%d9%8a%d9%83%d8%a7-%d8%a7%d9%84%d9%85%d9%88%d8%a7%d8%af-%d8%a7%d9%84%d8%ac%d8%b2%d8%a1-%d8%a7%d9%84%d8%a7%d9%88%d9%84-mechanics-of-materials-part-one-pdf</a></li> </ul> |

## Principles of Mathematics ( compulsory) - TIK110 - level I

Course Description: The course aims to provide students with the basic mathematical concepts necessary for studying engineering courses, through the study of algebra, functions, equations, sequences, matrices, complex numbers, and the basic concepts of differential and integral calculus, which contributes to developing their abilities in analysis and solving mathematical and engineering problems.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Principles of Mathematics (compulsory) - TIK110 - first level           |
| 4- Forms of presence available             | My presence in                                                          |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | فاتن سمین فاضل<br>fatansameen22@ntu.edu.iq                              |

### 8- Course Objectives

- To learn the fundamental mathematical concepts used in engineering sciences.
- To develop mathematical analysis and problem-solving skills.
- To apply mathematical principles in various engineering courses.
- To develop logical thinking and deductive reasoning skills.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Solving classroom problems and exercises.
- Scientific discussions and collaborative learning.
- Self-directed learning and homework assignments.
- Use of modern educational tools.

| 10 the structure of the curriculum |                |                                             |                                                                                   |                         |                      |
|------------------------------------|----------------|---------------------------------------------|-----------------------------------------------------------------------------------|-------------------------|----------------------|
| The week                           | Hours          | Required learning outcomes                  | Name of unit or subject                                                           | Method of education     | Method of assessment |
| 1 – 6                              | 2 hours a week | Solve matrix arithmetic problems            | Matrices and their calculations                                                   | Theoretical + Practical | Oral exams           |
| 7 – 9                              | 2 hours a week | Ability to solve determinants and equations | Determinants, linear equations, and Kramer's method                               | Theoretical + Practical | Written tests        |
| 10 – 12                            | 2 hours a week | Identifying and resolving vectors           | Vectors, their analysis, and standard and directional multiplication              | Theoretical + Practical | Projects             |
| 13-15                              | 2 hours a week | Solving equations and problems              | Differential, string rule, implicit function, and exponential function derivative | Theoretical + Practical | Homework             |

## 11- Course Assessment

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

| 12.the infrastructure                                          |                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>1_Thomas' Calculus</b><br><b>2- Mathematics for the Nonmathematician</b>                                                                                                                                                                        |
| <b>Books and references (scientific journals, reports,...)</b> | <b>1-Mathematics: A Very Short Introduction</b><br><b>2- Journal of the American Mathematical Society</b>                                                                                                                                          |
| <b>E-referencing, Web sites</b>                                | <b>1 - <a href="https://www.mathematicalreports.org/">https://www.mathematicalreports.org/</a></b><br><b>2 <a href="https://www.maa.org/press/periodicals/mathematics-magazine">https://www.maa.org/press/periodicals/mathematics-magazine</a></b> |

## Applied Mathematics ( compulsory) - TIK111 - level I

Course Description: The Applied Mathematics course aims to equip students with the mathematical concepts and methods necessary to analyze and solve engineering and applied problems. This is achieved through the study of differential and integral calculus, differential equations, matrices, vectors, and their applications in the fields of engineering and mechanical engineering, thereby contributing to the development of students' mathematical thinking and quantitative analysis skills.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Principles of Mathematics (compulsory) - TIK110 - first level           |
| 4- Forms of presence available             | My presence in classrooms                                               |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | فاتن سمین فاضل<br>fatansameen22@ntu.edu.iq                              |

### 8- Course Objectives

- To equip students with the necessary mathematical knowledge for studying engineering and technical courses.
- To develop the ability to use mathematical methods in analyzing engineering problems.
- To enhance logical thinking and mathematical deduction skills.
- To connect mathematical concepts with practical applications in the field of power mechanics techniques.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Solving applied mathematical problems and exercises.
- Classroom discussions and collaborative learning.
- Use of modern educational tools and mathematical software.
- Self-directed learning through homework assignments and short research projects.
- Continuous assessment and feedback to enhance understanding and academic achievement.

**10 the structure of the curriculum**

| The week | Hours          | Required learning outcomes               | Name of unit or subject                                                                | Method of education     | Method of assessment |
|----------|----------------|------------------------------------------|----------------------------------------------------------------------------------------|-------------------------|----------------------|
| 1 – 6    | 2 hours a week | Identify and solve equations             | Function, implicit function, trigonometric ratios, and purposes of algebraic functions | Theoretical + Practical | Oral exams           |
| 7 – 9    | 2 hours a week | Solving equations and problems           | High-ranking derivatives and applications                                              | Theoretical + Practical | Written tests        |
| 10 – 12  | 2 hours a week | Identify and solve integration equations | Undefined and defined integration and its applications                                 | Theoretical + Practical | Projects             |
| 13-15    | 2 hours a week | Solve complex number equations           | The composite numbers                                                                  | Theoretical + Practical | Homework             |

**11- Course Assessment**

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

**12 the infrastructure**

|                                                                |                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>1- Thomas' Calculus</b><br><b>2- Mathematics for the Nonmathematician</b>                                                                                                                                                                       |
| <b>Books and references (scientific journals, reports,...)</b> | <b>1-Mathematics: A Very Short Introduction</b><br><b>2- Journal of the American Mathematical Society</b>                                                                                                                                          |
| <b>E-referencing, Web sites</b>                                | <b>1 - <a href="https://www.mathematicalreports.org/">https://www.mathematicalreports.org/</a></b><br><b>2 <a href="https://www.maa.org/press/periodicals/mathematics-magazine">https://www.maa.org/press/periodicals/mathematics-magazine</a></b> |

## Fundamentals of Air Conditioning (compulsory) - PMTR241 - level II

Course Description: This course aims to introduce students to the fundamental principles of heat transfer and their applications in air conditioning systems. It covers the study of fans and their operating principles, duct and pipe design, and loss calculations. Additionally, it examines various air conditioning system applications, air-water systems, air scrubbers, and energy distribution within air conditioning systems. This comprehensive approach provides students with the scientific understanding and practical skills necessary for the operation, design, and maintenance of modern air conditioning systems.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Fundamentals of Air Conditioning (compulsory) - PMTR241 - level II      |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.محمود حسين خليل<br>mahmood.aborettag.husain@ntu.edu.iq              |

### 8- Course Objectives

- To understand the principles and mechanisms of heat transfer and their relationship to air conditioning systems.
- To study the characteristics, laws, and specifications of fans.
- To understand the fundamentals of duct and pipe network design and loss calculations.
- To become familiar with the applications of air conditioning systems and air-water systems.
- To develop practical skills related to the operation and maintenance of air conditioning systems.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Laboratory experiments and practical applications.
- Problem-based learning.
- Scientific discussions and group work.
- Use of modern educational tools and engineering software.
- Self-directed learning and preparation of technical reports.

| 10 the structure of the curriculum |                |                                                                                                                                                                                                                                                      |                                                                                                                                                                      |                         |                          |
|------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|
| The week                           | Hours          | Required learning outcomes                                                                                                                                                                                                                           | Name of unit or subject                                                                                                                                              | Method of education     | Method of assessment     |
| 1 – 6                              | 4 hours a week | Explain the basic modes of heat transfer (conduction, convection, and radiation), calculate heat transfer coefficients and overall heat transfer through composite walls, and identify fan types, specifications, and fan laws used in HVAC systems. | Heat transfer , conduction , convection , radiation , heat transfer coefficient , composite walls , total heat transfer coefficient , Fans , fan laws, specification | Theoretical + Practical | Oral and practical exams |
| 7 – 9                              | 4 hours a week | Design basic air duct systems, estimate pressure losses in ducts, analyze air movement and air distribution in conditioned spaces, and perform basic piping and pump selection calculations.                                                         | Air ducting design , pressure losses in duct, Movement energy and air discharge in room, Piping design pumps type calculation ,                                      | Theoretical + Practical | Oral and practical exams |
| 10 – 12                            | 4 hours a week | Explain the operation and applications of air conditioning systems and distinguish between air systems, water systems, and combined air–water HVAC systems.                                                                                          | Application of air conditioning system , Air and water systems                                                                                                       | Theoretical + Practical | Oral and practical exams |
| 13-15                              | 4 hours a week | Evaluate the performance of air washers and explain methods of energy distribution and air handling in air conditioning systems for achieving indoor thermal comfort.                                                                                | Air Washers, Energy distribution in air conditioning systems                                                                                                         | Theoretical + Practical | Oral and practical exams |

## 11- Course Assessment

- Daily Attendance, Participation, and Preparation: 5 marks.
- Quizzes and Oral Exams: 5 marks.
- Lab Reports and Assignments: 10 marks.
- Monthly Practical Exam: 10 marks.
- Monthly Theory Exam 1: 10 marks.
- Monthly Theory Exam 2: 10 marks.
- Final Midterm: 50 marks.
- Final Exam: 50 marks.

| 12- the infrastructure                                  |                                                                                                                                                                                                                                                         |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A. prescribed books and main references                 | <ul style="list-style-type: none"> <li>- Applied Air-conditioning and refrigeration by C.T Gosling</li> <li>- Air conditioning Engineering by W.P.Jones</li> </ul> <p>Khaled Al-Judi - Principles of Air Conditioning and Refrigeration Engineering</p> |
| Books and references (scientific journals, reports,...) | Virtual Library of the Ministry of Higher Education and Scientific Research                                                                                                                                                                             |
| E-referencing, Web sites                                | <p>Virtual Library of the Ministry of higher Education and Scientific Research</p> <p>Books in the Institute's electronic library</p>                                                                                                                   |

## Advanced air conditioning (compulsory) - PMTR252- level II.

Course Description: This course aims to provide students with advanced concepts of air conditioning systems, study the extreme thermal properties, calculate the heat loads for different heating and cooling systems, different heating and cooling systems, new electrical psychrometric analysis of compressed air processes, as well as computer applications in calculating heat loads, air filtration and air cleaning units, including contributing to the development of students' skills in the design, operation and maintenance of air conditioning.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Advanced air conditioning (compulsory) - PMTR252- level II.             |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | Second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.محمود حسين خليل<br>mahmood.aborettag.husain@ntu.edu.iq              |

### 8- Course Objectives

- To understand thermal comfort requirements and their impact on the design of air conditioning systems.
- To study the fundamentals of calculating heat loads for heating and cooling.
- To become familiar with different heating and cooling systems and their operational characteristics.
- To use psychrometric charts in analyzing air conditioning processes.
- To utilize computers in calculating heat loads and designing systems.
- To study air purification methods and air scrubbing units and their importance in improving indoor air quality.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Laboratory experiments and practical applications.
- Problem-based learning.
- Scientific discussions and group work.
- Use of modern educational tools and engineering software.
- Self-directed learning and preparation of technical reports.

| 10. Structure of the curriculum |                |                                                                                                                                                                              |                                                                                                     |                         |                          |
|---------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------|--------------------------|
| The week                        | Hours          | Required learning outcomes                                                                                                                                                   | Name of unit or subject                                                                             | Method of education     | Method of assessment     |
| 1 – 6                           | 4 hours a week | Explain the principles of human thermal comfort, calculate heating loads, and identify the components, operation, and applications of different heating systems.             | Human comfort , heating load calculations,heating systems                                           | Theoretical + Practical | Oral and practical exams |
| 7 – 9                           | 4 hours a week | Calculate refrigeration (cooling) loads, analyze the performance of refrigeration systems, and select appropriate systems for different applications.                        | Refrigeration load calculations , refrigeration systems                                             | Theoretical + Practical | Oral and practical exams |
| 10 – 12                         | 4 hours a week | Use the psychrometric chart to analyze air-conditioning processes, distinguish between sensible and latent heat, and perform computer-aided refrigeration load calculations. | Psychrometric chart , sensible and latent heat , computer aided calculation of refrigeration load , | Theoretical + Practical | Oral and practical exams |
| 13-15                           | 4 hours a week | Evaluate the performance of air filtration methods and air washers, and select suitable air-cleaning and air-treatment equipment for HVAC applications.                      | Air filter method s , Air washers ,                                                                 | Theoretical + Practical | Oral and practical exams |

### 11- Course Assessment

- Daily Attendance, Participation, and Preparation: 5 marks.
- Quizzes and Oral Exams: 5 marks.
- Lab Reports and Assignments: 10 marks.
- Monthly Practical Exam: 10 marks.
- Monthly Theory Exam 1: 10 marks.
- Monthly Theory Exam 2: 10 marks.
- Final Midterm: 50 marks.
- Final Exam: 50 marks.

| 12- the infrastructure                                         |                                                                                                                                                                                                                  |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>- Applied Air-conditioning and refrigeration by C.T Gosling</b><br><b>- Air conditioning Engineering by W.P.Jones</b><br><b>Khaled Al-Judi - Principles of Air Conditioning and Refrigeration Engineering</b> |
| <b>Books and references (scientific journals, reports,...)</b> | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b>                                                                                                                               |
| <b>E-referencing, Web sites</b>                                | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b><br><b>Books in the Institute's electronic library</b>                                                                         |

## Arabic Language (compulsory) - NTU103 - level I

Course Description: The course aims to develop students' skills in using the Arabic language correctly through the study of grammar, spelling, and punctuation rules, and to identify common linguistic errors and ways to correct them, in order to improve writing, expression, and scientific and professional communication skills.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Arabic Language (compulsory) - NTU103 - level I                         |
| 4- Forms of presence available             | My presence in classrooms                                               |
| 5- Semester/annual system                  | Second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.د. عماد يوسف خورشيد<br>emad.y.k@ntu.edu.iq                          |

### 8- Course Objectives

- To develop correct writing skills in Arabic.
- To learn basic spelling and grammar rules.
- To correct common linguistic errors in writing and expression.
- To enhance the ability to formulate scientific texts and reports correctly.
- To develop communication skills in Modern Standard Arabic.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Classroom discussions and cooperative learning.
- Solving language exercises and applications.
- Self-directed learning and homework.
- Continuous assessment and feedback

| 10. Structure of the curriculum |                |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                         |                         |                        |
|---------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------|
| The week                        | Hours          | Required learning outcomes                                                                                                                                                                                                                                                                                                        | Name of unit or subject                                                                                                                                                                                                                                                                 | Method of education     | Method of assessment   |
| 1 – 6                           | 2 hours a week | Identify common Arabic language errors, apply the rules of Taa Marbuta and Taa Maftuha, distinguish between Alif Maqsura and Alif Mamduda, differentiate solar and lunar letters, use Hamzat Al-Wasl and Hamzat Al-Qat', write medial and final hamza correctly, apply punctuation marks, and distinguish between nouns and verbs | The concept of language errors. Rules of tied and open-ended writing. A thousand outstretched and cabin, the solar and lunar letters. The light and the light. The link and the pieces. The average whisper. The extreme. Punctuation marks. Name and deed and distinguish between them | Theoretical + Practical | Oral and written exams |
| 7 – 9                           | 2 hours a week | Recognize and correctly use the different types of objects (Al-Maf'ulat), apply number rules in Arabic grammar, and correct common language errors in writing and speaking.                                                                                                                                                       | The effect is the ultimate effect. Number. Application of common language errors.                                                                                                                                                                                                       | Theoretical + Practical | Oral and written exams |
| 10 – 12                         | 2 hours a week | Explain the meanings and uses of Arabic particles (prepositions) and correctly apply the Distinguishing Alif (Alif Al-Fariqa) rule in writing.                                                                                                                                                                                    | Meaning of free letters. The thousand difference rule                                                                                                                                                                                                                                   | Theoretical + Practical | Oral and written exams |
| 13-15                           | 2 hours a week | Apply the rules of Nunation (Tanween) and Noon, prepare formal administrative correspondence, and use correct Arabic language in official writing.                                                                                                                                                                                | Oral and written exams                                                                                                                                                                                                                                                                  | Theoretical + Practical | Oral and written exams |

## 11- Course Assessment

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

## 12- the infrastructure

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>Lectures adapted from: 1- Clear dictation: Abdul Majid al-Naimi, Dham al-Kiyal, Library of Dar al-Mutanabbi, Baghdad I 6,1987. 2- Lessons in language, grammar and spelling for state employees: Ismail Hamoud Atwan and others Press of the Ministry of Education No. (3) Baghdad, I 2, 1984. 4-General Arabic language for departments other than specialization: Abdul Qadir Hassan Amin and others, Ministry of higher Education and Scientific Research, T2, 2000.</b> |
| <b>Books and references (scientific journals, reports,...)</b> | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b>                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>E-referencing, Web sites</b>                                | <b>Virtual Library of the Ministry of higher Education and Scientific Research<br/>Books in the Institute's electronic library</b>                                                                                                                                                                                                                                                                                                                                             |

## Arabic Language (compulsory) - NTU202 - Level II

The course aims to develop students' skills in using standard Arabic correctly through the study of spelling and grammar rules, addressing common linguistic errors, and learning the fundamentals of preparing and drafting administrative letters, thereby contributing to enhancing communication and administrative writing skills and preparing official correspondence correctly.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Arabic Language (compulsory) - NTU202 - Level II                        |
| 4- Forms of presence available             | My presence in classrooms                                               |
| 5- Semester/annual system                  | Second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.د. عماد يوسف خورشيد<br>emad.y.k@ntu.edu.iq                          |

### 8- Course Objectives

- Developing correct writing skills in Arabic.
- Understanding basic grammar and spelling rules and their applications.
- Addressing common linguistic errors in writing and expression.
- Developing skills in preparing administrative letters and official correspondence.
- Enhancing the ability to communicate effectively in scientific and administrative contexts.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Classroom discussions and collaborative learning.
- Solving language exercises and applications.
- Self-directed learning and completing homework assignments.
- Continuous assessment and feedback.

| 10. Structure of the curriculum |                |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                         |                         |                        |
|---------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------|
| The week                        | Hours          | Required learning outcomes                                                                                                                                                                                                                                                                                     | Name of unit or subject                                                                                                                                                                                                                                                                 | Method of education     | Method of assessment   |
| 1 – 6                           | 2 hours a week | Identify common Arabic language errors, apply the rules of Taa Marbuta and Taa Maftuha, distinguish between Alif Maqsura and Alif Mamduda, correctly use Hamzat Al-Wasl and Hamzat Al-Qat', write medial and final hamza accurately, use punctuation marks correctly, and distinguish between nouns and verbs. | The concept of language errors. Rules of tied and open-ended writing. A thousand outstretched and cabin, the solar and lunar letters. The light and the light. The link and the pieces. The average whisper. The extreme. Punctuation marks. Name and deed and distinguish between them | Theoretical + Practical | Oral and written exams |
| 7 – 9                           | 2 hours a week | Apply the rules of the different types of objects (Al-Maf'ulat), use Arabic numerals correctly in writing, and identify and correct common language errors.                                                                                                                                                    | The effect is the ultimate effect. Number. Application of common language errors.                                                                                                                                                                                                       | Theoretical + Practical | Oral and written exams |
| 10 – 12                         | 2 hours a week | Explain the meanings and uses of Arabic prepositions and correctly apply the Distinguishing Alif (Alif Al-Fariqa) rule in writing.                                                                                                                                                                             | Meaning of free letters. The thousand difference rule                                                                                                                                                                                                                                   | Theoretical + Practical | Oral and written exams |
| 13-15                           | 2 hours a week | Apply the rules of Noon and Tanween, prepare official administrative correspondence, and use accurate Arabic language in formal administrative writing.                                                                                                                                                        | Base and toner. Formal aspects of the administrative discourse. Language of administrative speech.                                                                                                                                                                                      | Theoretical + Practical | Oral and written exams |

## 11- Course Assessment

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

| 12- the infrastructure                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A. prescribed books and main references                 | Lectures adapted from: 1- Clear dictation: Abdul Majid al-Naimi, Dham al-Kiyal, Library of Dar al-Mutanabbi, Baghdad I 6,1987. 2- Lessons in language, grammar and spelling for state employees: Ismail Hamoud Atwan and others Press of the Ministry of Education No. (3) Baghdad, I 2, 1984. 4- General Arabic language for departments other than specialization: Abdul Qadir Hassan Amin and others, Ministry of higher Education and Scientific Research, T2, 2000. |
| Books and references (scientific journals, reports,...) | Virtual Library of the Ministry of higher Education and Scientific Research                                                                                                                                                                                                                                                                                                                                                                                              |
| E-referencing, Web sites                                | Virtual Library of the Ministry of higher Education and Scientific Research<br>Books in the Institute's electronic library                                                                                                                                                                                                                                                                                                                                               |

## Human Rights and Democracy (compulsory) - NTU100 - level I.

Course Description: The course aims to introduce students to the principles of human rights and democracy, their historical development, relevant international and regional agreements, and guarantees for the protection of human rights and public freedoms, as well as to explain the role of democracy in building society, promoting the rule of law, and respecting fundamental rights and freedoms.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Human Rights and Democracy (compulsory) - NTU100 - level I.             |
| 4- Forms of presence available             | My presence in classrooms                                               |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.د. عماد يوسف خورشيد<br>emad.y.k@ntu.edu.iq                          |

### 8- Course Objectives

- To understand the concept of human rights, their importance, and their objectives.
- To study the development of human rights in ancient civilizations, divine laws, and modern history.
- To become familiar with international and regional human rights agreements.
- To understand the principles of democracy, its types, and its applications.
- To promote a culture of respect for public freedoms, human rights, and the rule of law.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Classroom discussions and open dialogue.
- Cooperative learning and group work.
- Case studies and analysis.
- Preparation of short reports and research papers.
- Continuous assessment and feedback.

## 10. Structure of the curriculum

| The week | Hours          | Required learning outcomes                                                                                                                                                                                                                                                                          | Name of unit or subject                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Method of education     | Method of assessment |
|----------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|
| 1 – 6    | 2 hours a week | Define human rights and explain their objectives, identify the historical development of human rights in ancient civilizations and divine religions, describe the evolution of international and regional human rights instruments, and evaluate the status of human rights in Iraqi constitutions. | Human rights, their definition, their objectives<br>Human rights in ancient civilizations, especially the Mesopotamian civilization. Human rights in the divine laws with a focus on human rights in Islam. Human Rights in modern and modern History: International Recognition of Human Rights since World War I and the League/United Nations. Regional recognition of human rights: European Convention on Human Rights, 1950 American Convention on Human Rights, 1969, African Charter on Human Rights, 1981, Arab Charter on Human Rights, 1994. Human rights in Iraqi constitutions between theory and reality. | Theoretical + Practical | Written examinations |
| 7 – 9    | 2 hours a week | Explain the constitutional and legal guarantees for protecting human rights, evaluate the role of constitutional oversight, freedom of the press, public opinion, and NGOs in protecting human rights, and describe the concepts and forms of democracy.                                            | Guarantees and respect for the protection of human rights at the national level, guarantees in the Constitution and laws, guarantees in the principle of the rule of law. Guarantees in constitutional oversight, guarantees in freedom of the press and public opinion, the role of NGOs in respecting and protecting human rights. Democracy is defined. Types. Democratic concepts of the world's democratic systems.                                                                                                                                                                                                | Theoretical + Practical | Written examinations |
| 10 – 12  | 2 hours a week | Identify fundamental freedoms, distinguish between intellectual, economic, and social freedoms, and explain the importance of freedom of education, the press, and peaceful assembly in democratic societies.                                                                                       | Fundamental freedoms, intellectual freedoms, economic and social freedoms. Freedom of Education Freedom of the Press Freedom of Assembly, Freedom of Education Freedom of the Press, Freedom of Assembly.                                                                                                                                                                                                                                                                                                                                                                                                               | Theoretical + Practical | Written examinations |
| 13-15    | 2 hours a week | Explain the principles of freedom of association, work, property, trade, and industry, evaluate women's rights and political participation, and discuss the impact of scientific and technological progress on public freedoms and their future.                                                    | Freedom of association. Freedom of work. Property rights. Freedom of trade and industry. Freedom of women political parties, public freedoms, scientific and technical progress and public freedoms. The future of public freedoms.                                                                                                                                                                                                                                                                                                                                                                                     | Theoretical + Practical | Written examinations |

## 11- Course Assessment

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

## 12- the infrastructure

|                                                                |                                                                                                                                    |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>The lectures guarantee the vocabulary prescribed by the Ministry of higher Education and Scientific Research</b>                |
| <b>Books and references (scientific journals, reports,...)</b> | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b>                                                 |
| <b>E-referencing, Web sites</b>                                | <b>Virtual Library of the Ministry of higher Education and Scientific Research<br/>Books in the Institute's electronic library</b> |

## Profession Ethics (compulsory) - NTU204 - level II.

Course Description: The course aims to introduce students to the basic concepts of ethics and professional ethics and their sources, and to demonstrate their importance in practical and administrative life, and to promote higher human values and sound professional conduct, with a focus on combating administrative and financial corruption and establishing the ethics of scientific research, evaluation and examinations.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Profession Ethics (compulsory) - NTU204 - level II.                     |
| 4- Forms of presence available             | My presence in classrooms                                               |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.د. عماد يوسف خورشيد<br>emad.y.k@ntu.edu.iq                          |

### 8- Course Objectives

- To understand the concept of ethics and professional ethics and their importance.
- To explain ethical values in Islam and their impact on professional conduct.
- To develop commitment to work ethics and professional conduct.
- To identify manifestations of administrative and financial corruption and ways to reduce them.
- To instill the principles of integrity, scientific honesty, and research ethics.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Classroom discussions and open dialogue.
- Cooperative learning and teamwork.
- Case studies and analysis.
- Preparation of short reports and research papers.
- Continuous assessment and feedback.

## 10. Structure of the curriculum

| The week | Hours          | Required learning outcomes                                                                                                                                                                                                                                                                                                                                               | Name of unit or subject                                                                                                                                                                                                                                                                                                                                                                    | Method of education     | Method of assessment |
|----------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|
| 1 – 6    | 2 hours a week | The definition of morality (linguistically and terminologically); Professional ethics; The Islamic concept of ethics; Definition of profession in Islam; Concept of morality; Moral characteristics in Islam; Disgraceful behavior in Islam; Standards based on the profession; Objectives of professional ethic                                                         | The definition of morality is language and terminology. Professional ethics. The Islamic concept of Ethics. Definition of profession by Islam. The concept of morality. The moral characteristics of Islam. Disgraced behavior in Islam. Standards based on the profession. Objectives of professional ethics.                                                                             | Theoretical + Practical | Theoretical exams    |
| 7 – 9    | 2 hours a week | General rules of disagreement; Sources of morality; Legitimacy of professional ethics; Benefits of administrative work ethics; Importance of professional ethics; Characteristics of work ethics; Highest human values; Difference between work and profession.                                                                                                          | General rules of disagreement. Sources of morality. The legality of professional ethics. Benefits of administrative work ethics. Importance of professional ethics. Characteristics of work ethics. The highest human values. The difference between work and profession.                                                                                                                  | Theoretical + Practical | Theoretical exams    |
| 10 – 12  | 2 hours a week | Qualities of professional ethics; Behaviors contrary to professional ethics; Causes of administrative corruption.                                                                                                                                                                                                                                                        | Qualities of professional ethics. Things that are contrary to professional ethics. Things that are contrary to professional ethics. Causes of widespread administrative corruption.                                                                                                                                                                                                        | Theoretical + Practical | Theoretical exams    |
| 13-15    | 2 hours a week | Steps to achieve acceptable professional ethics; Rules governing job behavior; Methods of building professional ethics; Ethical qualities of employees; Ethics of teaching profession; Behavioral deviations; Financial deviations; Bribery; Difference between gift and bribe; Fraud at work; Ethical assessment and evaluation; Ethical values in scientific research. | Steps to an acceptable level of professional ethics. Rules governing job behavior. Ways to build professional ethics. Ethical qualities of the employee. Ethics of the teaching profession. Behavioral deviations. Financial deviations. Bribery offense. The difference between gift and bribe. Fraud at work. Ethical assessment and examination. Ethical values of scientific research. | Theoretical + Practical | Theoretical exams    |

## 11- Course Assessment

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

## 12- the infrastructure

|                                                                |                                                                                                                                    |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>Lectures prepared according to the prescribed vocabulary</b>                                                                    |
| <b>Books and references (scientific journals, reports,...)</b> | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b>                                                 |
| <b>E-referencing, Web sites</b>                                | <b>Virtual Library of the Ministry of higher Education and Scientific Research<br/>Books in the Institute's electronic library</b> |

## Crimes of the Baath regime in Iraq (compulsory) - NTU203 - Level II

Course Description: The course aims to introduce students to the concept of crimes and their categories, explain the crimes committed by the Baath regime in Iraq according to the Iraqi High Criminal Court Law of 2005, introduce human rights violations, international crimes and crimes against humanity, as well as study environmental, social and psychological crimes and their effects, and the events of mass graves and violations to which Iraqi society was subjected during the period (1963-2003).

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Crimes of the Baath regime in Iraq (compulsory) - NTU203 - Level II     |
| 4- Forms of presence available             | My presence in classrooms                                               |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | أ.م.د. عماد يوسف خورشيد<br>emad.y.k@ntu.edu.iq                          |

### 8- Course Objectives

- To understand the concept of crime and its categories from legal, social, and psychological perspectives.
- To study the crimes committed by the Ba'ath regime according to the Iraqi High Criminal Court Law.
- To understand international crimes, genocide, and crimes against humanity.
- To explain human rights violations and their impact on Iraqi society.
- To promote legal and national awareness and to instill the values of justice and respect for human rights.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Classroom discussions and analysis of historical events.
- Case studies and legal documents.
- Preparation of short reports and research papers.
- Self-directed learning and consulting approved sources.
- Continuous assessment and feedback.

## 10. Structure of the curriculum

| The week | Hours          | Required learning outcomes                                                                                                 | Name of unit or subject                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Method of education     | Method of assessment  |
|----------|----------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------|
| 1 – 6    | 2 hours a week | Introduction to Baath regime crimes; concept and types of crimes; international crimes; human rights violations; genocide. | A general idea of the article of the Baath crimes, crimes of the Baath regime according to the Iraqi Supreme Criminal Court Law 2005. The concept of crimes and their sections, the definition of crime language, the definition of crime in terminology, the definition of crime in law, psychology, sociology, and Sharia science. Crimes, International Crime, political Crime, Social crimes, Authority and Government crimes, psychological crimes. The corporal crimes freedom of religion and belief, and the corporal of the crime of confiscation of funds, the crime of displacement, environmental crimes, statement of human rights violations. The crimes of the Baath regime documented in accordance with the Iraqi Supreme Criminal Court Law 2005. Types of international crimes, crimes of genocide. | Theoretical + Practical | Oral and formal exams |
| 7 – 9    | 2 hours a week | Crimes against humanity; war crimes; psychological and social crimes; state responsibility; human rights violations.       | Crimes against humanity, war crimes. Explain the curriculum s of the Supreme Criminal Court. Psychological and social crimes and their consequences. The responsibility of the state to balance the public interest with the interest of individuals. Violations of the Baathist regime in Iraq, violations of Iraqi laws, forms of human rights violations and crimes of authority. Explain the mechanisms of psychological crimes and explain the effects of psychological crimes. Officer of social crimes.                                                                                                                                                                                                                                                                                                         | Theoretical + Practical | Oral and formal exams |
| 10 – 12  | 2 hours a week | Political and military crimes; environmental crimes; destruction of cities; mass graves; Iran–Iraq War.                    | Explain some of the curriculum s of political and military violations of the regime of some, and identify the places of prisons of the regime of some. Environmental crimes of the Baath regime. Military and radioactive contamination and mine explosions. The destruction of cities and villages (scorched earth policy). Crimes of drying the marshes by the Baath regime. And the destruction of palm groves, trees and crops. Mass grave crimes. The Genocide Cemetery. Events of 1963. The Iran-Iraq War, 1983, and its relationship to mass graves.                                                                                                                                                                                                                                                            | Theoretical + Practical | Oral and formal exams |
| 13-15    | 2 hours a week | Popular uprising; mass graves (1963–2003); Anfal campaign; Barzani genocide; 1991 uprising.                                | Statement of the events of the popular uprising. Chronological classification of mass graves from 1963 to 2003. Genocide graves dating back to the events of 1963. Genocide graves linked to the Iran-Iraq War. Cemetery of the 1983 Barzani Kurdish Genocide. The graves of the victims of the Anfal Massacre of 1987-1988. Explain the events of the genocide cemetery of the victims of the 1991 popular uprising.                                                                                                                                                                                                                                                                                                                                                                                                  | Theoretical + Practical | Oral and formal exams |

## 11- Course Assessment

- Attendance, Participation, and Assignments: 10
- First Monthly Exam: 15
- Second Monthly Exam: 15
- Annual Coursework: 40
- Final Exam: 60
- Total: 100

| 11- the infrastructure                                         |                                                                                                                                    |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>Lectures scheduled by the Ministry of higher Education and Scientific Research</b>                                              |
| <b>Books and references (scientific journals, reports,...)</b> | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b>                                                 |
| <b>E-referencing, Web sites</b>                                | <b>Virtual Library of the Ministry of higher Education and Scientific Research<br/>Books in the Institute's electronic library</b> |

## Principles of Thermodynamics (compulsory) - PMTR137 - level I

Course Description: The course aims to provide students with the basic concepts of thermodynamics, natural energy sources, principles of heat and work, methods of measuring pressure and temperature, and the study of the first law of thermodynamics and its applications to different thermal systems, in addition to identifying and representing thermodynamic processes and studying some thermal devices and equipment used in engineering applications.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Principles of Thermodynamics (compulsory) - PMTR137 - level I           |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.مرال محمود حسين                                                       |

### 8- Course Objectives

- To understand the fundamental concepts of thermodynamics and energy sources.
- To understand the relationship between heat, work, and internal energy.
- To study the first law of thermodynamics and its practical applications
- To understand thermodynamic processes and represent them graphically.
- To develop practical skills in measuring pressure, temperature, and the thermal properties of materials.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical experiments and laboratory applications.
- Solving engineering problems related to thermodynamics.
- Collaborative learning and scientific discussions.
- Use of modern educational tools and computer programs.
- Continuous assessment and feedback.

**10. Structure of the curriculum**

| The week | Hours          | Required learning outcomes                                                                                                | Name of unit or subject                                                                                                                    | Method of education     | Method of assessment     |
|----------|----------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|
| 1 – 6    | 4 hours a week | Basic thermodynamic concepts; energy sources; heat and work; pressure and temperature measurement.                        | Basic concepts, natural energy sources, heat workpiece, measuring instruments, pressure measurement, measurement of temperature            | Theoretical + Practical | Oral and practical exams |
| 7 – 9    | 4 hours a week | Internal energy; flow energy; first law of thermodynamics; liquid viscosity measurement.                                  | Internal thermal energy, flow energy, first law of thermodynamics, viscosity measurement of liquids                                        | Theoretical + Practical | Oral and practical exams |
| 10 – 12  | 4 hours a week | First law applications; thermodynamic devices (condenser, evaporator, heat exchanger, heater); specific heat measurement. | Applications of first Law, Publisher, throttle, condenser, evaporator, heat exchanger, heater, specific heat measurement of some materials | Theoretical + Practical | Oral and practical exams |
| 13-15    | 4 hours a week | Pressure, entropy, thermodynamic processes; steam boiler; cooling towers.                                                 | Pressure, heat, entropy stabilization, thermodynamic procedures and representation, steam boiler, the refrigeration towers                 | Theoretical + Practical | Oral and practical exams |

**11- Course Assessment**

- Daily Attendance, Participation, and Preparation: 5 marks.
- Quizzes and Oral Exams: 5 marks.
- Lab Reports and Assignments: 10 marks.
- Monthly Practical Exam: 10 marks.
- Monthly Theory Exam 1: 10 marks.
- Monthly Theory Exam 2: 10 marks.
- Final Midterm: 50 marks.
- Final Exam: 50 marks.

**12- the infrastructure**

|                                                                                                                            |                                                                |
|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| - Applied Engineering of Thermodynamic by JJ. Yonus<br>- Thermodynamic by Sontag van Wylem<br>- Thermodynamic by Eastop    | <b>A. prescribed books and main references</b>                 |
| Virtual Library of the Ministry of higher Education and Scientific Research                                                | <b>Books and references (scientific journals, reports,...)</b> |
| Virtual Library of the Ministry of higher Education and Scientific Research<br>Books in the Institute's electronic library | <b>E-referencing, Web sites</b>                                |

## Applied thermodynamics (compulsory) - PMTR139 - level I

The course aims to study the practical applications of thermodynamics through the analysis of thermodynamic processes with constant and variable properties, the study of the Carnot cycle and its applications, steam properties and steam tables, various thermodynamic processes, as well as fuels, steam boilers, and absorption refrigeration systems. The course equips students with the knowledge and skills required to understand and operate different thermal systems.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Applied thermodynamics (compulsory) - PMTR139 - level I                 |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | Second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.مرال محمود حسين                                                       |

### 9. Course Objectives

- Understand thermodynamic processes and their engineering applications.
- Study the Carnot cycle and the reversed Carnot cycle and their applications in refrigeration and heating systems.
- Understand steam properties and the use of steam tables in engineering calculations.
- Study fuels, steam boilers, and energy calculations.
- Understand the operating principles and applications of absorption refrigeration systems

### 10. Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Scientific discussions and teamwork.
- Use of modern educational tools and engineering software.
- Continuous assessment and feedback

## 10. Structure of the curriculum

| Method of assessment     | Method of education     | Name of unit or subject                                                                                                                                                                                       | Required learning outcomes                                                                                           | Hours          | The week |
|--------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------|----------|
| Oral and practical exams | Theoretical + Practical | Study of the procedure, the procedure fixed and variable properties, the Carnot cycle and its applications, the reflected Carnot cycle and its applications, refrigeration devices, Heating devices (Heating) | Understand thermodynamic processes and the Carnot cycle and their applications in refrigeration and heating systems. | 4 hours a week | 1 – 6    |
| Oral and practical exams | Theoretical + Practical | Study of steam, steam properties, steam tables, calculations of steam and water mixture, constant pressure procedure, constant volume                                                                         | Study steam properties and use steam tables in engineering calculations.                                             | 4 hours a week | 7 – 9    |
| Oral and practical exams | Theoretical + Practical | The isotropy and adiabatic procedure and their applications, fuel, fuel and energy calculations, boilers                                                                                                      | Analyze isentropic and adiabatic processes; study fuels and steam boilers.                                           | 4 hours a week | 10 – 12  |
| Oral and practical exams | Theoretical + Practical | Features of boilers, their use, absorption refrigeration systems                                                                                                                                              | Understand steam boiler characteristics and absorption refrigeration systems.                                        | 4 hours a week | 13-15    |

## 11. Course Assessment

- Attendance, participation, and daily preparation: **5 marks**
- Quizzes and oral examinations: **5 marks**
- Laboratory reports and assignments: **10 marks**
- Monthly practical examination: **10 marks**
- First monthly theoretical examination: **10 marks**
- Second monthly theoretical examination: **10 marks**
- Continuous assessment total: **50 marks**
- Final examination: **50 marks**

## 12- the infrastructure

|                                                                                                                            |                                                         |
|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| - Applied Engineering of Thermodynamic by JJ. Yonus<br>- Thermodynamic by Sontag van Wylem<br>- Thermodynamic by Eastop    | A. prescribed books and main references                 |
| Virtual Library of the Ministry of higher Education and Scientific Research                                                | Books and references (scientific journals, reports,...) |
| Virtual Library of the Ministry of higher Education and Scientific Research<br>Books in the Institute's electronic library | E-referencing, Web sites                                |

## Maintenance fundamentals of refrigeration and air conditioning equipment (compulsory) - PMTR243 - level II

The course aims to provide students with the basic knowledge and skills related to the maintenance of refrigeration and air conditioning equipment, to identify types of maintenance, diagnose mechanical and electrical faults and methods of treating them, and maintain various air conditioning units for buildings and vehicles, as well as carry out unloading and charging operations, replace cycle parts, and maintain compressors, valves, commercial refrigeration units and central air conditioning systems.

|                                            |                                                                                                            |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College                                                  |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning                                    |
| 3- Name/code of the curriculum             | Maintenance fundamentals of refrigeration and air conditioning equipment (compulsory) - PMTR243 - level II |
| 4- Forms of presence available             | My presence in classrooms and laboratories                                                                 |
| 5- Semester/annual system                  | first semester   2025                                                                                      |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                                                         |
| 7- Date of preparation of this description | 1 10 2025                                                                                                  |
| 8- 8- Name of the course coordinator       | م.سوران جلال محمد                                                                                          |

### 8- Course Objectives

- To understand the principles and types of maintenance in refrigeration and air conditioning systems.
- To diagnose and repair mechanical and electrical faults.
- To acquire practical skills for maintaining various air conditioning units.
- To understand the procedures for draining, charging, and changing compressor oil.
- To develop the ability to maintain commercial refrigeration units and central air conditioning systems.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical training in laboratories and workshops.
- Problem-based learning and fault diagnosis.
- Use of modern equipment and tools in maintenance.
- Scientific discussions and preparation of technical reports.
- Continuous assessment and feedback.

## 10. Structure of the curriculum

| The week | Hours          | Required learning outcomes                                                                           | Name of unit or subject                                                                                                                                                                                          | Method of education     | Method of assessment     |
|----------|----------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------|
| 1 – 6    | 6 hours a week | Understand maintenance principles, fault diagnosis, and maintenance of air conditioning systems.     | Hardware maintenance - types of maintenance, identification of mechanical and electrical faults, maintenance of an air conditioning unit for buildings and vehicles, electrical circuit breakdowns and treatment | Theoretical + Practical | Oral and practical exams |
| 7 – 9    | 6 hours a week | Perform maintenance and replacement of refrigeration cycle components.                               | Replacement of cycle parts, maintenance of wall room air conditioning unit, maintenance of compressor parts, maintenance of valves                                                                               | Theoretical + Practical | Oral and practical exams |
| 10 – 12  | 6 hours a week | Maintain split, packaged, and vehicle air conditioning systems.                                      | Maintenance of separate and integrated air conditioners, maintenance of vehicle air conditioning, jetters and fans                                                                                               | Theoretical + Practical | Oral and practical exams |
| 13-15    | 6 hours a week | Apply refrigerant servicing procedures and maintain commercial and central air conditioning systems. | Offloading, charging and compressor oil replacement operations, maintenance of commercial refrigeration units, maintenance of the central air conditioner with frequency compressor and centrifuge               | Theoretical + Practical | Oral and practical exams |

## 11. Course Assessment

- Attendance, participation, and daily preparation: **5 marks**
- Quizzes and oral examinations: **5 marks**
- Laboratory reports and assignments: **10 marks**
- Monthly practical examination: **10 marks**
- First monthly theoretical examination: **10 marks**
- Second monthly theoretical examination: **10 marks**
- Continuous assessment total: **50 marks**
- Final examination: **50 marks**

## 12- the infrastructure

|                                                                |                                                                                                                                                                                                |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. prescribed books and main references</b>                 | <b>Ashrae Guide and Data Book<br/>Modern Refrigeration and Air-condition by Althouse &amp; Turnquist<br/>Refrigeration &amp; Air-condition<br/>Refrigeration &amp; Air-condition institute</b> |
| <b>Books and references (scientific journals, reports,...)</b> | <b>Virtual Library of the Ministry of higher Education and Scientific Research</b>                                                                                                             |
| <b>E-referencing, Web sites</b>                                | <b>Virtual Library of the Ministry of higher Education and Scientific Research<br/>Books in the Institute's electronic library</b>                                                             |

## Advanced Refrigeration and Air Conditioning Maintenance (Compulsory) - PMTR248 - level II.

The course aims to equip students with advanced knowledge and practical skills in the maintenance of central refrigeration and air conditioning systems. It covers the maintenance of air handling units (AHUs), humidification devices, and fan coil units (FCUs), as well as evacuation, refrigerant charging, and leak detection procedures. The course also includes the maintenance of cooling towers, pumps, valves, electrical components, electrical control panels, and boilers used in central air conditioning systems, ensuring their safe, reliable, and efficient operation.

|                                            |                                                                                            |
|--------------------------------------------|--------------------------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College                                  |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning                    |
| 3- Name/code of the curriculum             | Advanced Refrigeration and Air Conditioning Maintenance (Compulsory) - PMTR248 - level II. |
| 4- Forms of presence available             | My presence in classrooms and laboratories                                                 |
| 5- Semester/annual system                  | Second semester   2025                                                                     |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                                         |
| 7- Date of preparation of this description | 1 10 2025                                                                                  |
| 8- Name of the course coordinator          | م.سوران جلال محمد                                                                          |

### Course Objectives

- To introduce students to advanced maintenance techniques for central refrigeration and air conditioning systems.
- To develop the practical skills required for maintaining air handling units (AHUs), humidification devices, and fan coil units (FCUs).
- To enable students to perform evacuation, refrigerant charging, and refrigerant leak detection procedures.
- To develop the skills required for maintaining cooling towers, pumps, valves, and their associated accessories.
- To enhance students' abilities in maintaining electrical components and electrical control panels, as well as interpreting and reading electrical wiring diagrams for central HVAC systems.

### Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical training in laboratories and instructional workshops.
- Problem-based learning (PBL) through troubleshooting and fault diagnosis.
- Utilization of modern maintenance tools, equipment, and diagnostic instruments.
- Scientific discussions and the preparation of technical reports.
- Continuous assessment accompanied by constructive feedback

## 10. Structure of the curriculum

| Week  | Hours        | Required Learning Outcomes                                                                                 | Unit / Topic                                                                                                                                                                                 | Teaching Method    | Assessment Method               |
|-------|--------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 6 hours/week | Identify the maintenance procedures for central air conditioning system components and air handling units. | Maintenance of air handling units (AHUs); humidification devices; air mixing boxes with dampers; fan coil units (FCUs); maintenance of central air conditioning system components.           | Theory + Practical | Oral and practical examinations |
| 7–9   | 6 hours/week | Acquire practical skills in evacuation, refrigerant charging, and refrigerant leak detection.              | Evacuation and refrigerant charging procedures; refrigerant leak detection and testing.                                                                                                      | Theory + Practical | Oral and practical examinations |
| 10–12 | 6 hours/week | Perform maintenance of cooling towers, water pumps, valves, and associated accessories.                    | Maintenance of cooling towers (types and components); water pumps; maintenance of motors and valves; replacement of pumps, piping, and accessories.                                          | Theory + Practical | Oral and practical examinations |
| 13–15 | 6 hours/week | Maintain electrical systems and interpret electrical diagrams of central air conditioning systems.         | Maintenance of electrical components; boiler maintenance; maintenance of electrical control panels; reading and interpreting electrical wiring diagrams of central air conditioning systems. | Theory + Practical | Oral and practical examinations |

## 11. Course Assessment

- Attendance, participation, and daily preparation: 5 marks
- Quizzes and oral examinations: 5 marks
- Laboratory reports and assignments: 10 marks
- Monthly practical examination: 10 marks
- First monthly theoretical examination: 10 marks
- Second monthly theoretical examination: 10 marks
- Final coursework (Continuous Assessment): 50 marks
- Final examination: 50 marks

## 12- the infrastructure

| Item                                                                            | Learning and Teaching Resources                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. Required Textbooks and Main References</b>                                | <ul style="list-style-type: none"> <li>• ASHRAE Guide and Data Book.</li> <li>• Modern Refrigeration and Air Conditioning by Althouse &amp; Turnquist.</li> <li>• Refrigeration &amp; Air Conditioning Institute Publications.</li> <li>• Dossat, R. J., Principles of Refrigeration.</li> <li>• Technical maintenance manuals issued by manufacturers of refrigeration and air conditioning equipment.</li> </ul> |
| <b>B. Recommended Books and References (Scientific Journals, Reports, etc.)</b> | <ul style="list-style-type: none"> <li>• Iraqi Virtual Science Library (IVSL), Ministry of Higher Education and Scientific Research.</li> </ul>                                                                                                                                                                                                                                                                    |
| <b>C. Electronic References and Websites</b>                                    | <ul style="list-style-type: none"> <li>• Iraqi Virtual Science Library (IVSL), Ministry of Higher Education and Scientific Research.</li> <li>• Electronic books and digital resources available through the Institute's E-Library.</li> </ul>                                                                                                                                                                     |

## Principles of Air Conditioning (Compulsory) – PMTR136 – First Level

The course aims to provide students with the fundamental principles of air conditioning systems, including psychrometric properties of moist air, human thermal comfort, cooling and heating load estimation, air conditioning processes, and the basic components and applications of residential and commercial air conditioning systems. It also develops students' practical skills in operating, testing, and evaluating air conditioning equipment.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Principles of Air Conditioning (Compulsory) – PMTR136 – First Level     |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. خالد يحيى شيمر                                                     |

### Course Objectives

- Understand the basic principles of air conditioning systems.
- Study the psychrometric properties of moist air and psychrometric charts.
- Identify human comfort conditions and indoor environmental requirements.
- Learn the fundamentals of cooling and heating load calculations.
- Understand the main components and operating principles of air conditioning systems.
- Develop practical skills in operating and testing air conditioning equipment.

### Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical laboratory experiments.
- Demonstrations using air conditioning equipment.
- Problem-solving and engineering calculations.
- Group discussions and technical presentations.
- Continuous assessment with constructive feedback

## Course Structure

| Week  | Hours        | Required Learning Outcomes                                          | Unit / Topic                                                                                     | Teaching Method    | Assessment Method               |
|-------|--------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–3   | 6 hours/week | Understand the basic concepts and applications of air conditioning. | Introduction to air conditioning, objectives, classifications, and applications.                 | Theory + Practical | Oral and practical examinations |
| 4–6   | 6 hours/week | Identify the properties of moist air and use psychrometric charts.  | Psychrometric properties, humidity, dew point, relative humidity, psychrometric chart.           | Theory + Practical | Oral and practical examinations |
| 7–9   | 6 hours/week | Analyze air conditioning processes.                                 | Sensible heating and cooling, humidification, dehumidification, evaporative cooling, air mixing. | Theory + Practical | Oral and practical examinations |
| 10–12 | 6 hours/week | Understand cooling load estimation and comfort conditions.          | Human comfort, cooling load calculations, heat gains, indoor air quality.                        | Theory + Practical | Oral and practical examinations |
| 13–15 | 6 hours/week | Identify the components and operation of air conditioning systems.  | Air conditioning equipment, fans, filters, coils, ducts, and basic system operation.             | Theory + Practical | Oral and practical examinations |

## Course Assessment

| Assessment Item                                  | Marks     |
|--------------------------------------------------|-----------|
| Attendance, participation, and daily preparation | 5         |
| Quizzes and oral examinations                    | 5         |
| Laboratory reports and assignments               | 10        |
| Monthly practical examination                    | 10        |
| First monthly theoretical examination            | 10        |
| Second monthly theoretical examination           | 10        |
| <b>Continuous Assessment Total</b>               | <b>50</b> |
| <b>Final Examination</b>                         | <b>50</b> |

## Learning and Teaching Resources

| Item                                                                            | Resources                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. Required Textbooks and Main References</b>                                | • ASHRAE Handbook – Fundamentals. • Carrier Air Conditioning System Design Manual. • <i>Principles of Heating, Ventilation and Air Conditioning</i> by Ronald H. Howell. • <i>Air Conditioning Principles and Systems</i> by Edward G. Pita. • McQuiston, Parker & Spitler, <i>Heating, Ventilating, and Air Conditioning: Analysis and Design</i> . |
| <b>B. Recommended Books and References (Scientific Journals, Reports, etc.)</b> | • Iraqi Virtual Science Library (IVSL). • ASHRAE Journal. • International Journal of Refrigeration. • HVAC&R Research Journals.                                                                                                                                                                                                                      |
| <b>C. Electronic References and Websites</b>                                    | • Iraqi Virtual Science Library (IVSL). • ASHRAE ( <a href="http://www.ashrae.org">www.ashrae.org</a> ). • Carrier Technical Library. • Trane Engineering Handbook. • Institute Electronic Library.                                                                                                                                                  |

# Principles of Refrigeration (Compulsory) – PMTR138 – Level One

This course introduces the fundamental principles and concepts of refrigeration systems, including heat transfer basics, refrigeration processes, and vapor compression refrigeration cycles. It covers the main components of refrigeration systems such as compressors, condensers, evaporators, and expansion devices. The course also discusses refrigerants, their properties, applications, and the basic operation and maintenance principles of refrigeration equipment. Students will learn how to analyze simple refrigeration cycles and evaluate system performance.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Principles of Refrigeration (Compulsory) – PMTR138 – Level One          |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | Second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. خالد يحيى شيمر                                                     |

## Course Objectives

- Introduce students to the basic concepts and principles of refrigeration.
- Explain the operation and functions of refrigeration system components.
- Understand the vapor compression refrigeration cycle and its processes.
- Study different types of compressors, condensers, evaporators, and expansion devices.
- Identify various refrigerants and their characteristics.
- Develop basic skills in operating and troubleshooting refrigeration systems.

## 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Laboratory experiments and practical applications.
- Problem-based learning.
- Using engineering diagrams and software programs for analyzing refrigeration cycles.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                             | Unit / Topic Name                                                                                                                                              | Teaching Method    | Assessment Method               |
|-------|------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding different refrigeration methods and analyzing the vapor compression refrigeration cycle. | Study of different refrigeration methods, using the (P-h) diagram for different refrigerants, and vapor compression refrigeration systems.                     | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying compressors, condensers, and cooling towers and comparing their characteristics.              | Compressors and their types, advantages and disadvantages of each type; condensers and cooling towers, their types, advantages and disadvantages of each type. | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Understanding expansion devices and evaporators and their characteristics.                             | Expansion devices and their types, advantages and disadvantages of each type; evaporators and their types, advantages and disadvantages of each type.          | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Studying refrigerants, their classifications, and selecting suitable refrigerants.                     | Refrigerants (primary and secondary), their types, classifications, properties, and selection criteria.                                                        | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks.**
- Short quizzes and oral examinations: **5 marks.**
- Laboratory reports and assignments: **10 marks.**
- Monthly practical examination: **10 marks.**
- First monthly theoretical examination: **10 marks.**
- Second monthly theoretical examination: **10 marks.**
- Final coursework assessment: **50 marks.**
- Final examination: **50 marks.**

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

- **Principles of Refrigeration – Roy J. Dossat**
- **ASHRAE Handbook**
- **A Course in Air Conditioning and Refrigeration – Arora and Domkundwar**
- **Roy J. Dossat, Principles of Refrigeration**
- **Stoecker, W. F. and Jones, J. W., Refrigeration and Air Conditioning**

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the institute's digital library.

## Computer (Compulsory) – NTU102 – Level One

The course aims to provide students with the basic knowledge and skills required for using computers and their various applications. It introduces computer components, system software, application software, operating systems, word processing, and spreadsheet management. It also covers the fundamentals of the Internet, computer networks, communication methods, and electronic mail, contributing to the development of digital skills required for university studies and the labor market.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Computer (Compulsory) – NTU102 – Level One                              |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | Second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.د. احمد سالار                                                         |

### 8- Course Objectives

- Identify computer components, system software, and application software.
- Acquire basic skills in using operating systems.
- Learn how to create, edit, and manage documents using word processing applications.
- Understand spreadsheet management, styles, and themes.
- Understand the fundamentals of the Internet, computer networks, and modern communication methods.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical training in the computer laboratory.
- Application-based learning.
- Self-learning using educational software.
- Discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                            | Unit / Topic Name                                                         | Teaching Method    | Assessment Method               |
|-------|------------------|-------------------------------------------------------|---------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–3   | 2 hours per week | Understanding computers and basic software            | Introduction to computers, system software, and application software      | Theory + Practical | Oral and practical examinations |
| 4–5   | 2 hours per week | Acquiring skills in using operating systems           | Operating Systems                                                         | Theory + Practical | Oral and practical examinations |
| 6–8   | 2 hours per week | Learning how to create documents and process text     | Word processing: opening and closing documents, creating and editing text | Theory + Practical | Oral and practical examinations |
| 9–11  | 2 hours per week | Using spreadsheets, styles, and themes                | Spreadsheet management and using styles and themes                        | Theory + Practical | Oral and practical examinations |
| 12–13 | 2 hours per week | Understanding the basics of the Internet and networks | Introduction to Internet browsers and basic computer networks             | Theory + Practical | Oral and practical examinations |
| 14–15 | 2 hours per week | Using modern communication methods                    | Communications, messages, and electronic mail                             | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks**.
- Short quizzes and oral examinations: **5 marks**.
- Laboratory reports and assignments: **10 marks**.
- Monthly practical examination: **10 marks**.
- First monthly theoretical examination: **10 marks**.
- Second monthly theoretical examination: **10 marks**.
- Final coursework assessment: **50 marks**.
- Final examination: **50 marks**.

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                                                        |
|-----|------------------------------------------------------------------------------------------------------------------|
| 1   | Graham Brown & David Watson, <b>Cambridge IGCSE Information and Communication Technology, 3rd Edition (2020)</b> |
| 2   | Alan Evans, Kendall Martin & Mary Anne Poatsy, <b>Technology in Action Complete, 16th Edition (2020)</b>         |
| 3   | Ahmed Banafa, <b>Introduction to Artificial Intelligence, 1st Edition (2024)</b>                                 |
| 4   | Curtis & Joan Lambert, <b>Microsoft Office 2019 Step by Step, 1st Edition</b>                                    |

### B- Books and References (Scientific Journals, Reports, etc.)

| No. | Reference                                                                               |
|-----|-----------------------------------------------------------------------------------------|
| 1   | Al-Khidr Ali Al-Khidr, <b>Research on Computer Fundamentals (2016)</b>                  |
| 2   | Dr. Adel Abdul Nour, <b>Introduction to the World of Artificial Intelligence (2005)</b> |

### C- Electronic References and Internet Resources

| No. | Reference                                                                       |
|-----|---------------------------------------------------------------------------------|
| 1   | The Virtual Library of the Ministry of Higher Education and Scientific Research |
| 2   | Available electronic books in the institute's digital library                   |

## Fundamentals of Heat Transfer (Compulsory) – PMTR242 – Level Two

The course aims to introduce students to the fundamental concepts of heat transfer and its different modes. It covers heat transfer by conduction and convection, thermal properties of materials, and analysis of heat transfer through plane and cylindrical walls. In addition, it includes the study of dimensionless groups and overall heat transfer coefficients, preparing students to understand engineering applications related to refrigeration, air conditioning systems, and heat exchangers.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Fundamentals of Heat Transfer (Compulsory) – PMTR242 – Level Two        |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | First semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن<br>engineer.abosadan@ntu.edu.iq                      |

### 8- Course Objectives

- Introduce students to the fundamental concepts and different modes of heat transfer.
- Study heat transfer by conduction and convection and heat transfer coefficients.
- Understand the thermal properties of materials and their effects on heat transfer.
- Analyze heat transfer through plane, composite, and cylindrical walls.
- Study dimensionless groups and overall heat transfer coefficients and their engineering applications.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using educational tools and modern engineering software.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                         | Unit / Topic Name                                                                       | Teaching Method    | Assessment Method               |
|-------|------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding heat transfer modes and calculating heat transfer rates by conduction and convection | Heat Transfer, Conduction, Convection, Heat Transfer Coefficient                        | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying thermal properties and analyzing heat transfer through plane and composite walls          | Thermal Conductivity (K), Thermal Diffusivity, The Plane Wall, The Composite Plane Wall | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Analyzing heat transfer through cylindrical walls and studying dimensionless groups                | Cylindrical Walls, Heat Convection, Film Temperature, Dimensionless Groups              | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Calculating overall heat transfer coefficient and its engineering applications                     | Total Heat Transfer Coefficient, Overall Heat Transfer Coefficient                      | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks**.
- Short quizzes and oral examinations: **5 marks**.
- Laboratory reports and assignments: **10 marks**.
- Monthly practical examination: **10 marks**.
- First monthly theoretical examination: **10 marks**.
- Second monthly theoretical examination: **10 marks**.
- Final coursework assessment: **50 marks**.
- Final examination: **50 marks**.

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                          |
|-----|------------------------------------------------------------------------------------|
| 1   | Yunus A. Çengel, <b>Heat and Mass Transfer: Fundamentals and Applications</b>      |
| 2   | Incropera, DeWitt, Bergman & Lavine, <b>Fundamentals of Heat and Mass Transfer</b> |
| 3   | Holman, J. P., <b>Heat Transfer</b>                                                |
| 4   | Kreith, F., <b>Principles of Heat Transfer</b>                                     |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Applied Heat Transfer (Compulsory) – PMTR247 – Level Two

The course aims to provide students with applied knowledge and skills related to heat transfer, with emphasis on heat exchangers, their types, and performance analysis methods using the Log Mean Temperature Difference (LMTD) method and heat exchanger effectiveness. It also covers thermal fins, their applications and efficiency, in addition to radiation heat transfer, Stefan–Boltzmann law, configuration factors, and radiation exchangers. The course enhances students' ability to analyze and design thermal systems used in refrigeration and air conditioning applications.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Applied Heat Transfer (Compulsory) – PMTR247 – Level Two                |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن<br>engineer.abosadan@ntu.edu.iq                      |

### 8- Course Objectives

- Introduce students to heat exchangers and their different types.
- Study methods for evaluating heat exchanger performance using the Log Mean Temperature Difference (LMTD) and effectiveness methods.
- Understand the importance of thermal fins, their applications, and efficiency.
- Study radiation heat transfer and the Stefan–Boltzmann law.
- Develop students' ability to analyze thermal systems used in refrigeration and air conditioning applications.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using educational tools and modern engineering software.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                             | Unit / Topic Name                                                                               | Teaching Method    | Assessment Method               |
|-------|------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding heat exchangers, their different types, and applications | Heat Exchangers, Types of Heat Exchangers                                                       | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Analyzing heat exchanger performance and evaluating efficiency         | Log Mean Temperature Difference (LMTD), Heat Exchanger Effectiveness                            | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Studying thermal fins, their applications, and efficiency              | Fins, Applications of Fins, Fin Efficiency                                                      | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Studying radiation heat transfer and analyzing radiation exchangers    | Heat Transfer by Radiation, Stefan–Boltzmann Law, Configuration Factor (F), Radiation Exchanger | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks**.
- Short quizzes and oral examinations: **5 marks**.
- Laboratory reports and assignments: **10 marks**.
- Monthly practical examination: **10 marks**.
- First monthly theoretical examination: **10 marks**.
- Second monthly theoretical examination: **10 marks**.
- Final coursework assessment: **50 marks**.
- Final examination: **50 marks**.

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                          |
|-----|------------------------------------------------------------------------------------|
| 1   | Yunus A. Çengel, <b>Heat and Mass Transfer: Fundamentals and Applications</b>      |
| 2   | Incropera, DeWitt, Bergman & Lavine, <b>Fundamentals of Heat and Mass Transfer</b> |
| 3   | Holman, J. P., <b>Heat Transfer</b>                                                |
| 4   | Kreith, F., <b>Principles of Heat Transfer</b>                                     |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Fundamentals of Control Systems (Compulsory) – PMTR244 – Level Two

The course aims to introduce students to the fundamental concepts of control systems used in refrigeration and air conditioning applications. It covers the study of components and elements of different control systems, as well as control valves and actuating devices, their types, and operating principles. The course also includes applications of control systems in refrigeration and air conditioning units, contributing to the development of students' skills in operation, maintenance, and analysis of various control systems.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Fundamentals of Control Systems (Compulsory) – PMTR244 – Level Two      |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- 8- Name of the course coordinator       | م.م.مها حسن غفور                                                        |

### 8- Course Objectives

- Introduce students to the basic principles and types of control systems.
- Study the components and elements of control systems used in refrigeration and air conditioning applications.
- Identify control valves and actuating devices, their types, and functions.
- Understand the operating principles of control systems used in refrigeration and air conditioning units.
- Develop practical skills in analyzing and operating different control circuits.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using electrical diagrams and educational control panels.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                           | Unit / Topic Name                                                           | Teaching Method    | Assessment Method               |
|-------|------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding the basic principles of control systems and their operation mechanisms                 | Principles of Control Systems                                               | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying the components and elements of different control systems                                    | Control System Components                                                   | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Identifying control valves and actuating devices, their types, and functions                         | Control Valves (Actuating Devices) and Their Types                          | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Applying control systems in refrigeration and air conditioning units and analyzing their performance | Applications of Control Systems in Refrigeration and Air Conditioning Units | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks.**
- Short quizzes and oral examinations: **5 marks.**
- Laboratory reports and assignments: **10 marks.**
- Monthly practical examination: **10 marks.**
- First monthly theoretical examination: **10 marks.**
- Second monthly theoretical examination: **10 marks.**
- Final coursework assessment: **50 marks.**
- Final examination: **50 marks.**

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                       |
|-----|---------------------------------------------------------------------------------|
| 1   | L. F. Adams, <b>Engineering Measurement and Instrumentation</b>                 |
| 2   | L. F. Adams, <b>Control Systems Engineering Measurement and Instrumentation</b> |
| 3   | <b>Control Systems</b>                                                          |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the institute's digital library.

## Advanced Control Systems (Compulsory) – PMTR253 – Level Two

The course aims to develop students' knowledge and skills in the field of electrical control systems used in refrigeration and air conditioning systems. It focuses on studying power and control circuits for simple devices and different air conditioning units, understanding electrical diagrams and their types, and analyzing and operating power and control circuits for split and packaged air conditioning units. The course prepares students to diagnose faults and perform operation and maintenance tasks efficiently.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Advanced Control Systems (Compulsory) – PMTR253 – Level Two             |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م.مها حسن غفور                                                        |

### 8- Course Objectives

- Identify power and control circuits used in control systems.
- Study different electrical diagrams and methods of reading and analyzing them.
- Understand power and control circuits of split air conditioning units.
- Study control circuits of packaged air conditioning units and their operating mechanisms.
- Develop practical skills in operating and maintaining control systems for refrigeration and air conditioning systems.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications inside the laboratory.
- Using electrical diagrams and educational control panels.
- Problem-based learning and practical case studies.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                   | Unit / Topic Name                                                                                             | Teaching Method    | Assessment Method               |
|-------|------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding power and control circuits and their basic components                          | Power and control circuits for some simple devices and introduction to electrical circuits in control systems | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying and analyzing electrical diagrams                                                   | Electrical diagrams and their types                                                                           | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Analyzing and operating power and control circuits of split air conditioning units           | Power and Control Circuits of Split Air Conditioning Units                                                    | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Studying power and control circuits of packaged air conditioning units and diagnosing faults | Power and Control Circuits of Packaged Air Conditioning Units                                                 | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks**.
- Short quizzes and oral examinations: **5 marks**.
- Laboratory reports and assignments: **10 marks**.
- Monthly practical examination: **10 marks**.
- First monthly theoretical examination: **10 marks**.
- Second monthly theoretical examination: **10 marks**.
- Final coursework assessment: **50 marks**.
- Final examination: **50 marks**.

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                       |
|-----|---------------------------------------------------------------------------------|
| 1   | L. F. Adams, <b>Engineering Measurement and Instrumentation</b>                 |
| 2   | L. F. Adams, <b>Control Systems Engineering Measurement and Instrumentation</b> |
| 3   | <b>Control Systems</b>                                                          |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the institute's digital library.

## Principles of Electrical Technology (Compulsory) – PMTR142 – Level One

The course aims to introduce students to the basic concepts of electrical technology and electrical circuits through the study of fundamental electrical quantities, Ohm's Law and its applications, and different electrical components such as resistors, inductors, and capacitors. It also covers power calculations, power factor, types of electric motors, their selection methods, and maintenance procedures. The course contributes to developing the skills required for operating and maintaining electrical devices used in refrigeration and air conditioning applications.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Principles of Electrical Technology (Compulsory) – PMTR142 – Level One  |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- 8- Name of the course coordinator       | فاتن سمين فاضل                                                          |

### 8- Course Objectives

- Identify the basic concepts of electricity, electrical quantities, and their measurement units.
- Study Ohm's Law and its applications in electrical circuits.
- Identify electrical circuit components and calculate electrical power and power factor.
- Study different types of electric motors and methods of selection.
- Develop practical skills in operating and maintaining motors and electrical devices.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using modern measuring instruments and electrical equipment.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                  | Unit / Topic Name                                                                               | Teaching Method    | Assessment Method               |
|-------|------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding the fundamentals of electricity, electrical quantities, and measurement units | Introduction to Electrical Technology, Definitions, Ampere, Current, Voltage, Resistance        | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Applying Ohm's Law and analyzing simple electrical circuits                                 | Ohm's Law and Its Applications                                                                  | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Studying electrical circuit components and power calculations                               | Resistors, Circuit Components, Capacitors, Series Connections, Power Calculations, Power Factor | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Understanding electric motors and performing basic maintenance operations                   | Motor Selection, Motor Maintenance, and Repair of Components                                    | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks**.
- Short quizzes and oral examinations: **5 marks**.
- Laboratory reports and assignments: **10 marks**.
- Monthly practical examination: **10 marks**.
- First monthly theoretical examination: **10 marks**.
- Second monthly theoretical examination: **10 marks**.
- Final coursework assessment: **50 marks**.
- Final examination: **50 marks**.

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                               |
|-----|-----------------------------------------------------------------------------------------|
| 1   | <b>Electrical Technology – Theraja</b>                                                  |
| 2   | <b>Electrical Technology – Hayke</b>                                                    |
| 3   | <b>Electrical Engineering Theory and Practical Electrical Installation Work – Franc</b> |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Advanced Electrical Technology (Compulsory) – PMTR146 – Level One

The course aims to develop students' knowledge in the field of electrical engineering through studying alternating current (AC), direct current (DC), and different types of electrical waveforms. It introduces the principles of electromagnetism, magnetic fields, and magnetic flux density. The course also covers polyphase systems, switching and operating equipment, electric motors, and their maintenance. It prepares students to understand, operate, and maintain electrical systems used in refrigeration and air conditioning applications.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Advanced Electrical Technology (Compulsory) – PMTR146 – Level One       |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- 8- Name of the course coordinator       | فاتن سمين فاضل                                                          |

### 8- Course Objectives

- Identify the characteristics of alternating current, direct current, and different types of electrical waveforms.
- Study the basic principles of electromagnetism and magnetic fields.
- Understand polyphase electrical systems and their applications.
- Identify switching and operating equipment used in electrical circuits.
- Develop practical skills in operating and maintaining electric motors.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using measuring instruments and educational panels.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                 | Unit / Topic Name                                          | Teaching Method    | Assessment Method               |
|-------|------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding the characteristics of AC and DC currents and analyzing electrical waveforms | Alternating Current, Types of AC Waveforms, Direct Current | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying the principles of electromagnetism and the effects of magnetic fields             | Electromagnetism, Magnetic Field, Magnetic Flux Density    | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Understanding polyphase systems and their practical applications                           | Polyphase Systems                                          | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Identifying switching and operating equipment and performing basic motor maintenance       | Switching Equipment, Motor Operation, and Maintenance      | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks.**
- Short quizzes and oral examinations: **5 marks.**
- Laboratory reports and assignments: **10 marks.**
- Monthly practical examination: **10 marks.**
- First monthly theoretical examination: **10 marks.**
- Second monthly theoretical examination: **10 marks.**
- Final coursework assessment: **50 marks.**
- Final examination: **50 marks.**

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                               |
|-----|-----------------------------------------------------------------------------------------|
| 1   | <b>Electrical Technology – Theraja</b>                                                  |
| 2   | <b>Electrical Technology – Hayke</b>                                                    |
| 3   | <b>Electrical Engineering Theory and Practical Electrical Installation Work – Franc</b> |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the institute's digital library.

## Fundamentals of Refrigeration Systems (Compulsory) – PMTR240 – Level Two

The course aims to provide students with fundamental knowledge related to theoretical and practical vapor compression refrigeration systems. It covers different types of refrigerants used in refrigeration systems and their properties, as well as the principles of selecting refrigeration system components. The course also includes the study of compound and multi-evaporator refrigeration cycles, design of refrigeration piping and accessories, and control devices used in refrigeration systems, enhancing students' ability to analyze, design, and operate various refrigeration systems.

|                                            |                                                                          |
|--------------------------------------------|--------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College                |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning  |
| 3- Name/code of the curriculum             | Fundamentals of Refrigeration Systems (Compulsory) – PMTR240 – Level Two |
| 4- Forms of presence available             | My presence in classrooms and laboratories                               |
| 5- Semester/annual system                  | first semester   2025                                                    |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                       |
| 7- Date of preparation of this description | 1 10 2025                                                                |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن                                                       |

### 8- Course Objectives

- Identify the theoretical and actual vapor compression refrigeration cycles and the refrigerants used.
- Study the principles of selecting different refrigeration system components.
- Understand compound and multi-evaporator refrigeration cycles.
- Identify the design principles of refrigeration system piping and accessories.
- Study control devices used in refrigeration systems and their applications.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using thermodynamic diagrams and simulation software.
- Scientific discussions and illustrative presentations.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                        | Unit / Topic Name                                                                                    | Teaching Method    | Assessment Method               |
|-------|------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding theoretical and actual vapor compression refrigeration cycles and used refrigerants | Vapor Compression System (Theoretical and Actual) and Types of Refrigerants                          | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying the principles of selecting vapor compression refrigeration system components            | Selection of Vapor Compression System Components                                                     | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Analyzing compound and multi-evaporator refrigeration cycles                                      | Compound Vapor Compression Cycle and Multi-Evaporator Refrigeration Systems                          | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Designing piping and accessories and studying control devices of refrigeration systems            | Design of Refrigeration System Piping and Accessories; Control Devices for Vapor Compression Systems | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks.**
- Short quizzes and oral examinations: **5 marks.**
- Laboratory reports and assignments: **10 marks.**
- Monthly practical examination: **10 marks.**
- First monthly theoretical examination: **10 marks.**
- Second monthly theoretical examination: **10 marks.**
- Final coursework assessment: **50 marks.**
- Final examination: **50 marks.**

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                          |
|-----|----------------------------------------------------|
| 1   | <b>Air-Conditioning Engineering – W. P. Jones</b>  |
| 2   | <b>ASHRAE Handbook</b>                             |
| 3   | <b>Air-Conditioning Engineering – Gupta</b>        |
| 4   | <b>Principles of Refrigeration – Roy J. Dossat</b> |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the institute's digital library.

## Advanced Refrigeration Systems (Compulsory) – PMTR246 – Level Two

The course aims to introduce students to non-conventional and advanced refrigeration systems, including the operating principles and types of absorption refrigeration systems, vapor jet refrigeration systems, and air refrigeration systems. It also covers air liquefaction systems and thermoelectric refrigeration, in addition to modern refrigeration technology applications in food preservation. The course contributes to developing students' skills in analyzing, operating, and selecting suitable refrigeration systems for various industrial applications.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Advanced Refrigeration Systems (Compulsory) – PMTR246 – Level Two       |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن                                                      |

### 8- Course Objectives

- Identify advanced refrigeration systems and their fields of application.
- Study absorption refrigeration systems, their types, and operating principles.
- Understand the operating principles of vapor jet refrigeration systems and air refrigeration systems.
- Identify air liquefaction systems and thermoelectric refrigeration systems.
- Study modern refrigeration technology applications in food preservation and different industries.

### 9- Teaching and Learning Strategies

- Interactive theoretical lectures.
- Practical applications and laboratory experiments.
- Problem-based learning.
- Using simulation software and illustrative presentations.
- Scientific discussions and applied case studies.
- Continuous assessment and feedback.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                            | Unit / Topic Name                                                   | Teaching Method    | Assessment Method               |
|-------|------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------|---------------------------------|
| 1–6   | 4 hours per week | Understanding absorption refrigeration systems, their types, and operating principles | Absorption Refrigeration Systems, Types, and Operating Principles   | Theory + Practical | Oral and practical examinations |
| 7–9   | 4 hours per week | Studying the operating principles of vapor jet and air refrigeration systems          | Vapor Jet Refrigeration System; Air Refrigeration System            | Theory + Practical | Oral and practical examinations |
| 10–12 | 4 hours per week | Understanding air liquefaction systems and thermoelectric refrigeration systems       | Air Liquefaction System; Thermoelectric Refrigeration System        | Theory + Practical | Oral and practical examinations |
| 13–15 | 4 hours per week | Studying thermoelectric refrigeration applications and food preservation technologies | Thermoelectric Refrigeration System; Food Preservation Technologies | Theory + Practical | Oral and practical examinations |

## 11- Course Assessment

- Attendance, participation, and daily preparation: **5 marks.**
- Short quizzes and oral examinations: **5 marks.**
- Laboratory reports and assignments: **10 marks.**
- Monthly practical examination: **10 marks.**
- First monthly theoretical examination: **10 marks.**
- Second monthly theoretical examination: **10 marks.**
- Final coursework assessment: **50 marks.**
- Final examination: **50 marks.**

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                          |
|-----|----------------------------------------------------|
| 1   | <b>Air-Conditioning Engineering – W. P. Jones</b>  |
| 2   | <b>ASHRAE Handbook</b>                             |
| 3   | <b>Air-Conditioning Engineering – Gupta</b>        |
| 4   | <b>Principles of Refrigeration – Roy J. Dossat</b> |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Fundamentals of Air Conditioning Systems Drawing (Compulsory) – PMTR245 – Level Two

The course aims to provide students with the basic skills required for preparing engineering drawings of refrigeration and air conditioning systems using standard engineering methods. It covers architectural drawings, air duct systems, air distribution networks, and water piping systems for different air conditioning systems. It also includes drawing of mechanical rooms, measuring instruments, and control devices, enabling students to prepare and interpret engineering drawings for central air conditioning systems.

|                                            |                                                                                     |
|--------------------------------------------|-------------------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College                           |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning             |
| 3- Name/code of the curriculum             | Fundamentals of Air Conditioning Systems Drawing (Compulsory) – PMTR245 – Level Two |
| 4- Forms of presence available             | My presence in classrooms and laboratories                                          |
| 5- Semester/annual system                  | first semester   2025                                                               |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                                  |
| 7- Date of preparation of this description | 1 10 2025                                                                           |
| 8- Name of the course coordinator          | م.م.محمد صباح حسن                                                                   |

### 8- Course Objectives

- Identify the principles of engineering drawing for air conditioning systems.
- Develop students' skills in drawing air ducts and air distribution networks.
- Learn methods of drawing water piping networks for cooling and heating systems.
- Study representation methods of mechanical rooms, measuring instruments, and control devices.
- Develop the ability to prepare and interpret engineering drawings for central air conditioning systems.

### 9- Teaching and Learning Strategies

- Direct practical explanation.
- Learning through practice and application.
- Using engineering drawing boards and computer-aided drawing software.
- Implementing projects and applied drawings.
- Technical discussions and continuous feedback.
- Continuous practical assessment.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                             | Unit / Topic Name                                                                                                                                                                                                                                                                                                                        | Teaching Method         | Assessment Method                               |
|-------|------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------|
| 1–6   | 3 hours per week | Mastering architectural drawings and air duct drawings and connecting them with air conditioning units | Drawing architectural plans for multi-story buildings; general concept of single-line air duct drawings; drawing double-line air ducts with dimensions; preparing complete air duct layouts including bends, T-branches, and other fittings with dimensions; connecting complete duct layouts with lifting devices or air handling units | Practical using laptops | Practical examinations and homework assignments |
| 7–9   | 3 hours per week | Preparing air and water network drawings for air conditioning systems                                  | Detailed air duct drawings; drawing air grilles and diffusers in their locations with dimensions and air quantities; introduction to water piping drawings for air conditioning units (chilled water system, heating water system, and condenser water system)                                                                           | Practical using laptops | Practical examinations and homework assignments |
| 10–12 | 3 hours per week | Drawing fan coil unit piping networks and riser pipes                                                  | Drawing water piping layouts for fan coil units with single, two, three, and four outlets; drawing double riser pipes within an integrated cooling system                                                                                                                                                                                | Practical using laptops | Practical examinations and homework assignments |
| 13–15 | 3 hours per week | Preparing complete drawings for mechanical rooms, control systems, and measuring devices               | Drawing complete piping network layouts including control and measuring devices; drawing mechanical room layouts using single-line and double-line pipe representation; drawing sections of mechanical rooms to show pipe routing within the room space                                                                                  | Practical using laptops | Practical examinations and homework assignments |

## 11- Course Assessment

| Grade      | Assessment Component                              |
|------------|---------------------------------------------------|
| 10         | Attendance, commitment, and practical assignments |
| 20         | First practical examination                       |
| 20         | Second practical examination                      |
| 50         | Annual coursework assessment                      |
| 50         | Final practical examination                       |
| <b>100</b> | <b>Total</b>                                      |

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                        |
|-----|------------------------------------------------------------------|
| 1   | <b>Mechanical Drawing – Feach Thomas</b>                         |
| 2   | <b>Handbook &amp; Air-Conditioning System Design – Carrier</b>   |
| 3   | <b>Sourcebook of H.V.A.C. Details – Frank E. Beaty Jr., P.E.</b> |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Advanced Air Conditioning Systems Drawing (Compulsory) – PMTR251 – Level Two

The course aims to develop students' skills in preparing advanced engineering drawings for refrigeration and air conditioning systems through drawing chilled water, condenser water, and refrigerant piping layouts, control system diagrams, and drawings of domestic and split refrigeration units. It also includes drawing supports, hangers, and pump bases, in addition to field visits to observe the implementation of air duct networks and water piping systems. The course enhances students' ability to read and execute advanced engineering drawings according to approved technical standards.

|                                            |                                                                              |
|--------------------------------------------|------------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College                    |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning      |
| 3- Name/code of the curriculum             | Advanced Air Conditioning Systems Drawing (Compulsory) – PMTR251 – Level Two |
| 4- Forms of presence available             | My presence in classrooms and laboratories                                   |
| 5- Semester/annual system                  | second semester   2025                                                       |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                           |
| 7- Date of preparation of this description | 1 10 2025                                                                    |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن                                                           |

### 8- Course Objectives

- Provide students with advanced skills in drawing refrigeration and air conditioning systems.
- Introduce methods of representing water piping networks and three-dimensional system layouts.
- Study control system diagrams for air conditioning and refrigeration units.
- Learn the principles of drawing supports, hangers, and pump foundations.
- Connect theoretical knowledge with practical applications through field visits.

### 9- Teaching and Learning Strategies

- Learning through practical application and practice.
- Using engineering drawing boards and computer-aided drawing programs.
- Projects and applied drawings.
- Technical discussions and continuous feedback.
- Scientific field visits.
- Continuous practical assessment.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                                    | Unit / Topic Name                                                                                                                                                                                                                                                                                                                        | Teaching Method         | Assessment Method                               |
|-------|------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------|
| 1–6   | 3 hours per week | Mastering water piping system drawings and connecting air conditioning units                                  | Drawing an architectural plan for one floor showing fan coil unit connections; drawing chilled water piping layout connecting the mechanical room with the terminal unit on a specific floor; drawing chilled water, condenser water, and refrigerant charging systems using 3D representation with installed valves and control devices | Practical using laptops | Practical examinations and homework assignments |
| 7–9   | 3 hours per week | Preparing control system diagrams for air conditioning and refrigeration units                                | Drawing control system diagrams for condensing units                                                                                                                                                                                                                                                                                     | Practical using laptops | Practical examinations and homework assignments |
| 10–12 | 3 hours per week | Drawing refrigeration unit layouts and identifying pipe support methods                                       | Drawing layouts for air-cooled heat exchanger units, domestic refrigeration panels, and split refrigeration panels; drawing pipe hangers and supports                                                                                                                                                                                    | Practical using laptops | Practical examinations and homework assignments |
| 13–15 | 3 hours per week | Understanding equipment installation methods and connecting theoretical knowledge with practical applications | Drawing equipment supports and pump foundations; field visit to one of the buildings to observe the implementation of air duct systems and water piping networks                                                                                                                                                                         | Practical using laptops | Practical examinations and homework assignments |

## 11- Course Assessment

| Grade      | Assessment Component                              |
|------------|---------------------------------------------------|
| 10         | Attendance, commitment, and practical assignments |
| 20         | First practical examination                       |
| 20         | Second practical examination                      |
| 50         | Annual coursework assessment                      |
| 50         | Final practical examination                       |
| <b>100</b> | <b>Total</b>                                      |

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                        |
|-----|------------------------------------------------------------------|
| 1   | <b>Mechanical Drawing – Feach Thomas</b>                         |
| 2   | <b>Handbook &amp; Air-Conditioning System Design – Carrier</b>   |
| 3   | <b>Sourcebook of H.V.A.C. Details – Frank E. Beaty Jr., P.E.</b> |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Fundamentals of Engineering Drawing (Compulsory) – PMTR143 – Level One

The course aims to provide students with the basic skills of engineering drawing and the use of drawing tools and boards. It introduces students to different types of lines, technical lettering, and basic geometric constructions. The course also covers the drawing of polygons, circles, arcs, and engineering perspectives, enabling students to read and prepare engineering drawings required in various technical and engineering fields.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Fundamentals of Engineering Drawing (Compulsory) – PMTR143 – Level One  |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | First semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن                                                      |

### 8- Course Objectives

- Understand the importance of engineering drawing and its basic tools.
- Master basic geometric constructions and technical lettering.
- Learn methods of drawing different geometric shapes, polygons, and circles.
- Study the principles of engineering perspective and its different types.
- Develop practical skills in preparing accurate engineering drawings according to technical standards.

### 9- Teaching and Learning Strategies

- Learning through practice and practical application.
- Direct explanation using engineering drawing boards.
- Performing exercises and manual drawing tasks.
- Project-based learning and practical assignments.
- Discussions and continuous feedback.
- Using modern educational tools and engineering drawing software.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                              | Unit / Topic Name                                                                                                                                                                                                                                                                                                                                                                        | Teaching Method         | Assessment Method                               |
|-------|------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------|
| 1–6   | 3 hours per week | Understanding the fundamentals of engineering drawing and basic geometric constructions | Importance of engineering drawing; drawing tools; measuring drawing sheets; enlargement and reduction; title block; types of lines with exercises; writing letters and numbers in both languages; geometric constructions; drawing perpendicular and bisector lines; drawing triangles based on side lengths or angles; drawing tangents to circles from points on or outside the circle | Practical using laptops | Practical examinations and homework assignments |
| 7–9   | 3 hours per week | Mastering the drawing of circles, arcs, polygons, and elliptical shapes                 | Drawing internal tangents between two circles; drawing arcs tangent to two circles externally, internally, or commonly with a known radius; drawing circles tangent to triangle vertices and sides; drawing regular polygons (pentagon, hexagon, octagon, and polygons); drawing ellipses using major and minor diameters or circle diameter methods                                     | Practical using laptops | Practical examinations and homework assignments |
| 10–12 | 3 hours per week | Understanding engineering perspective and its practical applications                    | Applications of geometric constructions; perspective drawing and its types with emphasis on isometric and oblique perspectives at 45 degrees; drawing perspectives containing circular holes on three faces using center transfer methods for ellipse drawing                                                                                                                            | Practical using laptops | Practical examinations and homework assignments |
| 13–15 | 3 hours per week | Developing skills in engineering representation of three-dimensional objects            | Drawing different shapes of objects using perspective methods                                                                                                                                                                                                                                                                                                                            | Practical using laptops | Practical examinations and homework assignments |

## 11- Course Assessment

| Grade | Assessment Component                              |
|-------|---------------------------------------------------|
| 10    | Attendance, commitment, and practical assignments |
| 20    | First practical examination                       |
| 20    | Second practical examination                      |
| 50    | Annual coursework assessment                      |
| 50    | Final practical examination                       |
| 100   | <b>Total</b>                                      |

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                 | B- Books and References (Scientific Journals, Reports, etc.)                                                                       |
|-----|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Engineering Drawing – Cousins             | <ul style="list-style-type: none"> <li>The Virtual Library of the Ministry of Higher Education and Scientific Research.</li> </ul> |
| 2   | Engineering Drawing – A.W. Boundy         | C- Electronic References and Internet Resources                                                                                    |
| 3   | Engineering Drawing – B. Dash Sharwa      | <ul style="list-style-type: none"> <li>The Virtual Library of the Ministry of Higher Education and Scientific Research.</li> </ul> |
| 4   | Engineering Drawing – Dr. Fathi Al-Sharif | <ul style="list-style-type: none"> <li>Available electronic books in the institute digital library.</li> </ul>                     |

## Advanced Engineering Drawing (Compulsory) – PMTR144 – Level One

The course aims to develop students' skills in preparing advanced engineering drawings through studying methods of applying engineering dimensions, drawing orthographic projections, and obtaining the third view. It also introduces engineering sections, their types, and their importance in illustrating the internal features of objects. In addition, the course includes practical applications combining perspective drawings, sections, and orthographic projections, enhancing students' ability to read and prepare engineering drawings according to approved technical standards.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Advanced Engineering Drawing (Compulsory) – PMTR144 – Level One         |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.م. محمد صباح حسن                                                      |

### 8- Course Objectives

- Master the rules of engineering dimensioning and avoid common dimensioning errors.
- Learn how to draw orthographic projections and obtain the third view.
- Identify the types of engineering sections and their importance.
- Develop skills in representing engineering objects using sections and perspective drawings.
- Enhance the ability to prepare accurate engineering drawings according to standard specifications.

### 9- Teaching and Learning Strategies

- Learning through practical application and practice.
- Direct explanation using engineering drawing boards.
- Performing exercises and practical assignments.
- Mini-project-based learning.
- Discussions and continuous feedback.
- Using modern educational tools and engineering drawing software.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                                | Unit / Topic Name                                                                                                                                                                                                                             | Teaching Method         | Assessment Method                               |
|-------|------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------|
| 1–6   | 3 hours per week | Mastering dimensioning rules and drawing basic projections                                | Dimensions; methods of placing dimensions and common errors; preparing two drawing sheets with dimensions; drawing three orthographic views from perspective (front, side, and top views); obtaining the third view from only two known views | Practical using laptops | Practical examinations and homework assignments |
| 7–9   | 3 hours per week | Developing the ability to derive engineering projections                                  | Obtaining the third view from two given views                                                                                                                                                                                                 | Practical using laptops | Practical examinations and homework assignments |
| 10–12 | 3 hours per week | Understanding engineering sections and representing internal features of objects          | Sections; importance of sections in engineering drawing; types of section lines according to cut materials; identifying parts that are not sectioned even when the cutting plane passes through them                                          | Practical using laptops | Practical examinations and homework assignments |
| 13–15 | 3 hours per week | Applying perspective, sections, projections, and dimensioning skills in complete drawings | Exercises combining perspective drawings with sections, extracting views, and applying dimensions                                                                                                                                             | Practical using laptops | Practical examinations and homework assignments |

## 11- Course Assessment

| Grade      | Assessment Component                              |
|------------|---------------------------------------------------|
| 10         | Attendance, commitment, and practical assignments |
| 20         | First practical examination                       |
| 20         | Second practical examination                      |
| 50         | Annual coursework assessment                      |
| 50         | Final practical examination                       |
| <b>100</b> | <b>Total</b>                                      |

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                           |
|-----|-----------------------------------------------------|
| 1   | <b>Engineering Drawing – Cousins</b>                |
| 2   | <b>Engineering Drawing – A.W. Boundy</b>            |
| 3   | <b>Engineering Drawing – B. Dash Sharwa</b>         |
| 4   | <b>Engineering Drawing – Dr. Fathi Al-Sharif</b>    |
| 5   | <b>Engineering Drawing – Abdul Rasoul Al-Khafaf</b> |
| 6   | <b>Engineering Drawing – Yousif Al-Radhi</b>        |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the institute digital library.

## English Language (Compulsory) – NTU101 – Level One

The course aims to develop students' basic English language skills through improving listening, speaking, reading, writing, and translation skills, with emphasis on basic grammar and vocabulary used in daily life. The course also seeks to enhance students' ability to communicate in English in different situations, understand simple texts, and use the language correctly in academic and everyday contexts.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | English Language (Compulsory) – NTU101 – Level One                      |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | second semester   2025                                                  |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.د. احمد سالار                                                         |

### 8- Course Objectives

- Develop students' listening and speaking skills in English.
- Improve reading and comprehension skills.
- Enhance basic writing and translation skills.
- Master basic grammar rules and apply them in daily communication.
- Expand students' vocabulary through common words and expressions.

### 9- Teaching and Learning Strategies

- Interactive lectures.
- Classroom discussions and dialogues.
- Listening and speaking exercises.
- Guided reading and text analysis.
- Translation and writing activities.
- Cooperative learning and self-learning.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                           | Unit / Topic Name                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Teaching Method           | Assessment Method                 |
|-------|------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------|
| 1–4   | 2 hours per week | Using basic vocabulary related to daily life and applying rules of place and time    | - Rooms and furniture - Grammar: There is/are, prepositions - Pronunciation: Word stress - Translations - Speaking: How to have a good time in Sydney - Reading and writing: Our House - Everyday English: Directions - Exercises - Years - Grammar: Was/Were, past tense, irregular verbs - Writing: Famous people - Vocabulary: Word groups - Everyday English: When's your Birthday? - Exercises                                                                             | Theory + Practical (Oral) | Oral and theoretical examinations |
| 5–8   | 2 hours per week | Using the past simple tense and expressing past events and daily activities          | - Past tense: We had a good time - Grammar: Past simple, regular and irregular verbs - Listening: Mike's Day - Writing: Last Saturday - Pronunciation: Who were they? - Vocabulary: Sports, Months - Questions: Where, What, Who, etc. - Everyday English: Filling in forms - Activities: We can do it! - Listening: Can I be in your pop group? - Pronunciation: Can/Can't, requests and offers - Vocabulary: Odd one out - Exercises - Everyday English: What is the problem? | Theory + Practical (Oral) | Oral and theoretical examinations |
| 9–12  | 2 hours per week | Developing communication skills in different daily situations                        | - Asking politely: I want / I would like - Speaking: In the restaurant (food and drink) - Translation - Reading: You are what you eat - Exercises - Everyday English: Going shopping - Colours: Here and now - Grammar: Present simple and present continuous - Translation - Vocabulary: Clothes - Reading: Summer in Portugal - Exercises - Everyday English: What's the matter?                                                                                              | Theory + Practical (Oral) | Oral and theoretical examinations |
| 13–15 | 2 hours per week | Using the present continuous to express future plans and communication during travel | - Holidays: Time to go - Grammar: Present continuous for the future - Listening: Hannah's Diary - Translation - Pronunciation: Shifting sentence stress - Vocabulary: Transport and travel - Reading and speaking: The Smiths - Exercises - Everyday English: Going sightseeing                                                                                                                                                                                                 | Theory + Practical (Oral) | Oral and theoretical examinations |

## 11- Course Assessment

| Assessment Component                       | Marks      |
|--------------------------------------------|------------|
| Attendance, participation, and assignments | 10         |
| First monthly examination                  | 15         |
| Second monthly examination                 | 15         |
| Annual coursework assessment               | 40         |
| Final examination                          | 60         |
| <b>Total</b>                               | <b>100</b> |

## 12- Learning and Teaching Resources

### A- Required Textbooks and Main References

| No. | Reference                                                                                                                                                         |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | New Headway Plus Beginner Student Book                                                                                                                            |
| 2   | Audio + Video Resources                                                                                                                                           |
| 3   | <a href="https://elt.oup.com/student/headway/beg/download?cc=us&amp;selLanguage=en">https://elt.oup.com/student/headway/beg/download?cc=us&amp;selLanguage=en</a> |
| 4   | New Headway Elementary – Oxford University Press                                                                                                                  |
| 5   | English Grammar in Use – Raymond Murphy                                                                                                                           |
| 6   | Oxford Practice Grammar – John Eastwood                                                                                                                           |

### B- Books and References (Scientific Journals, Reports, etc.)

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### C- Electronic References and Internet Resources

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic books in the college digital library.

## Physical Education (Compulsory) – NTU104 – Level One

The course aims to develop students' physical fitness and health awareness, and to introduce them to the importance of sports activities in individual and community life. It also provides students with basic skills and international rules of various team and individual sports. In addition, the course introduces common sports injuries and first aid methods, while developing teamwork, sportsmanship, competition skills, and the ability to organize and manage sports activities and tournaments.

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| 1- Educational institution                 | Northern Technical University/ Kirkuk Polytechnic College               |
| 2- Department                              | Power Mechanics Techniques/Branch of Refrigeration and Air conditioning |
| 3- Name/code of the curriculum             | Physical Education (Compulsory) – NTU104 – Level One                    |
| 4- Forms of presence available             | My presence in classrooms and laboratories                              |
| 5- Semester/annual system                  | first semester   2025                                                   |
| 6- Number of hours (total)                 | 4 x 15 weeks = 60 hours (semester)                                      |
| 7- Date of preparation of this description | 1 10 2025                                                               |
| 8- Name of the course coordinator          | م.د. احمد سالار                                                         |

### 8- Course Objectives

- Understand the concept of sports and their health and social importance.
- Develop students' physical fitness and motor abilities.
- Learn basic skills and international rules of different sports.
- Identify common sports injuries and first aid methods.
- Enhance cooperation, discipline, and fair sports competition.
- Acquire skills in organizing and managing sports activities and tournaments.

### 9- Teaching and Learning Strategies

- Theoretical lectures.
- Practical training in sports fields and halls.
- Learning through direct practice and application.
- Demonstrations and educational videos.
- Scientific visits to sports facilities.
- Cooperative learning and teamwork.

## 10- Course Structure

| Week  | Hours            | Required Learning Outcomes                                                            | Unit / Topic Name                                                                                                                                                                                                                                                                                                                                                                                                                                  | Teaching Method    | Assessment Method                             |
|-------|------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------|
| 1–6   | 2 hours per week | Understanding the concept of sports, body movement, injuries, and basic sports skills | Definition of sports, their importance and types; human body movement mechanism; common sports injuries; basic skills of basketball and international basketball rules; film presentation about sports types and their benefits to society; tests for muscles working on body joints and their ranges of motion; applying basic first aid procedures according to injury type and location; learning basic basketball skills                       | Theory + Practical | Oral, practical, and theoretical examinations |
| 7–9   | 2 hours per week | Developing skills in individual and team sports                                       | Basic skills of table tennis and its international rules; basic skills of volleyball and its international rules; swimming; basic skills of tennis and its international rules; practical application of skills individually and in groups; table tennis skills practice; volleyball skills practice; swimming educational video and scientific visit to Baghdad University swimming pool; tennis skills practice; introduction to handball skills | Theory + Practical | Oral, practical, and theoretical examinations |
| 10–12 | 2 hours per week | Applying team sport skills and understanding sports regulations                       | Basic skills of handball; international handball rules; athletics events and their types; international rules of athletics; practical application of individual and group skills; applying basic athletics events skills; learning important football rules                                                                                                                                                                                        | Theory + Practical | Oral, practical, and theoretical examinations |
| 13–15 | 2 hours per week | Developing football skills and learning sports management principles                  | Basic football skills; management of sports competitions and tournaments; sports laws and regulations; practical applications on organizing and managing sports tournaments and competitions                                                                                                                                                                                                                                                       | Theory + Practical | Oral, practical, and theoretical examinations |

## 11- Course Assessment

| Assessment Component                             | Marks |
|--------------------------------------------------|-------|
| Attendance, participation, and daily preparation | 5     |
| Short quizzes and oral tests                     | 5     |
| Reports and practical skills                     | 10    |
| Monthly practical examination                    | 10    |
| First monthly theoretical examination            | 10    |
| Second monthly theoretical examination           | 10    |
| Annual coursework assessment                     | 50    |
| Final examination                                | 50    |

## **12- Learning and Teaching Resources**

### **A- Required Textbooks and Main References**

- Physical Education textbooks approved by the Ministry of Higher Education and Scientific Research.
- International sports rules and regulations references.

### **B- Books and References (Scientific Journals, Reports, etc.)**

- The Virtual Library of the Ministry of Higher Education and Scientific Research.

### **C- Electronic References and Internet Resources**

- The Virtual Library of the Ministry of Higher Education and Scientific Research.
- Available electronic resources in the college digital library.