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

Academic Program and Course Description Guide

2025

Academic Program Description Form

University Name: Northern Technical University

Faculty/Institute: Technical Institute / Mosul

Scientific Department: Refrigeration and air conditioning technologies

Academic or Professional Program Name: Diploma in Refrigeration and Air Conditioning Technologies

Final Certificate Name: Diploma in Refrigeration and Air Conditioning Technologies

Academic System: Decisions

Description Preparation Date: 1/7/2025

File Completion Date: 1/7/2025

Signature:

Head of Department Name: Hareth Maher Abd

Date: 2025/9/10

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

Approval of the Dean

A.N

Signature: M Hass

Scientific Associate Name:

Date:

1. Program Vision

The department's vision is to be an innovative, pioneering, and influential entity in the field of refrigeration, air conditioning, thermal systems, and renewable energy technologies. Additionally, it aims to provide the labor market with highly skilled technical professionals capable of designing and building scalable thermal systems, diagnosing faults, performing preventive maintenance, and managing the operation of various systems. This will contribute to the development and service of the local and regional community and offer technical and scientific consultancy services in the specialty field while ensuring adherence to local and international quality standards, serving all segments of society, government institutions, and organizations.

2. Program Mission

To develop the curriculum both in terms of quality and quantity in line with the fundamental objectives of the Northern Technical University. This includes the creation of new tracks and channels in undergraduate studies to match the latest technological developments and ensure that the specializations align with scientific, professional progress, and the needs of the country and labor market in line with ongoing discoveries and rapid technological advancements across various aspects of contemporary human life.

3. Program Objectives

The department aims to graduate specialized technical professionals in the fields of air conditioning, refrigeration, and energy sciences. Additionally, it seeks to provide the community and labor market with skilled individuals capable of meeting the demands of scientific and practical progress and keeping pace with modern technology for the service of the country. To train

technicians in air conditioning and refrigeration who are capable of serving the local market with technical skill and the use of modern technologies in the field.

To develop exceptional technicians skilled in installing and maintaining modern refrigeration systems.

To instill sense of responsibility towards the community and maintain a constant readiness to contribute to the beautification and urban development of the region.

To meet the needs of the labor market by providing specialists in refrigeration and air conditioning design who are capable of decision – marking and working as part of a team.

To raise public awareness about the importance of using modern, energy – efficient, and environmentally – friendly technologies in refrigeration and air conditioning.

To offer local institutions better opportunities for expanding their markets and reaching larger consumer segments.

4. Program Accreditation

The program has been applied for accreditation.

5. Other external influences

1- Scientific Developments

2- Scientific and Field Visits

3- Summer Training

4- Training Courses

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*

University Requirements	**10**	**20**	**18.5%**	**8 Essential 2 optional**
Institute Requirements	**3**	**7**	**6.5%**	**3 Essential**
Department Requirements	**26**	**82**	**75%**	**25 Essential 1 optional**
Summer Training	**completed**	-------	-------	
Other	/	**There isn't any**		

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

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
2024-2025 / First	NTU100	Human rights and democracy	2	
	NTU101	English language	2	
	NTU102	computer	1	1
	NTU103	Arabic language	2	
	NTU104	Sports (optional)	1	1
	TIM100	Mathematics	2	
	TIM101	Mechanical Workshops		3
	MIT102	Engineering Drawing		3
	MIT103	Calculus	2	
	TRA100	Principles of Air Conditioning	2	3
	TRA101	Principles of Thermodynamics	2	3
	TRA102	Fluid Mechanics	2	3
	TRA103	Refrigeration and		6

		Air Conditioning Workshops		
	TRA104	Principles of Electricity Technique	2	3
	TRA105	Principles of Refrigeration	2	3
	TRA106	Applied Engineering Drawing		4
	TRA107	Engineering Mechanics	2	3
	TRA108	Renewable Energy	2	3
2024-2025 / Second	NTU200	English language	2	
	NTU201	computer	1	1
	NTU202	Arabic language	2	
	NTU203	Baath Party crimes in Iraq	2	
	NTU204	Professional ethics	2	
	MIT200	Research Project	2	
	MIT201	Specialized Workshop	3	
	MIT202	Application Project		2
	MIT203	Occupational Safety	2	
	TRA200	Fundamentals of Cooling System	2	3
	TRA201	Fundamentals of Heat Transfer	2	3
	TRA202	Fundamentals of Designing Air System	2	3
	TRA203	Fundamentals of	2	4

		Refrigeration and Air Conditioning Maintenance		
	TRA204	Fundamentals of Control System	2	3
	TRA205	Fundamentals of Air Conditioning System Drawing		3
	TRA206	Computer Application	2	2

8. **Expected learning outcomes of the program**	
Knowledge	
Learning Outcomes 1	1. It aims to understand the general principles of engineering drawing, which pave the way for understanding refrigeration system drawing. 2. It aims to understand the principles of electricity, which pave the way for understanding the electrical systems of refrigeration devices. 3. It aims to understand the electronic control systems in refrigeration devices. 4. It aims to understand the principles of fluid mechanics, which pave the way for understanding the conditions that the refrigerant fluid is exposed to in refrigeration devices. 5. It aims to understand heat transfer, which pave the way for understanding the methods of heat transfer in refrigeration and air conditioning devices. 6. It aims to understand the principles of thermodynamics, which pave the way for understanding the transformation of electrical energy into heating or cooling in refrigeration and air conditioning devices. 7. It aims to understand the types of refrigeration systems and methods for controlling their cooling capacity.
Skills	
Learning Outcomes 2	1. Gain the skill to install and operate refrigeration and air

	conditioning equipment. 2. Determine the efficiency of refrigeration equipment by measuring its performance parameters. 3. Diagnose mechanical, electrical, and electronic faults in refrigeration equipment and their maintenance methods. 4. Use laboratory and workshop tools with quality and care.
Ethics	
Learning Outcomes 3	1. Learn how to deal with others and work as a team. 2. Learn and be able to make appropriate decisions to address mistakes. 3. Learn how to manage and work on projects. 4. Commitment to occupational health and safety regulations in workshops and sites.

9. Teaching and Learning Strategies

1. Theoretical lectures and practical laboratory training.
2. Discussion sessions and scientific updates.
3. Summer training in the public and private sectors.
4. Academic visits.
5. E-learning and educational videos.
6. Training courses.
7. Graduation research.

10. Evaluation methods

1. Monitor attendance and absence.
2. Theoretical and practical tests.
3. Monitor behavior and conduct in the classroom.
4. Monitor attendance at training sites and the extent of benefit.
5. Submit and discuss reports.
6. Discuss graduation projects.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
assistant professor	Mechanical Engineering	Thermal engineering			Staff	
Lecturer	Mechanical Engineering	Thermal Forces			Staff	
Lecturer	Refrigeration and Air Conditioning Engineering Techniques	Thermal Engineering Technology			Staff	
Lecturer	Refrigeration and Air Conditioning Engineering Techniques	Mechanical Engineering			Staff	
Assistant Lecturer	Refrigeration and Air Conditioning Engineering Techniques	Thermal Engineering Technology			Staff	
Assistant Lecturer	Refrigeration and Air Conditioning Engineering Techniques	Thermal engineering techniques			Staff	
Assistant Lecturer	Refrigeration and Air Conditioning Engineering	Mechanical Engineering			Staff	

	Techniques					
Assistant Lecturer	Refrigeration and Air Conditioning Engineering Techniques	Thermal power engineering			Staff	
Assistant Lecturer	Fuel and Energy Technology	Thermal engineering Technology			Staff	
Assistant Lecturer	Mechanical Engineering	Thermal engineering			Staff	
Assistant Lecturer	Mechanical Engineering	Mechanical Engineering			Staff	
Assistant Lecturer	Water Resources Engineering	Irrigation Engineering			Staff	

Professional Development

Mentoring new faculty members

1- Teamwork skills.

2- Leadership skills and responsibility.

3- Training courses in the field of specialization.

4- Courses on teaching and learning.

5- Courses on how to publish scientific research.

Professional development of faculty members

1- Sending employees for training inside and outside the country.

2- Conducting field research related to refrigeration and air conditioning.

3- Employing new and appropriate educational methods that serve the knowledge students have acquired and help them in various fields of work.

12. Acceptance Criterion

1- Central admission requirements approved by the Ministry of Higher Education and Scientific Research

2- Admission of vocational students specializing in refrigeration and air conditioning according to central regulations

3- Admission for both genders admission or others.

13. The most important sources of information about the program

1. Scientific curriculum and methodology

2. External academic resources (central libraries, the internet, and social media)

3. Seminars, workshops, and specialized courses.

14. Program Development Plan

1- Keeping pace with scientific developments in the field of specialization to keep pace with the labor market.

2- Updating lectures.

3- Using modern teaching methods.

4- Working to develop the department's educational laboratories.

5- Working to develop the department's educational fields.

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
2024-2025 / First	NTU100	Human rights and democracy	Basic												
	NTU101	English language	Basic	/	/			/				/			
	NTU102	computer	Basic	/				/	/			/	/		
	NTU103	Arabic language	Basic	/				/	/			/			
	NTU104	Sports	optional												
	TIM100	Mathematics	Basic	/				/				/			
	TIM101	Mechanical Workshops	Basic												
	MIT102	Engineering Drawing	Basic												
	MIT103	Calculus	Basic	/				/	/			/			
	TRA100	Principles of Air	Basic	/	/	/		/	/			/	/		

		Conditioning													
	TRA101	Principles of Thermodynamics	Basic	/				/				/			
	TRA102	Fluid Mechanics	Basic	/				/				/			
	TRA103	Refrigeration and Air Conditioning Workshops	Basic	/				/	/						
	TRA104	Principles of Electricity Technique	Basic	/				/				/			
	TRA105	Principles of Refrigeration	Basic	/	/	/		/				/	/		
	TRA106	Applied Engineering Drawing	Basic	/				/				/			
	TRA107	Engineering Mechanics	Basic	/				/				/			
	TRA108	Renewable Energy	Basic	/	/	/		/				/	/		
2024–2025 /	NTU200	English language	Basic	/				/				/			

Second	NTU201	computer	Basic	/	/			/							
	NTU202	Arabic language	Basic	/				/				/			
	NTU203	Baath Party crimes in Iraq	Basic												
	NTU204	Professional ethics	Basic	/				/				/	/		
	MIT200	Research Project	Basic												
	MIT201	Specialized Workshop	Basic	/				/	/			/	/		
	MIT202	Application Project	Basic												
	MIT203	Occupational Safety	Basic												
	TRA200	Fundamentals of Cooling System	Basic	/	/			/				/	/		
	TRA201	Fundamentals of Heat Transfer	Basic	/				/	/			/	/		
	TRA202	Fundamentals of Designing Air System	Basic	/	/	/		/				/			

	TRA203	Fundamentals of Refrigeration and Air Conditioning Maintenance	Basic	/	/			/	/			/	/		
	TRA204	Fundamentals of Control System	Basic	/				/				/			
	TRA205	Fundamentals of Air Conditioning System Drawing	Basic	/		/		/	/			/			
	TRA206	Computer Application	Basic	/				/				/			

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

Course Description Form

First Level / First Semester

English language

1. Course Name: English language	
2. Course Code: NTU 101	
3. Semester / Year: 1st semester/first year/courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical) weekly * 15 weeks = 30 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Email:	
8. Course Objectives	
Course Objectives	1. Demonstrate understanding of fundamental grammar rules in academic writing contexts. 2. Develop analytical reading skills for interpreting academic English texts effectively. 3. Improve academic writing proficiency by composing clear, coherent, and well-structured texts
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy.

	7- Brainstorming strategy.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Ability to Use Basic Grammar Rules	Hello	theoretical	Classroom and homework assignments, weekly and monthly exams
2	2	Correct application of tenses in sentences.	Your world	theoretical	Classroom and homework assignments, weekly and monthly exams
3	2	Understanding and using auxiliary verbs.	All about you	theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	Improving Writing Skills	Family and friends	theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	Writing short paragraphs with coherence and cohesion.	The way I live	theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	Ability to write formal and informal letters.	Every day	theoretical	Classroom and homework assignments, weekly and monthly exams
7	2	Vocabulary Expansion.	My favourites	theoretical	Classroom and homework assignments, weekly and monthly exams
8	2	Learning new words e and using them in sentences.	Where I live	theoretical	Classroom and homework assignments, weekly and monthly exams
9	2	Knowing synonyms and antonyms of common word,	Times past	theoretical	Classroom and homework assignments, weekly and monthly exams
10	2	Regular& irregular, questions &negatives	We had a great time	theoretical	Classroom and homework assignments, weekly and monthly exams
11	2	Knowing synonyms and antonyms of common word	I can do that	theoretical	Classroom and homework assignments, weekly and monthly exams
12	2	Speaking and Pronunciation, signs all around	Please and thank you	theoretical	Classroom and homework assignments, weekly and monthly exams
13	2	Ability to engage	Here &	theoretical	Classroom and homework

		in simple and clear conversations.	now		assignments, weekly and monthly exams
14	2	Improving pronunciation and accurate word stress.	It's time to go	theoretical	Classroom and homework assignments, weekly and monthly exams
15	5	Scientific visit	Colleges of arts and education/ English dept.	theoretical	Discussion and dialogue

11.Course Evaluation

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

Daily preparation	10
1st month text	15
2nd month text	15
Final text	60

12.Learning and Teaching Resources

Required textbooks (curricular books, if any	not available
Main references (sources)	1- Beginner student's book, New headway plus
Recommended books and references (scientific journals, reports...)	1- Books on English language
Electronic References, Websites	Sites that care about English language

First Level / Second Semester

Computer

1. Course Name: Computer	
2. Course Code: NTU102	
3. Semester / Year: Second semester/second year/courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(1 theoretical +1 practical) weekly * 15 weeks = 30 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Bassam abbas ali Email: bassamabbasalnajjar@ntu.edu.iq	
8. Course Objectives	
Objectives	1. Understand the basic components of a computer and how they work, as well as acquire skills in effective use of the operating system and file management. 2.Develop proficiency in using Microsoft Word to create and format professional documents. 3. Learn how to troubleshoot and resolve common errors when using a computer or word processing software.
٩. Teaching and Learning Strategies	
Strategy	1. Self-direction strategy. 2. Collaborative learning strategy. 3. Continuous assessment strategies. 4. Discussion and dialogue strategy. 5. Lecture strategy. 6. Research and discovery

	strategy. 7. Active learning strategy.

1۰. Course structure

week	Hours	Required learning outcomes	Unit name/topic	Teaching method	Evaluation method
1	2	1.The student will learn about the stages a computer goes through in its development and the generations it has passed through. 2. The student will master how to use the desktop environment and manage files.	Theoretical / Computer Phases and Generations Practical / Desktop in the Windows Operating System	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
2	2	1.The student will understand the characteristics of the electronic computer and the areas in which it is used. 2.The student will be able to use the Start menu and the Run dialog box to run programs and commands.	Theoretical / Electronic Computer (Features - Areas of Use) Practical / Start Menu and Command Dialog Box (RUN(Operating System (Windows)	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
3	2	1.The student will understand how to classify computers according to	Theoretical / Classification of Computers by Use Practical / Desktop	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		their uses. 2.The student will master customizing the Windows desktop and managing its features.	Features Operating System (Windows)		
4	2	1.The student will be able to distinguish between different types of computers and the uses of each according to their size. 2. The student will be able to manage and control various program windows within the Windows operating system.	Theoretical / Types of computers by size Practical / Working with program windows in the Windows operating system	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
5	2	1. The student will learn about the types and functions of basic computer input devices. 2. The student will create, organize, and manage files and folders effectively within the Windows operating system.	Theoretical / Physical structure of the computer (input devices(Practical / Files and folders in the operating system)Windows(	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
6	2	1.The student will understand the types and functions of basic computer output devices	Theoretical / Physical structure of the computer (output devices(Practical /	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		and how to connect them to perform tasks. 2. The student will perform operations to manage and recover deleted items using the Recycle Bin in Windows.	Dealing with the Recycle Bin in the Windows operating system		
7	2	1.The student will identify the external components of the system unit and understand their functions in detail. 2. The student will perform some tasks using the basic programs included with the Windows operating system.	Theoretical / External Parts of the System Unit Practical / Using Accessories	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
8	2	1.The student will become familiar with the internal components of the system unit and be able to explain their functions in detail. 2.The student will be able to solve computer problems using the help and support tools available within the Windows operating system.	Theoretical / Internal Parts of the System Unit Practical / How to Get Help with the Operating System (Windows)	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

9	2	1.The student will be familiar with the functions of the central processing unit and types of secondary memory. 2. The student will create and edit documents using Microsoft Word 2010.	Theoretical / Central Processing Unit and Secondary Memory Practical / Word Processing Program (Microsoft Word 2010)	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
10	2	1.The student will identify the various ports on the back of the bag and understand the function of each port. 2. The student will master how to enter, format, and edit text effectively in Word 2010.	Theoretical / Back of System Box Ports Practical / Working with Text in Microsoft Word 2010	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
11	2	1. The student should become familiar with the different types of software that operate the computer and their functions, and be able to choose the software that serves the user. 2. The student should be able to adjust the layout of the program's page and determine the	Theoretical / Computer Software Practical / Page Layout in Microsoft Word 2010	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		appropriate type of paper and margins that should be used.			
12	2	1.The student will become familiar with digital storage capacity units and their uses, and will master how to convert from one unit to another. 2. The student will practice creating tables using various methods in the program and become proficient in entering various elements into tables.	Theoretical / Storage Units Page Layout in Microsoft Word 2010 Practical / Tables in Microsoft Word 2010	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
13	2	1.The student will be able to work with computer number systems, such as binary and decimal, and will be proficient in converting from one system to another. 2.The student will learn and be able to create tables in the program, link their elements, and demonstrate an	Theoretical / Number Systems in Computers Practical / Tables in Microsoft Word 2010	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		understanding of extracting final results from them.			
14	2	1.The student will become familiar with the computer platform and its main components, understand how the hardware and software components integrate so that the computer can perform the tasks for which it was designed, and understand how these components interrelate. 2. The student will learn the principles of text formatting to improve the appearance of documents in Word 2010.	Theoretical / Computer Platform Text Formatting in Microsoft Word 2010	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
15	2	1.The student will discuss how to identify and determine the specifications required for each type of computer use. 2. The student will master applying various formatting to texts to improve the	Theoretical / Main Features of a Personal Computer Practical / Text Formatting in Microsoft Word 2010	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		appearance of documents in Word 2010.			

١١. Course Evaluation	
Grades are distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily oral tests, monthly or written tests, reports, etc	
Daily preparation	10
daily oral tests	20
monthly or written tests	40
Preparing reports	20
Practical activity	10

١٢. Learning and teaching resources	
Required textbooks (curriculum books, if available)	Remember all the textbooks if any
Main References (Sources)	Cite references (sources), if any. Computer and Office Applications Book, Part 1
Recommended books and references (scientific) journals, reports...	Write the name of the recommended reference for each course. 1- Books that focus on software.
Electronic references and websites	Remember the websites (such as the department's YouTube channel or any link that can be used according to the specialization Sites that are interested in software applications.

First Level / First Semester

Arabic Language

1. Course name: Arabic Language	
2. Course code: NTU103	
3. Semester/Year: First semester / First year / Courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) : (2 theoretical) per week x 15 weeks = 30 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Bassam abbas ali Email: bassamabbasalnajjar@ntu.edu.iq	
8. Course Objectives	
Objectives	The objective of studying the Arabic language course is to: 1. Provide students with the skill of speaking fluent Arabic, free from colloquialisms, and to address common errors. 2. Develop students' linguistic wealth and raise their awareness of the importance of the Arabic language as a tool for thought and a means of expression within themselves and their community. This will encourage students to embrace learning it with conviction and interest. 3.Developing the ability to compose sentences, avoiding writing words with common mistakes, and how to formulate an administrative letter.

9. Teaching and Learning Strategies	
Strategy	.١ Self-direction strategy. 2. Collaborative learning strategy. .٣ Role-playing strategy. .٤ Discussion and dialogue strategy. .٥ Lecture strategy. .٦Brainstorming strategy.

10. Course structure

week	Hours	Required learning outcomes	Unit name/topic	Teaching method	Evaluation method
1	2	The student should become familiar with the concept of linguistic errors and master writing the open and connected taa.	1. The concept of linguistic errors 2. Rules for writing open and closed taa	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	2	The student must adhere to the rules for writing the extended and shortened alif, and must recognize and differentiate between the solar and lunar letters.	1. The extended and shortened alif 2. The solar and lunar letters	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	2	The student should pay attention to the difference between the letters “Ḍad” and “Ḍadh” and master their use.	Dad and Tha	Theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	The student should be able to distinguish between the hamzat al-wasl and the hamzat al-qata’, the places where each is used, and the rules for writing the medial and final hamza.	Writing the Hamza: -Connecting and disconnecting -The medial Hamza -The extreme Hamza	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	The student should become familiar with the types of punctuation marks used in the language and their uses, especially in formal correspondence.	punctuation marks	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	The student should observe the differences between nouns and verbs and be able to distinguish between them.	Noun, verb, and the difference between them	Theoretical	Classroom and homework assignments, weekly and monthly exams

7	2	To be able to distinguish between the direct object and the absolute object, and to master parsing.	Objects: -The direct object -The absolute object	Theoretical	Classroom and homework assignments, weekly and monthly exams
8	2	The student should demonstrate a complete understanding of the object of purpose, the object of place, and the object of accompaniment, and be able to parse each of them.	-The object for which -The object in which - The object with	Theoretical	Classroom and homework assignments, weekly and monthly exams
9	2	The student must adhere to the rules for writing numbers and counted items.	number	Theoretical	Classroom and homework assignments, weekly and monthly exams
10	2	The difference between the hamzat al-wasl and the hamzat al-qata’ and the places where each is used	Common language errors applications		
11	2	The student will extract most of the common linguistic errors in society and how to spread their correction in society.	Common language errors applications	Theoretical	Classroom and homework assignments, weekly and monthly exams
12	2	The student should be able to recognize the meanings of prepositions, easily distinguish the distinguishing alif in the Arabic language, and clearly understand the rule of nun and tanween.	Meanings of prepositions. The rule of the distinguishing alif. The rule of the nun and tanween.	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	2	The student should take into account the formal aspects of the administrative letter and memorize it correctly.	Formal aspects of administrative discourse	Theoretical	Classroom and homework assignments, weekly and monthly exams
14 - 15		The student should be able to formulate an administrative letter in a language free of errors.	The language of administrative discourse	Theoretical	Classroom and homework assignments, weekly and monthly exams

11. Course Evaluation	
Grades are distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily oral tests, monthly or written tests, reports, etc	
Daily preparation	10

daily oral tests	20
monthly or written tests	50
Preparing reports	20
Learning and teaching resources	
Required textbooks (curriculum books, if available)	Remember all the textbooks if any.
Main References (Sources)	The unified Arabic language curriculum taught in all departments of the Technical Institute / Mosul
Recommended books and references (scientific) journals, reports...	All language dictionaries, books and writings of linguists and grammarians.
Electronic references and websites	Sites that are interested in the Arabic language

First Level / First Semester

Mathematics

1. Course Name: Mathematics					
2. Course Code: MIT100					
3. Semester / Year: First semester/ First year/courses					
4. Description Preparation Date: 1/7/2025					
5. Available Attendance Forms: mandatory					
6. Number of Credit Hours (Total) / Number of Units (Total)					
2 weekly * 15 weeks = 30 hours					
7. Course administrator's name (mention all, if more than one name)					
Name: Sawla Taha Hamed Email: sawla99@ntu.edu.iq					
8. Course Objectives					
Course Objectives	1. Learning The student, the mathematical basics necessary to understand and analyses quantitative phenomena using the principles of mathematics. 2. Enabling The student to apply these principles in technical and applied fields within his technical specialization. 3. Developing t of computational and analytical skills on The student. 4. Enabling the student to perform the basic calculations and algebraic operations accurately and quickly.				
9. Teaching and Learning Strategies					
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.				
10. Course Structure					
Week	**Hours**	**Required**	**Unit or subject**	**Learning**	**Evaluation**

		Learning Outcomes	name	method	method
1	2	The student should learn the concept of matrices	Introduction to matrices	Theoretical	Classroom and homework assignments
2	2	The student should learn the Types of matrices, algebraic operations on matrices	Types of matrices, algebraic operations on matrices	Theoretical	Classroom and homework assignments, weekly exams
3	2	The student should learn how to calculate the value of determinants for the matrices	Find the determinants for the matrices	Theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	The student should learn Solving linear equations	Solving linear equations	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	The student should learn	The Kramer method, its applications	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	The student will learn how to apply the Kramer rule to solve linear equations	Introduction to vectors, algebraic operations on vectors, add and subtraction of vectors, multiplying a constant in the vector, finding the length of the vector	Theoretical	Classroom and homework assignments, weekly and monthly exams
7	2	The student will learn the Algebraic multiplication of vectors, directional multiplication of vectors	Algebraic multiplication of vectors, directional multiplication of vectors	Theoretical	Classroom and homework assignments, weekly and monthly exams
8	2	The student will learn how to Find the angle between two vectors, find the vertical vector on two vectors	Find the angle between two vectors, find the vertical vector on two vectors	Theoretical	Classroom and homework assignments, weekly and monthly exams
9	2	The student should know the types of algebraic functions	Algebraic functions	Theoretical	Classroom and homework assignments,

					weekly and monthly exams
10	2	To understand the student, the Trigonometric functions	Trigonometric functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
11	2	The student will able to draw trigonometric functions	Drawing trigonometric functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
12	2	To understand the student, the Exponential functions	Exponential functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	2	The student will able to student the Logarithmic functions, natural logarithms	Logarithmic functions, natural logarithms	Theoretical	Classroom and homework assignments, weekly and monthly exams
14	2	The student will able to draw the Exponential and logarithmic functions	Drawing the elecial and logarithmic functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
15	2	To understand the student, the difference between apparent function and the implied function	The apparent function, the implied function	Theoretical	Classroom and homework assignments, weekly and monthly exams

11. Course Evaluation

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

Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12. Learning and Teaching Resources

Required textbooks (curricular books, if any	
Main references (source	1- Thomas Calculus by George B. Thomas, JR. 2 Calculus by Frank Ayers

Recommended books ar references (scientific journals, reports...)	1-Panal calter “Technical Mathematics” 2- Murray R. “ Mathematical handbook” 3- Shantinarayam “ Engineering Mathematics part 1 – 1987” 4- Garlick B. “ Technical Mathematics” 1981.
Electronic References, Websites	https://youtube.com/@alihasanali?si=7pfr85WMfs5U9hw1

First Level / second Semester

Mathematics

1. Course Name: Calculus					
2. Course Code: MIT103					
3. Semester / Year: second semester/ First year/courses					
4. Description Preparation Date: 1/7/2025					
5. Available Attendance Forms: mandatory					
6. Number of Credit Hours (Total) / Number of Units (Total)					
2 weekly * 15 weeks = 30 hours					
7. Course administrator's name (mention all, if more than one name)					
Name: Sawla Taha Hamed Email: sawla99@ntu.edu.iq					
8. Course Objectives					
Course Objectives	1. Introducing the student to using mathematics in other scientific topics and increasing his ability to think logically when solving exercises. 2. increasing his ability and how to link data with his information to obtain a solution to the problem. 3. Providing the student with information to increase the logical ideas to solve any problem. 4. Providing the student with information about the conecting of the giving data with his information				
9. Teaching and Learning Strategies					
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.				
10. Course Structure					
Week	Hours	Required	Unit or	Learning	Evaluation method

		Learning Outcomes	subject name	method	
1	2	1- The student should know how to derivative the algebraic functions 2- The student will be able to use chain base 3- The student will be able to derive implied function	Derivative, derivative of algebraic functions, chain base applications, implied function	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	2	The student will be able to derive the exponential function and logarithmic function .	The derivative of the exponential function, the derivative of the logarithmic function	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	2	The student will be able to derive the trigonometric functions and circular functions	The derivative of the trigonometric function, the derivative of circular functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	The student will be able to solve the Partial differentiation	Partial differentiation	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	The student should know how to find the integration of the exponential and logarithmic functs	Integration of exponential and logarithmic functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	The student should know how to find the integration of the trigonometric functions	Integration of trigonometric functions	Theoretical	Classroom and homework assignments, weekly and monthly exams
7	2	The student should be able to perform the specific integration and calculate (the area under the curve), (the area between two curves)	Definite integral, applications (distance under the curve, distance between the curve)	Theoretical	Classroom and homework assignments, weekly and monthly exams

8	2	The student should learn to find the rotational volumes and the arc length of the curve	The rotational magnitudes and arc length of the curve	Theoretical	Classroom and homework assignments, weekly and monthly exams
9	2	The student should know the approximation in integration and the trapezoid rule, the Simpson rule	Approximation in integration (trapezoid rule, Simpson's rule)	Theoretical	Classroom and homework assignments, weekly and monthly exams
10	2	The student should know the Integration methods, retail integration	Integration methods, retail integration	Theoretical	Classroom and homework assignments, weekly and monthly exams
11	2	The student should learn integration in the manner of compensation	Integration by compensation method	Theoretical	Classroom and homework assignments, weekly and monthly exams
12	2	student should learn the integration of partial fractions	Integration by partial fraction method	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	2	The student should be able to solve differential equations of the first order and the first separate homogeneous degree	Solving differential equations of first order and first order, discrete homogeneous	Theoretical	Classroom and homework assignments, weekly and monthly exams
14	2	The student should understand differential equations - linear - and their applications	Differential equations - linear - applications	Theoretical	Classroom and homework assignments, weekly and monthly exams
15	2	The student should learn compound numbers, collect, subtract and divide – multiply	Complex numbers - addition - subtraction - division - multiplication	Theoretical	Classroom and homework assignments, weekly and monthly exams
11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such					

as daily preparation, daily oral, monthly, or written exams, reports .... etc	
Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any	
Main references (source	1- Thomas Calculus by George B. Thomas, JR. 2 Calculus by Frank Ayers
Recommended books an references (scientific journals, reports...)	1-Panal calter "Technical Mathematics" 2- Murray R. " Mathematical handbook" 3- Shantinarayam " Engineering Mathematics part 1 – 1987" 4- Garlick B. " Technical Mathematics" 1981.
Electronic References, Websites	https://youtube.com/@alihasanali?si=7pfr85WMfs5U9hw1

First Level / First Semester

Principles of Air Conditioning

1. Course Name: Air Conditioning	
2. Course code:TRA100	
3. Semester/Year: Second Semester/First Year/Courses	
4. Date this description was prepared: 1/7/2025	
5. Available forms of attendance: Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 4 practical) weekly * 15 weeks = 90 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Mustafa Wadallah Hamdallah Email: mustafawadd_82@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. Provide students with the fundamental knowledge of air conditioning principles. 2. Enhance sustainability concepts and equip them with the practical skills necessary for the installation, operation, and maintenance of renewable energy systems, contributing to their readiness for the job market and supporting clean energy solutions. 3. Introduce students to modern technologies used in this field, while also aiming to raise their environmental awareness. 4. Meet the needs of various sectors in the air conditioning field with highly qualified personnel.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	The student should be able to identify different types of air conditioning systems.	Introduction to the material and its sources	Theoretical	Classroom and homework assignments, weekly and monthly exams
1	3	The student should be able to identify the types of thermometers used in refrigeration.	Study the types of thermometers used in refrigeration	Practical	Classroom and homework assignments, weekly and monthly exams
2	2	The student should be able to know the basic principles of air conditioning systems.	Air conditioning basics	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	3	The student should be able to calibrate the thermocouple.	Thermocouple calibration	Practical	Classroom and homework assignments, weekly and monthly exams
3	2	The student should be able to know how to test air conditioning systems and devices.	Basic definitions	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	3	The student should be able to identify blood pressure measuring devices.	Pressure measuring devices	Practical	Classroom and homework assignments, weekly and monthly exams
4	٢	The student should be able to identify the properties of air.	air conditioning	Theoretical	Classroom and homework assignments, weekly and monthly exams
4	3	The student should be able to study the properties of air.	Study of the properties of air	Practical	Classroom and homework assignments, weekly and monthly exams
5	٢	The student should be able to use the mathematical method to determine the properties of air.	Air conditioning material	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	3	The student should be able to identify air speed measuring devices.	Air speed measuring devices	Practical	Classroom and homework assignments, weekly and monthly exams

6	٢	The student should be able to understand the air diagram.	Scheme	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	3	The student should be able to calculate the performance of an air cooler.	Air Cooled Performance Calculation	Practical	Classroom and homework assignments, weekly and monthly exams
7	٢	The student should be able to identify the processes that take place on the air diagram.	Operations performed on the air diagram	Theoretical	Classroom and homework assignments, weekly and monthly exams
7	3	The student should be able to draw a relationship between pressure and saturation temperature of vapor.	The relationship between pressure and saturation temperature of steam	Practical	Classroom and homework assignments, weekly and monthly exams
8	٢	The student should be able to use the mathematical method to determine the properties of air.	Use the chart	Theoretical	Classroom and homework assignments, weekly and monthly exams
٨	3	The student should be able to cool the air and remove moisture.	Air cooling and dehumidificati on	Practical	Classroom and homework assignments, weekly and monthly exams
٩	٢	The student should be able to know the humidity calculations.	Mathematical operations	Theoretical	Classroom and homework assignments, weekly and monthly exams
٩	3	The student should be able to cool and remove moisture while reheating.	To cool and remove moisture with reheating	Practical	Classroom and homework assignments, weekly and monthly exams
10	2	The student should be able to identify the contact coefficient.	Mathematical operations	Theoretical	Classroom and homework assignments, weekly and monthly exams
10	3	The student should be able to heat, humidify and reheat.	Heating and humidification with reheating	Practical	Classroom and homework assignments, weekly and monthly exams
11	2	The student should be able to understand the coefficient of permeability and	Mathematical operations	Theoretical	Classroom and homework assignments, weekly and monthly exams

		the sensible heat ratio.			
11	3	The student should be able to understand evaporative cooling of air.	evaporative air cooling	Practical	Classroom and homework assignments, weekly and monthly exams
12	2	The student should be able to understand the introduction to heat transfer.	Introduction to the material	Theoretical	Classroom and homework assignments, weekly and monthly exams
12	3	The student should be able to identify the steam compression system with or outside the heat exchanger.	Steam compression system with or without heat exchanger	Practical	Classroom and homework assignments, weekly and monthly exams
13	2	The student should be able to understand heat transfer by conduction and radiation.	Introduction to the material	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	3	The student should be able to calculate the pressure efficiency.	Calculate pressure efficiency	Practical	Classroom and homework assignments, weekly and monthly exams
١٤	٢	The student should be able to understand icing.	Calculate efficiency	Theoretical	Classroom and homework assignments, weekly and monthly exams
15	5	The student should be able to calculate efficiency.	All syllabus	Theoretical + Practical	final exam

11.Course Evaluation

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

Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources

Required textbooks (curricular book	

if any)	
Main references (sources)	1. Refrigeration and Air-conditioning by Stoecker 2. Modren Air – Condition practice by Harris 3. Wind Energy Explained: Theory, Design and Application 4. Handbook of air-conditioning system design by carrier air-conditioning company 5. Refrigeration & Air – conditioning.
Recommended books and references (scientific journals, reports...)	1-ASHRAE Journal. 2- International Journal of Refrigeration.
Electronic References, Websites	1- https://www.youtube.com/watch?v=fJcMV9EWYAU&list=PL_rxhivlh6RC7XzllHNvZOKW7mKw0g5AK

First Level / First Semester

Principles of thermodynamics

1. Course Name: Principles of thermodynamics	
2. Course Code: TRA101	
3. Semester / Year: first semester/first year/courses	
4. Description Preparation Date: 1/7/2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 3 practical) weekly * 15 weeks = 75 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Omar Mahmood JUMAAH Email: omarmahmood803@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. The student will be able to understand and analyze the properties of materials (such as steam, air, and fluids). 2. The student will be able to apply the first law of thermodynamics to closed and open systems. 3. The student will learn to interpret the concept of thermal efficiency and apply the second law of thermodynamics. 4. The student will learn how heat engines and heat exchangers operate from an energy perspective. 5. The student will learn to conduct practical experiments to measure thermal properties and understand the dynamic behavior of systems.
9. Teaching and Learning Strategies	

Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Chapter one 1.1Temperature and the Zeroth Law of Thermodynamics 1.2Thermometers and the Celsius Temperature Scale 1.3The Constant-Volume Gas Thermometer and the Absolute Temperature Scale	1Temperature and the Zeroth Law of Thermodynamics	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
2	5	1.4Thermal Expansion of Solids and Liquids 1.5 Macroscopic Description of an Ideal Gas	٤Thermal Expansion	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
3	5	Chapter Two: 2.1Heat and the First Law of Thermodynamics 2.2Heat and Internal Energy 2.2Heat Capacity and Specific Heat 2.4Latent Heat	٢,١Heat and the First Law of	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
4	5	2.5Energy Transfer Mechanisms: 2.5.1Thermal conduction 2.5.2Convection 2.5.3Radiation	٥Energy Transfer Mechanisms	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
5	5	2.6Work and Heat	٢,٦Work and	Theoretical+	Classroom and

		in Thermodynamic Processes 2.7The First Law of Thermodynamics	Heat in Thermodynamic Processes	practical	homework assignments, weekly and monthly exams
6	5	2.8Some Applications of the First Law of Thermodynamics	2.8Some Applications of the First Law	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
7	5	First Exam	First Exam	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
8	5	Chapter Three: 3.1The Kinetic Theory of Gases	Chapter Three: 3.1The Kinetic Theory of Gases	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
9	5	3.2Molecular Model of an Ideal Gas 3.3Molar Specific Heat of an Ideal Gas	Ideal Gas	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
10	5	3.4Distribution of Molecular Speeds	4Distribution of Molecular Speeds	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
11	5	3.5The Equipartition of Energy	Energy	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
12	5	3.6Adiabatic Processes for an Ideal Gas 3.7The Boltzmann Distribution Law Mean Free Paths	٦Adiabatic Processes	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
13	5	Solve examples	Solve examples	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams
14	5	Solve examples	Solve examples	Theoretical+ practical	Classroom and homework assignments, weekly and

					monthly exams
15	5	Last Exam	Last Exam	Theoretical+ practical	Classroom and homework assignments, weekly and monthly exams

11.Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
Daily preparation	10
Daily oral exam	20
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources	
Required textbooks (curricular books, if any	not available
Main references (sources)	1-Physics, Alan Giambattisa, BettyMcCarthy Richardson, and RobertC.Richradson, (2008) 2- Thermodynamics and Chemistry , Second edition Howard Devoe,2012
Recommended books and references (scientific journals, reports...)	1-An Introduction to Statistical Mechanics and Thermodynamics Robert H. Swendsen, First edition 2012.
Electronic References, Websites	https://alison.com/course/advanced-diploma-in-engineering-thermodynamics?utm_source=chatgpt.com Thermodynamics of Materials

First Level / Second Semester
Fluid Mechanics

1. Course: Fluid Mechanics	
2. Course Code: TRA102	
3. Semester / Year: Second Semester / First Year / Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available Forms of Attendance: Mandatory	
6. Number of Credit Hours (Total)	
(2 theoretical + 3 practical) per week * 15 weeks = 75 hours	
7. Course administrator name (list all names, if more than one)	
Name: Omar Mahmoud Gomaa Email: omarmahmood803@ntu.edu.iq Name: Lubna Ali Hussein Email: lubna.ali15783@ntu.edu.iq	
8. Course Objectives (General Objectives of the Course)	
Course Objectives	1. Provide the student with basic information for fluid mechanics 2. Introduce the student to the laws of conservation of mass, momentum, and energy 3. Introduce the student to the calculations of viscous flow, pipe flow and pipe losses
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course structure

Week	Hours	Required Learning Outcomes	Unit / Subject Name	Learning method	Evaluation method
1	2	The student will understand the basic principles and fundamental laws of fluid mechanics.	Introduction to fluid mechanics and its sources.	Theoretical	Classroom and homework assignments, weekly and monthly exams

1	3	The student will become familiar with the types of velocity meter used.	velocity meter and its types.	Practical	Classroom and homework assignments, weekly and monthly exams
2	2	The student will learn about fluids, identify the difference between liquids and gases, and define the properties of steady flow.	Fluid Properties, Steady Flow	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	3	The student will understand the principle and operation of the gauge, and explain the relationship between pressure and velocity.	Venture Scale	Practical	Classroom and homework assignments, weekly and monthly exams
3	2	The student should understand the pressure in fluids and how pressure changes within a fluid.	Static fluids, pressure at a given depth	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	3	The student should understand the principle of operation, distinguish its components, and understand the relationship between pressure and flow and the factors affecting measurement accuracy.	Orifice scale	Practical	Classroom and homework assignments, weekly and monthly exams
4	2	The student should be able to calculate specific gravity and explain the relationship between it and density. The student should know the types of viscosity and their applications.	Specific gravity, viscosity (Newton's law of viscosity, types of fluids)	Theoretical	Classroom and homework assignments, weekly and monthly exams

4	3	The student should be able to apply the law to viscosity.	Applications of viscosity (Newton's law)	Practical	Classroom and homework assignments, weekly and monthly exams
5	2	The student will focus on understanding the relationship between temperature and pressure and explaining their effect on viscosity.	Effect of temperature on viscosity, effect of pressure on viscosity	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	3	The student will identify applications affected by viscosity and analyze how this change affects them.	Applications of the effect of temperature and pressure on viscosity	Practical	Classroom and homework assignments, weekly and monthly exams
٦	2	The student will be able to select the appropriate pressure gauge and read the data correctly.	Pressure gauges Boarder gage, Piezometer manometer, Pitot	Theoretical	Classroom and homework assignments, weekly and monthly exams
٦	3	The student will be able to understand the operating principle of this gauge and distinguish it from other pressure gauges.	Pressure gauge applications	Practical	Classroom and homework assignments, weekly and monthly exams
٧	٢	The student will understand the working principle of this gauge and distinguish it from other pressure gauges.	U-tube manometer	Theoretical	Classroom and homework assignments, weekly and monthly exams
٧	٣	The student will be able to check the pressure in ventilation systems and compare the pressure between cooling and heating systems.	Applications on U-tube manometer	Practical	Classroom and homework assignments, weekly and monthly exams
٨	٢	The student will be able to understand buoyancy and submersion using the laws of physics.	Buoyancy and Submergence Calculations	Theoretical	Classroom and homework assignments, weekly and monthly exams

٨	٣	The student will be able to distinguish between the different states of objects in liquids.	Applications of Buoyancy and Submergence Calculations	Practical	Classroom and homework assignments, weekly and monthly exams
٩	٢	The student will be able to understand this equation and relate it to the principle of conservation of mass.	Continuity Equation	Theoretical	Classroom and homework assignments, weekly and monthly exams
٩	٣	The student will be able to analyze engineering systems and interpret the results for flow-related problems.	Application of the Continuity Equation	Practical	Classroom and homework assignments, weekly and monthly exams
١٠	٢	To demonstrate the student's understanding of the physical and hydraulic principles governing fluid behavior.	Bernoulli's Equation	Theoretical	Classroom and homework assignments, weekly and monthly exams
١٠	٣	To enable the student to mathematically analyze the equation and apply it to calculate fluid velocity or pressure at various points.	Application of Bernoulli's Equation	Practical	Classroom and homework assignments, weekly and monthly exams
١١	٢	The student will identify the basic concepts of energy and its types.	Energy Equation	Theoretical	Classroom and homework assignments, weekly and monthly exams
١١	٣	The student will apply the energy equation to closed and open systems.	Application of the Energy Equation	Practical	Classroom and homework assignments, weekly and monthly exams
١٢	٢	The student will be able to understand linear momentum and understand the law in isolated systems.	Momentum Equation	Theoretical	Classroom and homework assignments, weekly and monthly exams

١٢	٣	The student will be able to explain physical phenomena using momentum and interpret graphs.	Application of the Momentum Equation	Practical	Classroom and homework assignments, weekly and monthly exams
١٣	٢	The student will understand flow, distinguish between its types, and use equations to calculate losses.	Pipe Flow, Losses	Theoretical	Classroom and homework assignments, weekly and monthly exams
١٣	٣	The student will analyze fluid flow in engineering systems, evaluate the performance of these systems, and draw a flow diagram.	Flow Types (Parallel Flow, Series Flow)	Practical	Classroom and homework assignments, weekly and monthly exams
١٤	٢	The student will be able to distinguish between types of losses and identify the factors affecting frictional losses.	Parallel and series losses, friction losses in pipes	Theoretical	Classroom and homework assignments, weekly and monthly exams
١٤	٣	The student will also be able to identify the type of flow and calculate the coefficient of friction.	Determining pipe losses	Practical	Classroom and homework assignments, weekly and monthly exams
١٥	٢	The student will understand the types of connections and distinguish between the effects of each type on performance. The student will analyze the effect of Reynolds number on pipe losses.	Pump Connections, Reynolds Number	Theoretical	Classroom and homework assignments, weekly and monthly exams
١٥	٣	The student will explain the principle of flow measurement, power recording, efficiency calculations, and interpretation of results.	Performance Testing of Centrifugal Pumps	Practical	Classroom and homework assignments, weekly and monthly exams
11. Course Evaluation					

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12. Learning and Teaching Resources	
Required textbooks (curriculum books, if applicable)	Remember all textbooks, if any.
Main references (sources)	Remember references (sources) if any **1.** Fluid Mechanics, Frank M. White, McGraw-Hill, 2011 **2.** Fundamentals of Fluid Mechanics by B.R. Munson, D.F. Young and T. H. Okiishi **3.** Schaum's Outline of Fluid Mechanics by Potter, Merle and Wiggert
Recommended books and references (scientific journals, reports...)	Write the name of the recommended reference for each course 1. Books on fluid mechanics 2. The existence of a laboratory for fluid mechanics
Websites & References	Remember the websites (such as the department's YouTube channel or any link that can be used accordin to the specialization Sites interested in the fields of fluid mechanics

First Level / First Semester
Refrigeration and air conditioning workshops

1. Course Title: Refrigeration and Air Conditioning Workshops	
2. Course Code TRA103	
3. Semester / Year: First Semester / First Year / Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available Forms of Attendance: Mandatory	
6. Number of Credit Hours (Total)	
(6 work) per week * 15 weeks = 90 hours	
7. Course administrator name (list all names, if more than one)	
Name: Iyad Daoud Suleiman Email: ayad.dawood@ntu.edu.iq	
8. Course Objectives (General Objectives of the Course)	
Objectives	1- Performs cutting, bending and welding operations practical and safely. 2- Be precise and tight connections to prevent leakage in the systems. 3- Identify the components of the traditional compressive refrigeration cycle and its functions. 4- Connecting and checking the practical refrigeration circuits inside the laboratory. 5- Reading measuring devices (pressure, temperature, ampere volts) and interpreting values. 6- Conducting gas loading and unloading operations accurate and safely. 7- Applying periodic and basic maintenance procedures for cooling systems. 8- Commitment to safety procedures inside refrigeration workshops and workshops.
9. Teaching and Learning Strategies	
Strategy	Experiential Learning Collaborative Learning Mini Projects

	Demonstration

10.Course structure

The week	Hours	Required Learning Outcomes	Unit / Subject Name	Method of education	Evaluation method
١	6	1. The student will be familiar with the laboratory and its equipment and will be able to set it up safely and in an organized manner before beginning the experiments. 2. The student must follow general safety procedures inside the laboratory	Safety precautions in refrigeration and air conditioning workshops	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
٢	6	1. The student will be familiar with the pipes used in refrigeration and air conditioning systems (types, diameters, and dimensions).	Types of pipes used in the field of refrigeration and air conditioning	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
٣	6	1. The student will be familiar with the tools used for cutting pipes, such as hand and tube cutters. 2. The student will be able to use cutting tools properly and safely. 3. The student will be able to	Cutting, expanding and bending pipes at different angles	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-kly Wee reports

		carry out the cutting process accurately according to the required specifications. 4. The student will be able to distinguish between the types of cuts (straight, oblique, and angled). 5. The student will perform practical exercises on various types of cutting. 6. The student will be required to maintain accuracy and safety when performing cutting operation			
٤	6	1. The student will explain the principles of welding and its importance in joining pipes. 2. Distinguish between welding types (silver, arc, gas). 3. Select the appropriate welding type based on the pipe material and application.	Gas welding	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
٥	6	1. The student will be familiar with the main parts of the gas welding system: the oxygen cylinder and the acetylene	Welding System Parts	practical	1- Attendance, discipline and active participation 2- Practical tests (making models)

		cylinder. The oxygen and acetylene pressure system: the hoses that transport the gas from the cylinders to the torch; the torch used to extract and mix the gases and contains the oxygen and acetylene control valves.			3-Short tests ٤-Weekly reports
٦	6	1. The student will perform a welding process using silver and gas. 2. Distinguish between welding types (silver, arc, and gas). 3. Observe cleanliness and precision in welding positions. 4. Evaluate weld quality through visual and test inspection.	Welding copper pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
٧	6	1. Identify the components of a home refrigeration system. 2. Explain the function of each part of a refrigerator or freezer. 3. Implement basic refrigerator inspection and maintenance proc edures	Compressive air conditioning and cooling system (mechanical circuit of household refrigerator, freezer, water cooler)	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
٨	6	1. The student will be familiar	Compression air conditioning and	practical	1- Attendance,

		with the components of an electrical circuit for household appliances, how to connect and inspect them, how to use appropriate personal protective equipment while working, and how to apply safety procedures when working with electricity.	cooling system (electrical circuit for home refrigerator, freezer, water cooler)		discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
٩	6	1. The student will be able to identify the types of leaks and common malfunctions in household appliances (electrical, mechanical, thermal). 2. The student will understand different detection methods, such as: visual inspection, soap and water, and electronic detectors. 3. The student will be able to distinguish between gas, water, and oil leaks in terms of their causes and effects on the appliance. Detection - in the air conditioning system 4. Analyze the results of the	Detection of leaks and malfunctions in household cooling and air conditioning systems by scientific methods followed	practical	1-Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-ekly We reports

		inspection to determine the root cause of the leak or malfunction. 5. Identify common malfunctions in air conditioning systems. 6. Assess the severity of the malfunction or leak and determine the need for repair or replacement.			
١٠	6	1. The student will understand the importance of the vacuum process for removing air and moisture from the refrigeration cycle. 2. The student will be familiar with the types of charging and discharging devices (charge vacuum pump, Freon cylinder). 3. The student will be able to distinguish between the types of refrigerant gases and their properties: R134a (...R22 R410a	Unloading and charging household air conditioning and cooling systems with refrigerant	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
١١	6	1. The student will be familiar with the steps of the unloading and loading process through actual observation. 2. Understand the	Presentation of practical scientific films for the process of discharge and charging of refrigeration systems	practical	1- Attendance, discipline and active participation 2- Practical tests (making models)

		function of each tool used in the process (e.g., vacuum pump, measuring device, gas cylinder). 3. Understand the correct sequence of procedures for connecting the devices and performing the process safely. 4. Understand the importance of implementing the safety procedures as demonstrated in the film. 5. To recognize potential hazardous situations during loading and unloading and how to avoid the m			3-Short tests 4-Weekly reports
١٢	6	1. The student will understand the function and importance of oil in the refrigeration cycle (lubrication, cooling, and friction prevention). 2. The student will distinguish between the types of refrigerant oils suitable for each type of refrigeration and gas system. 3. The student will identify the appropriate	Adding oil to refrigeration and air conditioning systems	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		amount of oil according to the type of compressor and the manufacturer's recommendations . 4. The student will perform the oil addition process accurately and safely using appropriate tools. 5. The student will apply occupational safety procedures when handling oil and the system .			
١٣	6	1. The student will explain the operating principle of air conditioning systems. 2. Identify the components of the indoor and outdoor units. 3. Identify common faults in air conditioning systems.	Identify separate refrigeration and air conditioning devices (mechanical circuit)	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports
١٤	6	1. The student will be familiar with electrical components and their connection methods. 2. The student will be able to apply occupational safety procedures when working with electricity.	Identify separate refrigeration and air conditioning devices (electrical circuit)	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

١٥	6	1. The student will learn about real-life applications of refrigeration and air conditioning systems in factories or facilities. 2. The student will understand the components of various commercial, industrial, and central systems through direct observation. 3. The student will learn about the measuring and maintenance tools and devices used in the field. 4. The student will connect what he/she has learned theoretically with practical application in the workplace.	A scientific visit to learn about the tirid and air conditioning devices	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4- Weekly reports

11. Course Evaluation

Distribution of grades out of 100 according to the tasks assigned to the student such as daily preparation, daily oral tests, monthly or written tests, reports... Etcetera.

Daily preparation	10%
Practical Reports	10%
Monthly test	30%
Reporting	10%
Practical activity	40%

12. Learning and Teaching Resources	
Required textbooks (curriculu books, if applicable)	Mandatory maintenance and operation of units
Main references (sources)	Principles of refrigeration, air conditioning and refrigeration engineering (Khaled Ahmed Al-Judi) Refrigeration and air conditioning devices (Sabri Boulos) Modern practical aspects in refrigeration and air conditioning (Sabri Boulos)
Recommended books and references (scientific journals, reports...)	Write the name of the recommended reference for each course Principles of Refrigeration (Narrated J. Dosat)
Websites & References	Remember the websites (such as the department YouTube channel or any link that can be used according to the specialization

First Level / First Semester

Principles of Electricity Technique

1. Course Name: Principles of Electricity Technique	
2. Course Code: TRA104	
3. Semester / Year: first semester/first year/courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 3 practical) weekly * 15 weeks = 75 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Abdallah Basim Jasim Email: Eng.abdallh7491@ntu.edu.iq	
8. Course Objectives	
Course Objectives	This course aims to equip students with a foundational understanding of electrical principles crucial for air conditioning systems. It will introduce them to the fundamental concepts of electricity, including circuits, voltage, current, and resistance, while emphasizing their direct application within HVAC technologies. Furthermore, the course seeks to develop students' practical skills in interpreting electrical diagrams, identifying common electrical components
9. Teaching and Learning Strategies	
Strategy	1- Lecture strategy 2- Research and discovery strategy 3- Project-Based Learning 4- experiential learning through lab work 5- practical exercises

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The student will be know	Introduction to	theoretical	Classroom and

		the principles about electricity	electricity		homework assignments, weekly and monthly exams
1	3	The students will identify basic hand tools for electrical work.	Introduction to electricity	practical	Classroom and homework assignments, weekly and monthly exams
2	2	The students will identify voltage, Current, Resistance, and Power. Ohm's Law	Ohm's Law	theoretical	Classroom and homework assignments, weekly and monthly exams
2	3	The students will know how to Measuring Voltage, Current, and Resistance with a Digital Multimeter	Introduction to series circuits.	practical	Classroom and homework assignments, weekly and monthly exams
3	2	The students will understanding parallel circuits (voltage, current, resistance rules).	Introduction to series-parallel combination circuits.	theoretical	Classroom and homework assignments, weekly and monthly exams
3	3	The students will know how to building and testing parallel resistive circuits.	open and short circuits in series and parallel configurations.	practical	Classroom and homework assignments, weekly and monthly exams
4	2	The students will identify the power calculations Understanding electrical energy consumption	Introduction to circuit breakers and fuses.	theoretical	Classroom and homework assignments, weekly and monthly exams
4	3	The students will know how to measuring power in DC circuits.	Identifying different types of fuses and circuit breakers.	practical	Classroom and homework assignments, weekly and monthly exams
5	2	The students will identify how magnetism used to generate electricity and motion.	Introduction to solenoids and relays.	theoretical	Classroom and homework assignments, weekly and monthly exams
5	3	The students will know demonstrating magnetic fields. Building a simple electromagnet.	Experimenting with basic relay operation and continuity testing.	practical	Classroom and homework assignments, weekly and monthly exams
6	2	The students will be understanding the sine	Introduction to AC vs. DC.	theoretical	Classroom and homework

		waves, frequency, peak … etc			assignments, weekly and monthly exams
6	3	The students will know how to using an oscilloscope to visualize AC waveforms.	Introduction to single-phase AC power.	practical	Classroom and homework assignments, weekly and monthly exams
7	2	The students will identify the various switches (thermostats, pressure switches, limit switches) and their function in HVAC	relays and contactors	theoretical	Classroom and homework assignments, weekly and monthly exams
7	3	The students will be knowing the wiring and controlling a simple load using a relay and contactor.	Wiring and testing various types of switches	practical	Classroom and homework assignments, weekly and monthly exams
8	2	The students will identify the principles of capacitors (starting and run capacitors in motors). Introduction to transformers (step-up/step-down, control transformers).	Capacitors and transformers	theoretical	Classroom and homework assignments, weekly and monthly exams
8	3	The students will be able to testing HVAC capacitors (capacitance and resistance). Measuring voltage ratios on a control transformer.	Capacitors and transformers.	practical	Classroom and homework assignments, weekly and monthly exams
9	2	The students will be understanding motor winding, starting, and running.	Principles of electric motors (induction, PSC, split-phase).	theoretical	Classroom and homework assignments, weekly and monthly exams
9	3	The students will be able to identifying different types of HVAC motors. Testing motor windings for continuity and resistance.	Practicing safe motor disconnection and connection.	practical	Classroom and homework assignments, weekly and monthly exams
10	2	The students will knowing the common motor issues (overload, open windings, shorted windings).	Motor protection devices	theoretical	Classroom and homework assignments, weekly and monthly exams
10	3	The students will identify wiring and testing motor protection circuits.	Motor protection devices	practical	Classroom and homework assignments, weekly and monthly exams
11	2	The students will understanding electrical	wiring diagrams	theoretical	Classroom and homework

		symbols common in HVAC. Reading and interpreting basic ladder diagrams.			assignments, weekly and monthly exams
11	3	The students will be able to identifying symbols on pre-made HVAC schematics.	wiring diagrams	practical	Classroom and homework assignments, weekly and monthly exams
12	2	The students will be introduced to common HVAC control circuits	schematic reading	theoretical	Classroom and homework assignments, weekly and monthly exams
12	3	The students will be able to analyzing and troubleshooting a multi-component HVAC control board	Practicing logical troubleshooting steps.	practical	Classroom and homework assignments, weekly and monthly exams
13	2	The students will identify the basic sensors and their electrical signals (thermistors, pressure transducers).	Introduction to sensors in HVAC	theoretical	Classroom and homework assignments, weekly and monthly exams
13	3	The students will be identifying and testing simple sensor circuits.	Introduction to sensors in HVAC	practical	Classroom and homework assignments, weekly and monthly exams
14	2	The students will be able to troubleshooting strategies for common HVAC electrical problems.	Review of all concepts.	theoretical	Classroom and homework assignments, weekly and monthly exams
14	3	The students will be able to troubleshooting scenarios on simulated or real (non-operational) HVAC units with multiple electrical faults.	Students work in teams to diagnose and repair.	practical	Classroom and homework assignments, weekly and monthly exams
15	5	Q&A session.	Comprehensive review of all theoretical and practical concepts	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

11.Course Evaluation

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

Daily preparation	10
Daily oral exam	20
Monthly and written tests	40

Reporting	20
Practical activity	10
12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	not available
Main references (sources)	1- Electricity for Refrigeration, Heating, and Air Conditioning 2- Electricity and Controls for HVAC-R 3- Essential Electrical Skills for HVACR: Theory and Labs
Recommended books and references (scientific journals, reports...)	1- Books on electricity for HVAC. 2- Reports on electricity for HVAC.
Electronic References, Websites	Sites that care about electricity.

First Level / Second Semester

Principles of Refrigeration

1. Course Name: Principles of Refrigeration	
2. Course code:TRA105	
3. Semester/Year: Second Semester/First Year/Courses	
4. Date this description was prepared: 1/7/2025	
5. Available forms of attendance: Mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 4 practical) weekly * 15 weeks = 90 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Mustafa Wadallah Hamdallah Email: mustafawadd_82@ntu.edu.iq	
8. Course Objectives	
Course Objectives	Providing students with basic knowledge about cooling sources and their applications. 2. Promoting concepts of sustainability and equipping them with the practical skills necessary to install, operate, and maintain cooling systems, thus preparing them for the job market and contributing to finding clean energy solutions. 3. Introducing students to modern technologies used in this field. The course also seeks to enhance their environmental awareness.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	The student will be able to distinguish between the types of cooling systems and the characteristics and advantages of each one.	Introduction to the material and its sources	Theoretical	Classroom and homework assignments, weekly and monthly exams
1	4	The student should be able to draw and analyze basic refrigeration circuit diagrams.	Enthalpy pressure diagram	Practical	Classroom and homework assignments, weekly and monthly exams
2	2	The student should be able to explain the basic concepts of refrigeration and the importance of its use in various applications.	Definitions and basics	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	4	The student should be able to explain the working principle of the vapor compression cycle.	enthalpy vapor pressure cycle	Practical	Classroom and homework assignments, weekly and monthly exams
3	2	The student will be able to identify the components of the refrigeration cycle and the function of each part.	simple compression cycle	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	4	The student	Heat balance and	Practical	Classroom and

		should be able to determine the heat balance and calculate the coefficient of performance for a steam compression cycle.	coefficient of performance calculation for steam compression cycle		homework assignments, weekly and monthly exams
4	٢	The student should be able to accurately read operating values from the pressure-enthalpy diagram.	Operations performed on the pressure-enthalpy diagram	Theoretical	Classroom and homework assignments, weekly and monthly exams
4	٤	The student should be able to identify the types of expansion valves.	Study of types of expansion valves	Practical	Classroom and homework assignments, weekly and monthly exams
5	٢	The student should be able to calculate the compression cycle.	Compression cycle calculations	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	٤	The student should be able to understand the steam compression cycle through a heat exchanger.	Steam compression cycle through a heat exchanger	Practical	Classroom and homework assignments, weekly and monthly exams
6	٢	The student should be able to explain the concepts of supercooling processes.	Excessive cooling processes	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	٤	The student should be able to calculate the compressive efficiency of the compressor.	Compressor Compressive Efficiency Calculation	Practical	Classroom and homework assignments, weekly and monthly exams
7	٢	The student should be able	Arithmetic operations	Theoretical	Classroom and homework

		to perform mathematical operations.			assignments, weekly and monthly exams
7	٤	The student should be able to identify the components of a reciprocating compressor.	Study of the components of the reciprocating compressor	Practical	Classroom and homework assignments, weekly and monthly exams
8	٢	The student should be able to identify actual compression refrigeration cycles.	Actual compression refrigeration cycles	Theoretical	Classroom and homework assignments, weekly and monthly exams
٨	٤	The student should be able to identify the components of a centrifugal compressor.	Study of centrifugal compressor components	Practical	Classroom and homework assignments, weekly and monthly exams
٩	٢	The student should be able to identify the heat exchanger.	Heat exchanger	Theoretical	Classroom and homework assignments, weekly and monthly exams
٩	٤	The student should be able to identify the components of a reciprocating compressor.	Study of the components of the reciprocating compressor	Practical	Classroom and homework assignments, weekly and monthly exams
10	2	The student should be able to identify the types of compressors.	Types of compressors	Theoretical	Classroom and homework assignments, weekly and monthly exams
10	4	The student should be able to identify the components of a screw compressor.	Study of screw compressor components	Practical	Classroom and homework assignments, weekly and monthly exams
11	2	The student should be able to identify the types of capacitors.	Types of capacitors	Theoretical	Classroom and homework assignments, weekly and monthly exams
11	4	The student should be able	Learn about different types of	Practical	Classroom and homework

		to identify different types of capacitors.	capacitors.		assignments, weekly and monthly exams
12	2	The student should be able to identify the types of choking devices.	Types of strangulation devices	Theoretical	Classroom and homework assignments, weekly and monthly exams
12	4	The student should be able to identify different types of cooling towers.	Learn about different types of cooling towers.	Practical	Classroom and homework assignments, weekly and monthly exams
13	2	The student should be able to identify the types of incense burners.	Types of evaporators	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	4	The student should be able to identify different types of incense burners.	Learn about different types of incense burners.	Practical	Classroom and homework assignments, weekly and monthly exams
١٤	٢	The student should be able to identify supercooling and superheating.	Supercooling and superheating	Theoretical	Classroom and homework assignments, weekly and monthly exams
١٤	٤	The student should be able to know how to calculate the efficiency of different types of capacitors.	Calculating the efficiency of capacitor types	Practical	Classroom and homework assignments, weekly and monthly exams
١٥	2	The student should be able to identify ways to improve the performance of the compression cycle.	Methods for improving compression cycle performance	Theoretical	Classroom and homework assignments, weekly and monthly exams
11.Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student					

such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources	
Required textbooks (curricular books if any)	
Main references (sources)	1- Refrigeration & Air-conditioning by Jordan & Priester 2- Refrigeration & Air – conditioning by ARORA . 3- Principle & Refrigeration by Dossat ٤ -Refrigeration & Air-conditioning by Ballany
Recommended books and references (scientific journals, reports...)	1-ASHRAE Journal. 2- International Journal of Refrigeration.
Electronic References, Websites	1- https://www.youtube.com/watch?v=fJcMV9EWYAU&list=PL_rxhivlh6RC7XzllHNvZOKW7mKw0g5AK

First Level / Second Semester

Applied Engineering Drawing

1. Course: Applied Engineering Drawing	
2. Course Code :TRA106	
3. Semester / Year: Second Semester / First Year / Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available Forms of Attendance: Mandatory	
6. Number of Credit Hours (Total)	
(4 practical) per week * 15 weeks = 60 hours	
7. Course administrator name (list all names, if more than one)	
Name: Rafal Khalid Jassim Email: mti.lec228.rafal@ntu.edu.iq	
8. Course Objectives (General Objectives of the Course)	
Objectives	1. This course provides a necessary summary of the most important characteristics of AutoCAD as follows: Definition of engineering drawing orders 2. Communicate design concepts and its goal using a unified pictorial language consisting of forms, symbols and its uses, engineering drawing tools. Types of geometric lines and their uses, exercises + function. 3. Computer drawing geometric shapes (rectangle, parallelogram, square, circle) exercises + function. Dimensions and how to put on the drawing. Principles of projection in geometric drawing) simple shapes (projection drawing and three-dimensional drawing). Cartesian on three levels. Uncomplicated, medium forn Complexity, complex geometric shapes
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Participatory learning strategy. 3- Role-playing strategy. 4- Discussant and dialogue strategy.

	5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10.Course structure

week	Hours	Required Learning Outcomes	Unit / Subject Name	Method of education	Evaluation method
١	4	Introduction to AutoCAD	Introduction to Orders and Directives	Theoretical + Practical	Class assignments and weekly and monthly exams
٢	4	Perspective Drawing ISO Miter	Panels that only include the use of fonts	practical	Class assignments and weekly and monthly exams
٣	4	Perspective Drawing ISO Miter	Panels involving the use of lines and cylinder	practical	Classroom and home assignments and weekly and monthly exams
٤	4	Perspective Drawing ISO Miter	Plates involving the use of lines, cylinder and cavities	practical	Class assignments and weekly and monthly exams
٥	4	Perspective Drawing ISO Miter	Paintings involving the use of lines and drawing distractions	practical	Classroom and home assignments and weekly and monthly exams
٦	4	drawing shapes with inclination at an angle in the ISO,	Application of the use of angles in ISO Metrek	practical	Class assignments and weekly and monthly exams
٧	4	Perspective Drawing ISO Miter	Drawing different paintings that ensure lines, deviations and cavities	practical	Class assignments and weekly and monthly exams
٨	4	Perspective Drawing ISO Miter	Drawing different and complex paintings	practical	Class assignments and weekly and

					monthly exams
٩	4	Introduction to projections	Introduction to the axes and how to define the perspective interface	practical	Class assignments and weekly and monthly exams
١٠	4	Drawing projections	Draw projections for simple shapes with lines only	practical	Class assignments and weekly and monthly exams
١١	4	Drawing projections	draw the three projections of cylindrical shapes,	practical	Class assignments and weekly and monthly exams
١٢	4	Drawing projections	Drawing the three projections of hollow shapes,	practical	Class assignments and weekly and monthly exams
١٣	4	Drawing projections	draw the three projections of oblique shapes (angled deviation)	practical	Class assignments and weekly and monthly exams
١٤	4	Drawing projections	Drawing the three projections of hollow and inclined cylindrical shapes,	practical	Class assignments and and weekly monthly exams
١٥	4	Drawing projections	Drawing the Three Projections of Complex Shapes,	practical	Class assignments and weekly and monthly exams

11. Course Evaluation

Distribution of grades out of 100 according to the tasks assigned to the student such as daily preparation, daily oral tests, monthly or written tests, reports... Etcetera.

Daily preparation	10
Daily Operation Testing	25
Monthly and practical testing	50
Practical activity	15

12. Learning and Teaching Resources	
Required textbooks (curriculum books, if applicable)	Remember all textbooks, if any.
Main references (sources)	Remember references (sources) if any 1. A variety of engineering sketchbooks prepared by the department
Recommended books and references (scientific journals, reports...)	Write the name of the recommended reference for each course 1- Books that are concerned with applied engineering drawing 2- Reports on applied engineering drawing.
Websites & References	Remember the websites (such as the departmer YouTube channel or any link that can be us according to the specialization Sites that are interested in applied engineeri drawing.

First Level / Second Semester

Engineering mechanics

1. Course Name: Course Name: Engineering mechanics	
2. Course Code: TRA107	
3. Semester / Year: Second semester/first year/courses	
4. Description Preparation Date: 1/7/2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 3 practical) weekly * 15 weeks = 75 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Sawla Taha Hamed Email: sawla99@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. Providing the student with basic information about the principles of Engineering mechanics. 2. Introducing the student to the use of Engineering mechan ics. 3. in other scientific topics and increasing his ability to think logically when solving exercises. 4. increasing the student ability and how to link data with his information to obtain a solution to the problem.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy.

	4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course Structure

Week	Hours	Required learning outcome	Unit name / or the subject	Learning method	Evaluation method
1	2	The student should know the topics of mechanics	Introduction to engineering mechanics	Theoretical	Classwork, homework, weekly and monthly exams
2	2	The student should know the quantities and units used to measure them	Definition of mechanics science & the branches basic quantities & units ,	Theoretical The student should know the	Classwork, homework, weekly and monthly exams
3	2	The student should be able to analyze static objects	Force , resolution and resultant	Theoretical	Classwork, homework, weekly and monthly exams
4	2	The student should learn to calculate the moment of the forces and their various applications	Moment of the force & applications	Theoretical	Classwork, homework, weekly and monthly exams
5	2	The student should be able to solve problems related to the couples	Couples , applications	Theoretical	Classwork, homework, weekly and monthly exams
6	2	The student should learn the concept of balance, its conditions and ”applications	Equilibrium , definition & the conditions and applications	Theoretical	Classwork, homework, weekly and monthly exams
7	2	The student should be able to find the free body chart F.B.D	Free body diagram , procedure of the ”drawing “F.B.D	Theoretical	Classwork, homework, weekly and monthly exams
8	2	The student should know the concept of friction and its applications	Friction , theory and applications types of the friction , coefficient of friction , angle of friction	Theoretical	Classwork, homework, weekly and monthly exams
9	2	The student should learn to calculate the center of gravity & Centroid single area	Center of gravity, application & Centroid single area	Theoretical	Classwork, homework, weekly and monthly exams

10	2	The student should learn to calculate the center of gravity for composite area	Center of gravity , Centroid of composite area	Theoretical	Classwork, homework, weekly and monthly exams
11	2	The student should learn the moment of inertia, its definition and calculate moment of inertial single area	Moment of inertial , definition , moment of inertial single area	Theoretical	Classwork, homework, weekly and monthly exams
12	2	The student should learn and calculate the moment of inertia of composite area	Moment of inertial of composite area	Theoretical	Classwork, homework, weekly and monthly exams
13	2	The student should be able to understand and apply the theory of turning the axes	parallel axis theory	Theoretical	Classwork, homework, weekly and monthly exams
14	2	The student should understand the basic principles of dynamics using Newton's basic principles	linear motion, freely falling bodies or thrown up	Theoretical	Classwork, homework, weekly and monthly exams
15	2	The student should understand the rotational movement of objects and solve the problems related to them	Rotational motion	Theoretical	Classwork, homework, weekly and monthly exams
Practical part					
Week	Hours	Required learning outcome	Unit name / or the subject	Learning method	Evaluation method
1	3	student should learn about the engineering mechanics laboratories and how to write the report	Define the laboratory and the method of writing especial report	Practical	Classroom and homework assignments, weekly and monthly exams
2	3	The student should be able to understand and perform a hardness test for metals by Brinell method for the hardness test	The Brinel hardness test	Practical	Classroom and homework assignments, weekly and monthly exams
3	3	The student should be able to understand and perform a	The Vickers hardness test	Practical	Classroom and homework assignments,

		hardness test for metals by Vickers method for the hardness test			weekly and monthly exams
4	3	The student should be able to understand and perform a hardness test for metals by Rockwell method for the hardness test	The Rockwell hardness test	Practical	Classroom and homework assignments, weekly and monthly exams
5	3	The student should learn to measure the hardness of carbon metals	Hardening metals with carbon and an ailing	Practical	Classroom and homework assignments, weekly and monthly exams
6	3	The student should learn to measure injections using cold formation	Measure Injecting with cold shaping	Practical	Classroom and homework assignments, weekly and monthly exams
7	3	The student should be able to understand and take a impact test for metals	The impact test for the metals	Practical	Classroom and homework assignments, weekly and monthly exams
8	3	For the purpose of the student's monthly assessment	Practical examine to the students	Practical	Classroom and homework assignments, weekly and monthly exams
9	3	The student should be able to understand and take a impact test for plastics	The impact test for the plastics	Practical	Classroom and homework assignments, weekly and monthly exams
10	3	The student should learn to draw files after the trial procedure	Drawing the coils	Practical	Classroom and homework assignments, weekly and monthly exams
11	3	The student should be able to understand and take a Tension test for metals	Tension test	Practical	Classroom and homework assignments, weekly and monthly exams
12	3	The student should be able to understand and take a Compression test for metals	Compression test	Practical	Classroom and homework assignments, weekly and monthly exams

13	3	The student should be able to understand and take a Torsion test for metals	Torsion test	Practical	Classroom and homework assignments, weekly and monthly exams
14	3	The student should be able to understand and take a Bending test for metals	Bending test	Practical	Classroom and homework assignments, weekly and monthly exams
15	3	For the purpose of the student's monthly assessment	Practical examine to the students	Practical	Classroom and homework assignments, weekly and monthly exams

11. Course Evaluation

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

Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12. Learning and Teaching Resources

Required textbooks (curricular books, if any	not available
Main references (sources)	1- Engineering mechanics Ferdinand L. Singer third edition. Harber and P. Ow. Publisher inc. 2- Hibbeler, R. C. (2007). Engineering Mechanics (Eleventh ed.), Pearson, Prentice Hall. p. 393. ISBN 978-0-13-127146-3. 3- Holzner, Steven (December 2005). Physics for Dummies. Wiley, John & Sons, Incorporated. p. 64. ISBN 978-0-7645-5433-9
Recommended books and references (scientific journals, reports...)	1. Books concerned with Engineering mechanics
Electronic References, Websites	1- https://repository.uobabylon.edu.iq/mechanical.aspx. 2- youtube: @JassimeLTaiyeb

	@ahmedsabri1 @user-xd7wm9cj5g

First Level / Second Semester

Renewable energy

1. Course Name: Renewable energy	
2. Course Code: TRA108	
3. Semester / Year: Second semester/first year/courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 3 practical) weekly * 15 weeks = 75 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Mohammed Nazra Yousif Email: mohammednazar1983@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1- Providing students with ba knowledge about renewable ener sources and their applications. 2- Promote sustainability concepts a equip them with the practical ski necessary to install, operate, and maint renewable energy systems, thus prepari them for the labor market and contributi to finding clean energy solutions. 3- Introducing students to mod technologies used in this field. The cou also seeks to develop their environmen awareness.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	1- The student will be introduced to the basic concepts of renewable energy and its sources. 2- The student will appreciate the importance of using renewable energy sources in reducing pollution and preserving the environment.	Introduction to Renewable Energy	theoretical	Classroom and homework assignments, weekly and monthly exams
1	3	The student should use appropriate measuring tools to determine the intensity of solar radiation or wind speed.	Learn about safety tools and measurements in the energy lab.	practical	Classroom and homework assignments, weekly and monthly exams
2	2	The student will understand the characteristics, advantages and disadvantages of each type of renewable energy.	The difference between traditional and renewable energy, the importance of renewable energy	theoretical	Classroom and homework assignments, weekly and monthly exams
2	3	The student will be able to measure solar radiation using a solar meter.	solar energy Measuring solar radiation using a solar meter	practical	Classroom and homework assignments, weekly and monthly exams
3	2	The student will compare renewable energy and conventional energy in terms of environmental impact, cost, and sustainability.	Solar Energy - Basics Solar Radiation - Solar Cells - System Components	theoretical	Classroom and homework assignments, weekly and monthly exams
3	3	The student will install a small solar energy system in a laboratory or training project.	Learn about the components of a photovoltaic (PV) solar system	practical	Classroom and homework assignments, weekly and monthly exams
4	2	The student will be able to predict future developments in	Solar energy systen (photovoltaic syster	theoretical	Classroom and

		the field of renewable energy in Iraq and the world.	PV - thermal systen		homework assignments, weekly and monthly exams
4	3	The student will be able to connect a simple circuit for a solar system.	solar energy Connecting a simple circuit for a solar photovoltaic system to power a small load	practical	Classroom and homework assignments, weekly and monthly exams
5	2	The student will learn about the industrial and technical applications of renewable energy in the fields of refrigeration, air conditioning, or electricity.	solar energy Solar thermal collectors (Flat Plate - Evacuated Tube).	theoretical	Classroom and homework assignments, weekly and monthly exams
5	3	The student will learn about the applications of solar heaters.	solar energy Home and industrial solar heater applications	practical	Classroom and homework assignments, weekly and monthly exams
6	2	The student will be able to calculate the efficiency of solar energy.	Solar energy efficiency calculation	theoretical	Classroom and homework assignments, weekly and monthly exams
6	3	The student will be able to assemble and operate a typical solar heater – recording temperatures.	solar energy Assembly and operation of a typical solar water heater – recording temperatures	practical	Classroom and homework assignments, weekly and monthly exams
7	2	The student should know the components of turbines.	wind energy Turbine components, design, and uses in energy production..	theoretical	Classroom and homework assignments, weekly and monthly exams
7	3	The student will construct a simple model of a wind turbine power system.	wind energy Wind turbine assembly and explanation of its	practical	Classroom and homework assignments,

			basic components (educational model).		weekly and monthly exams
8	2	The student will be able to calculate the efficiency of wind energy.	wind energy Wind energy efficiency calculation	theoretical	Classroom and homework assignments, weekly and monthly exams
8	3	The student calculates the efficiency of a wind turbine at different air speeds.	wind energy Calculating wind turbine efficiency at different wind speeds	practical	Classroom and homework assignments, weekly and monthly exams
9	2	The student will learn about the geothermal energy and its use in cooling and heating.	geothermal energy Geothermal energy and its use in cooling and heating	theoretical	Classroom and homework assignments, weekly and monthly exams
9	3	The student should be able to distinguish between the applications of geothermal energy in winter and summer.	geothermal energy geothermal energy applications	practical	Classroom and homework assignments, weekly and monthly exams
10	2	1- The student should understand hydropower. 2- The student should explain the generation of energy from water (hydroelectricity).	Hydro energy Hydro energy - generating energy from water (hydroelectricity)	theoretical	Classroom and homework assignments, weekly and monthly exams
10	3	The student will be able to distinguish between the types of hydropower plants.	Hydro energy Types of Hydropoenergy Plants (Educational Video)	practical	Classroom and homework assignments, weekly and monthly exams
11	2	The student should differentiate between the types of water turbines.	Hydro energy Hydropower Applications Explanation of Types of Hydro Turbines	theoretical	Classroom and homework assignments, weekly and monthly

					exams
11	3	The student should know the components of the Pelton turbine.	Hydro energy Pelton Turbine Components	practical	Classroom and homework assignments, weekly and monthly exams
12	2	The student should distinguish between bioenergy and biomass.	Bioenergy and biomass	theoretical	Classroom and homework assignments, weekly and monthly exams
12	3	The student will be able to identify the types of biofuels.	Biofuel Types of biofuels, biogas production, heating applications	practical	Classroom and homework assignments, weekly and monthly exams
13	2	The student converts biomass into energy (thermal, electrical, biofuel)	Bioenergy Converting biomass to energy (thermal, electrical, biofuel)	theoretical	Classroom and homework assignments, weekly and monthly exams
13	3	The student will be able to identify the use of heat generated from the combustion of biomass to produce electricity.	Bioenergy Using the heat produced by burning biomass to produce electricity.	practical	Classroom and homework assignments, weekly and monthly exams
14	2	The student will understand the process of decomposition of organic matter by bacteria in the absence of oxygen to produce methane gas.	anaerobic digestion The process of decomposition of organic matter by bacteria in the absence of oxygen to produce methane gas.	theoretical	Classroom and homework assignments, weekly and monthly exams
14	3	To introduce the student to biodiesel.	Biodiesel Biodiesel (liquid fuel obtained from vegetable oils or animal fats)	practical	Classroom and homework assignments, weekly and monthly exams

15	5	1- The student should learn how hydropower plants work. 2- The student should take responsibility for using natural resources in sustainable ways. 3- The student must demonstrate keenness to apply ethical and professional standards in field work.	Hydropower Scientific visit	Theoretical + practical	Discussion and dialogue

11.Course Evaluation

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

Daily preparation	10
Daily oral exam	20
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources

Required textbooks (curricular books, if any	not available
Main references (sources)	1- Renewable Energy: Power for a Sustainable Future 2- Solar Engineering of Thermal Processes 3- Wind Energy Explained: Theory, Design and Application
Recommended books and references (scientific journals, reports...)	1- Books on renewable energy. 2- Reports on renewable energy.
Electronic References, Websites	https://www.youtube.com/watch?v=mh51mAUexK4&list=PLwdnzlV3ogoXUifhvYB65lLJCZ74o_fAk

Second Level / Second Semester

English language

1. Course Name: English language					
2. Course Code: NTU 200					
3. Semester / Year: 2nd semester/2nd year/courses					
4. Description Preparation Date: 1/ 7 / 2025					
5. Available Attendance Forms: mandatory					
6. Number of Credit Hours (Total) / Number of Units (Total)					
(2 theoretical) weekly * 15 weeks = 30 hours					
7. Course administrator's name (mention all, if more than one name)					
Name: Email:					
8. Course Objectives					
Course Objectives			**1-**1. Demonstrate understanding of fundamental grammar rules in academic writing contexts. 2. Develop analytical reading skills for interpreting academic English texts effectively. 3. Improve academic writing proficiency by composing clear, coherent, and well-structured texts		
9. Teaching and Learning Strategies					
Strategy			1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.		
10. Course Structure					
Week	**Hours**	**Required**	**Unit or**	**Learning**	**Evaluation**

		Learning Outcomes	subject name	method	method
1	2	Extracting key information from lectures or conversations.	Getting to know you	theoretical	Classroom and homework assignments, weekly and monthly exams
2	2	Reading and Comprehending Complex Texts	The way we live	theoretical	Classroom and homework assignments, weekly and monthly exams
3	2	Understanding both literary and non-literary texts at an advanced level.	It all went wrong	theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	Analyzing texts and extracting their underlying meanings	Let’s go shopping	theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	Interaction in Real-Life Situations	What do you want to do	theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	Ability to communicate in everyday situations	Tell me what is it like	theoretical	Classroom and homework assignments, weekly and monthly exams
7	2	Understanding English-Speaking Cultures	fame	theoretical	Classroom and homework assignments, weekly and monthly exams
8	2	Deliver short oral presentations in English.	Do's and dont's	theoretical	Classroom and homework assignments, weekly and monthly exams
9	2	Use new English vocabulary in appropriate contexts.	Going places	theoretical	Classroom and homework assignments, weekly and monthly exams
10	2	Write clear and coherent sentences and short	Scared to death	theoretical	Classroom and homework assignments,

		paragraphs.			weekly and monthly exams
11	2	Passives and nouns and verbs	Things that changed the world	theoretical	Classroom and homework assignments, weekly and monthly exams
12	2	Expand vocabulary with new words and phrases regularly	Dreams and reality	theoretical	Classroom and homework assignments, weekly and monthly exams
13	2	Analyze English texts and deduce main ideas and details..	Earning a living	theoretical	Classroom and homework assignments, weekly and monthly exams
14	2	Understand spoken English in everyday conversations	Family ties	theoretical	Classroom and homework assignments, weekly and monthly exams
15	5	Scientific visit	Colleges of arts and education/English dept.	Theoretical	Discussion and dialogue

11.Course Evaluation

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

Daily preparation	10
1st month text	15
2nd month text	15
Final text	60

12.Learning and Teaching Resources

Required textbooks (curricular books, if any	not available
Main references (sources)	1- Beginner student's book, New headway plus
Recommended books and references (scientific journals, reports...)	1- Books on English language
Electronic References, Websites	Sites that care about English language

Second Level / first Semester

Computer

1. Course Name: Computer	
2. Course Code: NTU201	
3. Semester / Year: first semester/second year/courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(1 theoretical +1 practical) weekly * 15 weeks = 30 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Bassam abbas ali Email: bassamabbasalnajjar@ntu.edu.iq	
8. Course Objectives	
Objectives	The student will learn basic computer security concepts, types of malware (such as viruses and spyware), and methods for protection against them. The student will distinguish between different types of software licenses (such as free, paid, and open source), and understand the importance of intellectual property rights to avoid legal problems. The student will understand common methods of cyber attacks, such as phishing and distributed denial of service (Dos) attacks, and learn how to secure their personal data online. The student will gain basic knowledge about operating systems (such as Windows, Linux, and macOS) and their classifications, as well as an understanding of network components and their requirements. The student will master the skills of using PowerPoint to create professional presentations, and master the basic principles of Excel to enter data and perform simple calculations. 6. Harmful effects Computers and Public Health:

	The student understands the potential health effects of excessive computer use, such as eye strain and back pain, and learns how to adopt correct sitting and working postures to ensure physical safety.
Strategy	1. Self-directed strategy. 2. Collaborative learning strategy. 3. Role-playing strategy. 4. Discussion and dialogue strategy. 5. Research and discovery strategy. 6. Brainstorming strategy. 7. Project-based learning strategy. 8. Learning through problem-solving strategy.

1٠. Course structure

week	Hours	Required learning outcomes	Unit name/topic	Teaching method	Evaluation method
1	**2**	- The student must ensure the safety of both personal and public computers - The student must adhere to globally recognized cyber ethics. - The student must be able to identify various forms of cyber bullying in the digital world. - The student must understand the importance and privacy of computers. - The student must be fully familiar with the presentation software interface and be proficient in operating the program and interacting smoothly with the user interface.	Theoretical / Computer Security and Software Licensing -Cyber Ethics -Types of Abuse in the Digital World -Computer Privacy Practical / Presentation Program (Power Point) -Purpose of the Program -Program Operation -User Interface	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
2	**2**	- The student must identify the types of software and application licenses and adhere to their standards . - The student must be able to open and edit saved documents . - The student must be able to save documents after creating or editing them.	Theoretical / Computer Software Licenses. Practical / Presentation Program (Power Point.(-Opening saved documents. -Closing and saving documents.	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

3	**2**	- The student will be able to identify the sources of cyber-attacks - Demonstrate a commitment and awareness to avoiding them . - The student will be able to list the elements of the home page tab in the presentation program . - Be able to use each element correctly.	Theoretical/Cyber Hacking Practical/Power Point Presentation - Home tab	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
4	**2**	- The student should understand the danger of malware . - The student should know its types and seek ways to avoid it . - The student should fully understand the elements of the Insert tab . - The student should be proficient in dealing with it in the presentation program.	Theoretical / Malware Practical / PowerPoint Presentation - Insert Tab.	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
5	**2**	- The student will gain a comprehensive understanding of how computers can harm public health, especially in the long term, and will learn the correct sitting position . - The student will be able to distinguish between the elements of the design tab and begin designing their own templates to use according to their needs.	Theoretical: The harms of computers on public health. Practical: Presentation program (Power Point) - Design tab.	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
6	**2**	- The student will demonstrate a scientific understanding of the operating system, identify its functions, and understand the objectives for which it was designed . - The student will be able to link the elements of the transition tab with the elements selected when designing specific documents . - The student will be able to easily create a clear and distinctive document .	Theoretical / Operating Systems - Definition of Operating Systems - Functions of Operating Systems - Objectives of Operating Systems - Practical / Presentation Program)Power Point(- Transitions Tab	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

7	**2**	-The student should be able to classify operating systems according to the number of users or the nature of the system being used. -The student should perform some movements that add a distinctive elegance to the templates.	Theoretical / Operating Systems Classification: - By System Nature - By Users Practical / Presentation Program)Power Point(- Animations Tab	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
8	**2**	-The student will identify the differences between various operating systems. -The student will be able to identify the pros and cons of each system, enabling them to optimally select the appropriate operating system for their use. -The student will be able to determine the appropriate presentation method for each slide, based on its content and the elements that should be emphasized during the presentation.	Theoretical / Examples of some operating systems : DOS operating system- - Mac operating system - Windows operating system - Linux operating system - Android operating system . Practical / Presentation program)Power Point(- Slideshow tab .	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
9	**2**	-The student should be able to identify the system requirements to determine whether or not it can be used on their personal computer. -The student should master the use of the Review tab to note strengths and weaknesses in the design, and review and correct spelling errors before exporting the template.	Theoretical / Windows 7 - System requirements - New features in the system - Practical / Presentation program)Power Point(- Review tab	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
10	**2**	-The student will become familiar with the nature of the network. -The student will be able to list the types of networks. -The student will be able to choose the appropriate method for comprehensive presentation. -The student will be able to explain and present the template simultaneously, so that the idea is fully conveyed to the recipient.	Theoretical / Networks - Network - Types of Networks Practical / Presentation Program)Power Point(- View Tab	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

11	**2**	-The student will discuss the communication media used in networks and list the protocols used in networks, with the ability to determine the appropriate protocol for each network operation. -The student will become familiar with the spreadsheet program. -The student will fully understand its importance and the possibilities of its use, in addition to how to open the program.	Theoretical / Networks - Communication Media - Protocols Practical / Excel - Program Concept - Program Benefits - Opening the Program	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
12	**2**	-The student will demonstrate an understanding of the advantages of the network. -Record his information about network requirements and fully understand what internet service is and what it can offer. -The student will begin working with a spreadsheet program. -Familiarize himself with the data the program handles.	Theoretical / Networks - Student Benefits - Computer Network Requirements - The Internet - What the Internet Offers Practical / Excel - Program Interface - Basic Data Types and How to Enter Them	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
13	**2**	-The student will be familiar with the types of services offered by the Internet. -They will have a thorough understanding of how the Internet works. -They will be able to explore various websites themselves. -They will create a workbook and learn how to work with a worksheet.	Theoretical / Networks - Main Internet Services - How the Internet Works - Websites Practical / Excel - Working with Worksheets	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
14	**2**	-The student will understand what search engines are. -Understand what a browser is and its uses. -Understand the capabilities of Internet Explorer. -The student will be prepared to choose the appropriate browser for their use. -Master how to work with spreadsheet cells.	Theoretical / Networks - Search Engines - Browsers - Internet Explorer Practical / Excel - Working with Cells	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

15	**2**	-The student should begin utilizing the capabilities of popular search engines. -The student should utilize the capabilities of the search engine (Google) in his study requirements, such as writing reports, searching for information that will help him in his studies, preparing reports, and graduation projects. -The student should apply the correct method for creating new workbooks. -The student should learn how to save and maintain documents. -The student should open saved documents, edit them, and then re-save them correctly.	Theoretical / Networks - Using popular search engines - The search engine (Google) Practical / Excel - How to create a new workbook - Saving the workbook - Opening saved workbooks.	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

١١. Course Evaluation

Grades are distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily oral tests, monthly or written tests, reports, etc

Daily preparation	10
daily oral tests	20
monthly or written tests	40
Preparing reports	20
Practical activity	10

12. Learning and teaching resources

Required textbooks (curriculum books, if available)	Remember all the textbooks if any
Main References (Sources)	Cite references (sources), if any. Computer and Office Applications Book,
Recommended books and references (scientific) journals, reports...	Write the name of the recommended reference for each course. 1- Books that focus on software.
Electronic references and websites	Remember the websites (such as the department's YouTube channel or any link that can be used according to the

	specialization Sites that are interested in computer , networks ,and software applications.

Second Level / Second Semester

Arabic Language

1. Course name: Arabic Language	
2. Course code: NTU202	
3. Semester/Year: Second semester / Second year / Courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) : (2 theoretical) per week x 15 weeks = 30 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Bassam abbas ali Email: bassamabbasalnajjar@ntu.edu.iq	
8. Course Objectives	
Objectives	The objective of studying the Arabic language course is to: 1. Provide students with the skill of speaking fluent Arabic, free from colloquialisms, and to address common errors. 2. Develop students' linguistic wealth and raise their awareness of the importance of the Arabic language as a tool for thought and a means of expression within themselves and their community. This will encourage students to embrace learning it with conviction and interest. 3.Developing the ability to compose sentences, avoiding writing words with common mistakes, and how to formulate an administrative letter.
9. Teaching and Learning Strategies	

Strategy	.١ Self-direction strategy. 2. Collaborative learning strategy. .٣ Role-playing strategy. .٤ Discussion and dialogue strategy. .٥ Lecture strategy. .٦Brainstorming strategy.

10. Course structure

week	Hours	Required learning outcomes	Unit name/topic	Teaching method	Evaluation method
1	2	The student should be able to know the correct rules for writing the subject and predicate and be able to parse each of them correctly.	Subject and predicate	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	2	The student should be able to distinguish between the verb, the subject, and the object, and should follow the correct rules in parsing each of them.	verb, subject and object	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	2	The student should demonstrate a thorough understanding of transitive and intransitive verbs and discuss the difference between them.	Intransitive and transitive verbs	Theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	To apply the correct rules in identifying and parsing pronouns and to be able to distinguish between separate, attached, prominent and hidden pronouns.	pronouns	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	To adhere to the rules of diacritics and become familiar with the original and subsidiary diacritics.	Original and secondary diacritical marks	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	To identify the five verbs wherever they appear and to apply the rules for writing them correctly according to the rules of the language.	The five verbs	Theoretical	Classroom and homework assignments, weekly and monthly exams
7	2	To learn the conjunctions in the language, memorize their meanings, and be familiar with the correct positions for these letters.	Conjunctions and their meanings	Theoretical	Classroom and homework assignments, weekly and monthly exams
8	2	The student must adhere to the rules for writing numbers	Number and counted	Theoretical	Classroom and homework

		and counted items.			assignments, weekly and monthly exams
9	2	The student should demonstrate a clear understanding of the hamzat al-wasl and hamzat al-qata' and be able to write the correct diacritics when they occur.	Hamzat al-Wasl and Hamzat al-Qat`	Theoretical	Classroom and homework assignments, weekly and monthly exams
10-11	2	The student should be familiar with the extra letters in the Arabic language, know the reasons for their use, and be able to formulate his writing without errors.	Extra letters	Theoretical	Classroom and homework assignments, weekly and monthly exams
12-13	2	The student should implement the correct rules for writing the letter "noon" and "tanween" and adhere to these rules and explain the rules of the letter "noon" and "tanween" himself.	Noon and Tanween	Theoretical	Classroom and homework assignments, weekly and monthly exams
14	2	The student should take into account the formal aspects of the administrative letter and memorize them correctly and be able to formulate a complete administrative letter free of linguistic errors.	Administrative speech	Theoretical	Classroom and homework assignments, weekly and monthly exams
15	2	The student should explore the common linguistic errors in society and be able to correct them and try to spread correct words in society.	Some common language mistakes	Theoretical	Classroom and homework assignments, weekly and monthly exams

11. Course Evaluation	
Grades are distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily oral tests, monthly or written tests, reports, etc	
Daily preparation	10
daily oral tests	20
monthly or written tests	50
Preparing reports	20
12 . Learning and teaching resources	
Required textbooks (curriculum books, if available)	Remember all the textbooks if any.

Main References (Sources)	The unified Arabic language curriculum taught in all departments of the Technical Institute / Mosul
Recommended books and references (scientific) journals, reports...	All language dictionaries, books and writings of linguists and grammarians.
Electronic references and websites	Sites that are interested in the Arabic language

Second Level / first Semester

Professional Ethics

1. Course Name: Professional Ethics	
2. Course Code: NTU204	
3. Semester / Year: Semester One / Second Year / Courses	
4. Description Preparation Date: 1/7/2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical) weekly * 15 weeks = 30 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Mohammed Nazra Yousif Email: mohammednazar1983@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1- Understanding the fundamentals of professional ethics and general principles. 2- Recognizing the differences between work behavior, profession, and craft. 3- Identifying methods and approaches for instilling professional ethical values and how to apply ethics in professional practice.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	To introduce the student to the concept of professional ethics and its importance in the work environment.	Introduction to Ethics and Its Importance in Human Life and Society – The Difference Between General Ethics and Professional Ethics.	theoretical	Classroom and homework assignments, weekly and monthly exams
2	2	To explain to the student the concept of professional ethics and the most important basic principles associated with it.	The concept of professional ethics - definition, objectives, and basic functions of professional ethics.	theoretical	Classroom and homework assignments, weekly and monthly exams
3	2	The student should list the professional rights and duties of the technician in the refrigeration and air conditioning sector.	The Importance of Professional Ethics in Technical Specialties – with a Focus on the Refrigeration and Air Conditioning Profession	theoretical	Classroom and homework assignments, weekly and monthly exams
4	2	The student will be able to predict future developments in the field of renewable energy in Iraq and the world.	Core professional values: honesty, integrity, responsibility, mastery, and discipline.)	theoretical	Classroom and homework assignments, weekly and monthly exams
5	2	The student must respect the intellectual property rights of others' designs or professional innovations.	Professional behavior in the workplace: adherence to regulations, cooperation, positive communication.	theoretical	Classroom and homework assignments, weekly and monthly exams
6	2	The student must participate in work teams, taking into	Ethics in dealing with	theoretical	Classroom and

		account the ethics of cooperation and interaction.	colleagues and clients - respect for opinions and privacy.		homework assignments, weekly and monthly exams
7	2	The student will acquire The student will acquire environmental awareness in using materials and gases in a way that does not harm the environment.	Use public and private resources and property in an ethical manner.	theoretical	Classroom and homework assignments, weekly and monthly exams
8	2	The student classifies the types of professional behaviors.	First semester exam (theoretical) + general review of the previous.	theoretical	Classroom and homework assignments, weekly and monthly exams
9	2	The student must demonstrate loyalty to the profession and the institution in which he works.	The technician's ethical responsibility is to carry out work accurately and safely, and to maintain occupational safety.	theoretical	Classroom and homework assignments, weekly and monthly exams
10	2	The student should have a high sense of ethical responsibility in all his professional practices.	Ethical challenges in business: corruption, bribery, forgery, negligence.	theoretical	Classroom and homework assignments, weekly and monthly exams
11	2	The student must adhere to professional confidentiality and protect customer data.	Ethics of maintaining the confidentiality of technical and commercial information of clients and companies.	theoretical	Classroom and homework assignments, weekly and monthly exams
12	2	The student must adhere to and apply the rules of occupational safety and ethical security during maintenance and installation.	Labor laws and legislation related to the profession (awareness summary).	theoretical	Classroom and homework assignments, weekly and monthly exams
13	2	That the student solves	Real or	theoretical	Classroom

		professional problems according to ethical values and not just technical ones.	hypothetical case studies of an ethical professional situation for analysis and discussion		and homework assignments, weekly and monthly exams
14	2	The student must have a desire to be a good role model for his colleagues through his professional conduct.	Work Ethics During Field Training and Practical Application – Positive Representation of the Educational Institution	theoretical	Classroom and homework assignments, weekly and monthly exams
15	5	The student will analyze the role of ethics in enhancing the quality of artistic and technical work.	Discussion and dialogue + theoretical exam.	theoretical	Discussion and dialogue + theoretical exam

11.Course Evaluation

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

Daily preparation	10
Daily oral exam	20
Monthly and written tests	40
Reporting	20
Classroom activity	10

12.Learning and Teaching Resources

Required textbooks (curricular books, if any	not available
Main references (sources)	1- Engineering Ethics: Concepts and Cases 2- Ethics and Professionalism Engineering 3- Business Ethics: Ethical Decision Making & Cases
Recommended books and references (scientific journals, reports...)	Business Ethics: Ethical Decision Makin & Cases
Electronic References, Websites	https://www.youtube.com/watch?v=Bva3 wWCTUA

Second Level / First Semester
Specialized Workshop

1. Course Title: Specialized Workshop	
2. Course Code MIT201	
3. Semester / Year: First Semester / Second Year / Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available Forms of Attendance: Mandatory	
6. Number of Credit Hours (Total)	
(6 work) per week * 15 weeks = 90 hours	
7. Course administrator name (list all names, if more than one)	
Name: Anmmar Mahmoud Ahmed Email: anmarket.ahmed@ntu.edu.iq	
8. Course Objectives (General Objectives of the Course)	
Course Objectives	1. Perform cutting, bending, and welding operations using professional techniques to ensure high-quality connections in compliance with industrial safety standards. 2. Form precise and reliable joints to ensure the integri of the system and prevent leakage in various refrigeration systems. 3. Analyze and understand the operation of componen in conventional and advanced vapor-compression refrigeration cycles, and interpret their interaction as an integrated system. 4. Connect and test mechanical and electrical refrigeration circuits in the laboratory using advanced diagnostic and verification methods. 5. Accurately use digital and analog measuring instruments, and interpret readings related to pressure, temperature, current, and voltage under various operating conditions. 6. Carry out refrigerant charging and recovery procedures for different refrigerant types

	using well-defined technical steps and applying proper control techniques for quantity and pressure. 7. Implement preventive and scheduled maintenance (PM) programs for early fault detection in refrigeration units and execute both basic and advanced repair procedures. 8. Strictly adhere to occupational safety procedures when handling gases, electrical equipment, and welding tools in the workshop environment.

9. Teaching and Learning Strategies

Strategy	Experiential Learning Collaborative Learning Mini Projects Demonstration

10.Course structure

week	Hours	Required Learning Outcomes	Unit / Subject Name	Method of education	Evaluation method
١	6	1. To understand occupational safety instructions and procedures specific to refrigeration and air conditioning workshops. 2. To adhere to the implementation of safety measures while performing tasks within the	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		workshop. 3. To demonstrate professional discipline and accuracy during the execution of practical tasks in the workshop. 4. To collaborate effectively with colleagues as part of a team during maintenance and assembly operations. 5. To ensure proper use of tools and equipment while maintaining cleanliness and organization of the work environment.			
٢	6	1. To identify the common types of pipes used in refrigeration and air conditioning systems (e.g., copper, steel, plastic). 2. To distinguish	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		the properties of each type of pipe in terms of material characteristics such as corrosion resistance, weldability, and flexibility. 3. To understand the impact of pipe material on the performance of refrigeration and air conditioning systems in terms of efficiency and service life. 4. To determine the appropriate use for each type of pipe (e.g., supply lines, drainage pipes, high-pressure and low-pressure pipes). 5. To classify pipes based on manufacturing material and intended application within the system. 6. To apply skills in			

		identifying and selecting the suitable pipe type during system design or maintenance. 7. To comply with technical standards and safety regulations when handling different types of pipes in the workplace.			
٣	6	1. To identify the hand tools and equipment used for cutting, expanding, and bending pipes. 2. To understand the principles and methods of handling metal pipes (such as copper or aluminum) during shaping. 3. To determine the appropriate angles for pipe bending	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		according to design or connection requirements. 4. To accurately perform pipe cutting steps using manual or automatic cutting tools. 5. To execute pipe expansion according to specified measurements using suitable tools. 6. To carry out pipe bending at various angles while ensuring the material is not damaged or compromised. 7. To adhere to occupational safety procedures when using cutting, bending, and expanding tools. 8. To demonstrate a high level of accuracy and			

		efficiency during mechanical operations on pipes. 9. To verify the quality of shaped pipes and compare them with the required technical specifications.			
٤	6	1. To identify the components and parts of the gas welding system (such as oxygen cylinder, acetylene cylinder, pressure regulator, torch, hoses). 2. To understand the operating principles of the gas welding system and the ignition mechanism of the gas mixture used in welding. 3. To explain the function of each welding	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		equipment component and its role in ensuring a proper and safe welding process. 4. To distinguish between types of flames produced (neutral flame, oxidizing flame, reducing flame) and the appropriate use of each in pipe welding. 5. To apply the basic rules for preparing and operating gas welding equipment correctly and safely. 6. To identify factors affecting the quality of pipe welding such as temperature , gas type, and material nature. 7. To comply with occupationa l safety requirement			

		s specific to welding work to avoid hazards. 8. To assess the readiness of the welding system by inspecting equipment, hoses, and safety valves before starting work.			
٥	6	1. To prepare the worksite and gas welding equipment according to occupational safety standards. 2. To select the appropriate type and grade of filler material for copper pipe welding. 3. To properly prepare the pipe surface (cleaning, sanding, removing oils) before starting the welding process. 4. To adjust the torch flame	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests ٤-Weekly reports

		according to the required welding type (usually a neutral flame). 5. To secure the pipes in a suitable position to ensure continuous and uniform welding. 6. To perform the welding process using the gas torch with appropriate movements to ensure balanced heating and uniform distribution of the filler metal. 7. To monitor the required temperature to avoid pipe damage or welding failure. 8. To adhere to safety procedures during work, such as wearing protective glasses, gloves, and ensuring proper ventilation. 9. To evaluate			

		the weld quality visually or by using non-destructive testing methods when possible. 10. To demonstrate high accuracy and skill in performing clean, safe, and effective welding of copper pipes.			
٦	6	1. To identify the main mechanical components in vapor compression refrigeration systems (compressor, condenser, expansion valve, evaporator). 2. To understand the operating mechanism of each mechanical component within the refrigeration cycle and its role in heat transfer	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		and cooling the medium. 3. To recognize the auxiliary electrical components in household appliances (relay, thermostat, start capacitor, electric motor, protective devices). 4. To explain the relationship between the mechanical circuit and the electrical circuit in operating the system as an integrated unit. 5. To distinguish between the systems used in various household appliances such as: 6. Refrigerator (simple thermal separation cooling system with automatic temperature			

		control). 7. Freezer (cooling system with low cooling capacity to achieve subzero temperatures). 8. Water cooler (cooling system with an internal tank and electrical circuit for level control). 9. To correlate household appliance faults with the roles of their mechanical and electrical components. 10. To use schematic diagrams to understand the arrangement and connection of components within the appliance. 11. To demonstrate an integrated understanding of how the system operates as			

		a closed loop for heat transfer and temperature control.			
٧	6	1. To identify the basic components of split air conditioning units (indoor unit – outdoor unit). 2. To recognize the main mechanical parts (compressor, condenser, evaporator, expansion valve, fans). 3. To identify the electrical components (electronic control board, thermostat, control devices, capacitor, sensors). 4. To understand the function of each mechanical component in the cooling process and heat transfer. 5. To	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		understand the role of each electrical component in controlling system operation and regulating thermal response. 6. To connect the mechanical and electrical circuits to understand the integrated system performance. 7. To distinguish between different electrical wire signals and colors used in connections. 8. To analyze potential causes of common faults based on understanding components and their functions. 9. To read and accurately interpret wiring diagrams.			

		10. To demonstrate practical understanding of task distribution between the indoor and outdoor units in a split system.			
٨	6	1. To identify the basic diagrams of mechanical and electrical circuits in simple household refrigeration systems. 2. To understand the function of each component in the mechanical circuit (compressor, evaporator, condenser, expansion valve). 3. To recognize the basic electrical components such as relay, thermostat, capacitor, start switch, and protective	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		devices. 4. To determine the correct connection points between electrical components using technical schematics. 5. To use appropriate tools to connect wires and mechanical components safely and effectively. 6. To perform electrical and mechanical connections following the correct technical sequence. 7. To apply system trial operation procedures after completing the connections. 8. To observe performance indicators (cooling efficiency, operational stability, thermostat response) after system start-up. 9. To adhere			

		to electrical and mechanical safety standards during connection and operation. 10. To evaluate the effectiveness of the connections made and correct any potential errors to ensure efficient system operation.			
٩	6	1. To identify common faults in refrigeration systems, such as gas leaks, blockages, reduced cooling, or compressor failure. 2. To understand early indicators signaling leaks or faults (e.g., pressure drop, unusual noises, pipe freezing). 3. To determine the	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		diagnostic tools and methods used in fault detection, including: 4. Bubble solution 5. Electronic leak detector 6. Manometer 7. Current and voltage meters 8. To apply standardized scientific methods to locate leaks (e.g., visual inspection, electronic detectors, pressure measurement). 9. To implement systematic procedures for inspecting mechanical and electrical components to identify faults. 10. To measure operational variables (pressure, temperature, current) and compare them against standard values.			

		11. To analyze inspection results to determine the root cause of faults or leaks. 12. To document observations and inspection data using technical forms and reports. 13. To recommend appropriate repair or replacement actions based on diagnostic outcomes. 14. To comply with occupational safety procedures during inspection and diagnosis activities.			
١٠	6	1. To identify types of moisture barriers and contaminants that must be removed during the evacuation process. 2. To understand the	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		importance of evacuation in protecting the system from damage and enhancing operational efficiency. 3. To prepare the necessary tools and equipment for evacuation and charging (vacuum pump, pressure gauge, refrigerant cylinder, hoses, digital scale). 4. To correctly connect measuring devices and vacuum pump to the system according to technical procedures. 5. To perform air and moisture evacuation from the system until the desired pressure is reached (typically below 500 microns).			

		6. To select the appropriate refrigerant type based on the equipment and specifications (e.g., R134a, R600a, R410A). 7. To accurately weigh the required refrigerant quantity using an electronic scale or digital charging device. 8. To inject refrigerant into the system in an organized manner (through the suction or service line) and within the permissible pressure limits. 9. To monitor system stability after charging using the manometer and by measuring suction and discharge			

		line temperatures. 10. To adhere to all safety procedures when handling high pressures and flammable gases (such as wearing gloves, protective goggles, and working in well-ventilated areas). 11. To verify the absence of leaks after charging through re-inspection.			
١١	6	1. To watch educational videos related to refrigeration and air conditioning topics carefully and attentively. 2. To extract the key technical ideas and concepts presented in the videos, such as maintenanc	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		e, connection, or inspection steps. 3. To identify the tools and equipment used in the educational videos and compare them with those available in the workshop. 4. To analyze the sequence of practical steps demonstrated in the videos and relate them to the approved standard procedures. 5. To take notes on important practices, including correct methods and common mistakes presented in the videos. 6. To connect the theoretical knowledge gained from the videos with the practical			

		tasks required in the workshop. 7. To evaluate the degree of alignment or discrepancy between theoretical instruction and actual workplace conditions. 8. To apply the skills learned from the educational videos while performing practical exercises in the workshop. 9. To discuss with colleagues and workshop supervisors the practical benefits of the videos and ways to improve performanc e based on them. 10. To demonstrate the ability to integrate digital learning methods with hands-on practice			

		to achieve more accurate and skilled results.			
١٢	6	1. To understand the role of oil in refrigeration systems and its importance in lubricating moving components such as the compressor. 2. To identify the types of oils used in refrigeration systems and the characteristics of each type. 3. To determine the appropriate oil quantity required according to system specifications and manufacturer instructions. 4. To prepare the tools and equipment necessary for adding oil safely and	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		accurately. 5. To apply the steps for adding oil to the refrigeration system while considering operating and maintenance conditions. 6. To adhere to occupational safety procedures when handling oil and system components. 7. To verify oil distribution within the system to ensure effective lubrication of all moving parts. 8. To monitor system performance after oil addition to ensure stability and absence of leaks or faults. 9. To document oil addition operations, including dates and			

		quantities used, in the maintenance log.			
١٣	6	1. To identify the types of measuring instruments used in inspection and maintenance, such as manometers and thermometers, and understand the function of each device. 2. To understand the operating principles of each instrument and accurately read measurement values. 3. To properly prepare the instruments before use, ensuring their functionality and calibration. 4. To apply correct connection and installation methods of measuring	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		instruments on the refrigeration system. 5. To use the manometer to precisely measure operating pressures during inspection and maintenance stages. 6. To measure temperatures at various points in the system using thermometers. 7. To accurately and systematically record measurements for system performance analysis. 8. To interpret readings and understand their implications for system condition and potential issues. 9. To adhere to safety procedures while handling instruments and systems			

		under pressure or varying temperatures. 10. To maintain and care for measuring instruments to preserve their accuracy and efficiency.			
١٤	6	1. To identify the types of air ducts used in air conditioning systems and the characteristics of different sheet metal materials. 2. To understand the steps involved in designing and preparing air ducts to meet ventilation and air conditioning requirements. 3. To determine the tools and equipment necessary for cutting, shaping,	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4-Weekly reports

		welding, and assembling air ducts and sheet metal. 4. To apply accurate sheet metal cutting techniques according to required dimensions for manufacturing air ducts and condensate drainage pipes. 5. To perform sheet metal forming and bending operations to create ducts and channels in various shapes and angles. 6. To join air duct components using appropriate methods such as welding, bolting, or spot welding. 7. To fabricate condensate drainage pipes with proper slope to prevent water accumulatio			

		n. 8. To adhere to occupational safety standards during manufacturing and installation processes. 9. To monitor manufacturing quality in terms of accuracy, strength, and installation integrity. 10. To securely install air ducts and drainage pipes at their final locations within the air conditioning system correctly and safely.			
١٥	6	1. To prepare for the field visit by reviewing the basics and components of refrigeration and air conditioning equipment in advance.	Refrigeration workshops, air conditioning and pipes	practical	1- Attendance, discipline and active participation 2- Practical tests (making models) 3-Short tests 4- Weekly reports

		2. To identify during the visit the various types and models of refrigeration and air conditioning equipment used in industrial and residential settings. 3. To observe the installation and operation of equipment and different system components. 4. To determine the primary functions of each component within the refrigeration and air conditioning system observed. 5. To collect practical information related to equipment maintenance and operation through			

		interaction with accompanying technicians or engineers. 6. To describe the inspection and maintenance procedures and techniques witnessed during the visit. 7. To record observations and any questions to discuss later with supervisors or peers. 8. To correlate previously studied theoretical knowledge with what was observed during the field visit. 9. To prepare a concise report highlighting key learnings and emphasizing the strengths and challenges			

		of the equipment encountered. 10. To demonstrate professional behavior during the visit, such as adherence to instructions, safety protocols, and constructive engagement.			

11. Course Evaluation	
Distribution of grades out of 100 according to the tasks assigned to the student such as daily preparation, daily oral tests, monthly or written tests, reports... Etcetera.	
Daily preparation	10%
Practical Reports	10%
Monthly test	30%
Reporting	10%
Practical activity	40%
12. Learning and Teaching Resources	

Required textbooks (curriculum books, if applicable)	Mandatory maintenance and operation of units
Main references (sources)	Principles of refrigeration, air conditioning and refrigeration engineering (Khaled Ahmed Al-Judi) Refrigeration and air conditioning devices (Sabri Boulos) Modern practical aspects in refrigeration and air conditioning (Sabri Boulos)
Recommended books and references (scientific journals, reports...)	Write the name of the recommended reference for each course Principles of Refrigeration (Narrated J. Dosat)
Websites & References	Remember the websites (such as the department's YouTube channel or any link that can be used according to the specialization

Second Level / First Semester
Systems Cooling

1. Course Name: Cooling Systems	
2. ٢٠٠Course Code: TRA	
3. Semester / Year: First Semester / Second Year / Courses	
4. Date of Preparation of this Description : 1/ 7 / 2025	
5. Attendance Forms: Mandatory Available	
6. (Number of Study Hours (Total	
Hours ٧٥Weeks = ١٥Practical) Weekly * ٣Theoretical + ٢)	
7. (Course Coordinator Name (List all names, if there is more than one name	
Name: Ayad Dawood Sulaiman Email: ayad.dawood@ntu.edu.iq	
8. (Course Objectives (General Objectives of the Course	
Objectives	1- The student will learn the theoretical principles on which vapor compression refrigeration and air conditioning systems .operate 2- The student will be able to perform theoretical calculations related to vaporcompression systems, which will help him/her to understand each part of the system more accurately and closer to .reality 3- Introduce the student to the refrigerants heir physical and chemical used and know t properties and the difference between one .type and another 4- The student will learn about cooling and refrigeration stations and the pipes that are installed inside the stations and how to .install them 5- -ut nonThe student will learn abo compression systems such as steam jet systems, vortex tubes, and absorption ammonia -systems, which include a water water system, -system, a lithium bromide .and an Electrolux refrigerator 6- .Identify food preservation techniques

9. strategies Teaching and learning	
Strategy	1- direction strategy-Self 2- Participatory learning strategy 3- playing strategy-Role 4- Discussion and dialogue strategy 5- Lecture strategy 6- Research and discovery strategy 7- Brainstorming strategy

10. Course structure

Week	Hours	Required learning outcomes	Unit name / or topic	Teaching method	Evaluation method
١	٢	The student should be able to understand pressure-enthalpy diagrams and identify the ideal vapor compression cycle along with the processes involved in it.	Overview of refrigeration, air conditioning and freezing systems	Theoretical	Class and homework assignments, weekly and monthly exams
1	3	The student should become familiar with safety tools and measurement instruments in the laboratory.	Overview of refrigeration, air conditioning and freezing systems	Practical	Class and homework assignments, weekly and monthly exams
٢	٢	The student must understand the processes of compression, condensation, expansion, and evaporation, and distinguish between superheating and subcooling operations.	Overview of refrigeration, air conditioning and freezing systems	Theoretical	Class and homework assignments, weekly and monthly exams
2	3	The student should recognize different types of compressors, condensers, and evaporators.	Overview of air ،refrigeration conditioning and freezing systems	Practical	Class and homework assignments, weekly and monthly exams
٣	٢	The student must differentiate	Overview of refrigeration, air	Theoretical	Class and

		between the actual and ideal vapor compression cycles.	conditioning and systems freezing		homework assignments, weekly and monthly exams
٣	٣	The student should be capable of performing thermal balance calculations and studying the heat pump system.	Overview of refrigeration, air conditioning and freezing systems	Practical	Class and homework assignments, weekly and monthly exams
٤	٢	The student should be able to compare the theoretical Carnot cycle with the simple vapor compression refrigeration cycle.	Carnot cycle	Theoretical	Class and homework ،assignments weekly and monthly exams
٤	٣	The student must be able to calculate the capacity and efficiency of an air-cooled evaporator.	Calculating the capacities of the compression system components	Practical	Class and homework assignments, weekly and monthly exams
٥	٢	The student should learn how to calculate the coefficient of performance (COP) for the Carnot cycle and understand its limitations and possible modifications.	Carnot cycle	Theoretical	Class and homework assignments, weekly and monthly exams
٥	٣	The student should be able to calculate the capacity and efficiency of a water-cooled evaporator.	Calculating the capacities of the compression system components	Practical	Class and homework assignments, weekly and monthly exams
٦	٢	The student must be capable of solving problems comparing the Carnot and ideal cycles, including cases involving superheating and	Solving problems	Theoretical	Class and homework assignments, weekly and monthly exams

		subcooling.			
٦	٣	The student should be able to calculate the capacity and efficiency of an air-cooled condenser.	Calculating the capacities of the compression system components	Practical	Class and homework assignments, weekly and monthly exams
٧	٢	The student should recognize the use of heat exchangers as a method to improve system performance and solve related problems.	Methods of improving the performance of the compression refrigeration system	Theoretical	Class and homework assignments, weekly and monthly exams
٧	٣	The student should be able to calculate the capacity and efficiency of a water-cooled evaporator.	Calculating the capacities of the compression system components	Practical	Class and homework assignments, weekly and monthly exams
٨	٢	The student must identify the application of flash chambers and intercooling as techniques for enhancing cycle performance, and solve problems related to these techniques.	Methods of improving the performance of the compression refrigeration system	Theoretical	Class and homework assignments, and weekly monthly exams
٨	٣	The student should be able to evaluate the thermal performance of direct cooling units.	Methods of improving the performance of the compression refrigeration system	Practical	Class and homework assignments, weekly and monthly exams
٩	٢	The student must be familiar with refrigerants used for air conditioning and freezing applications, as well as their properties in practical scenarios.	Refrigerants	Theoretical	Class and homework assignments, weekly and monthly exams

٩	٣	The student should learn about the refrigerants used for air conditioning and freezing applications, and practically identify the properties of these refrigerants. solving relevant problems.	Refrigerants	Practical	Class and homework assignments, weekly and monthly exams
١٠	٢	The student should be capable of identifying refrigerants by numbering systems, reading their chemical composition, and solving relevant problems.	Refrigerants	Theoretical	Class and homework assignments, weekly and monthly exams
١٠	٣	The student should become familiar with the refrigerants used for air conditioning and freezing applications, and practically understand the properties of refrigerants.	Refrigerants	Practical	Class and homework assignments, weekly and monthly exams
١١	٢	The student should learn the general design of suction lines, including calculating the suction line diameter, double	Refrigeration station pipes	Theoretical	Class and homework assignments, weekly and monthly exams

		risers, and liquid lines.			
١١	٣	The student must distinguish the impact of suction and discharge temperature variations on compression systems.	Refrigeration station pipes	Practical	Class and homework assignments, weekly and monthly exams
١٢	٢	The student should differentiate between vapor compression and absorption systems	Absorption systems	Theoretical	Class and homework assignments, weekly and monthly exams
١٢	٣	The student must understand absorption systems and their associated components	Absorption systems	Practical	Class and homework assignments, weekly and monthly exams
١٣	٢	The student should differentiate between the Lithium Bromide-Water absorption system and the Electrolux refrigerator.	Absorption systems	Theoretical	Class and homework assignments, weekly and monthly exams
١٣	٣	The student should gain practical knowledge of kerosene or Electrolux absorption refrigerators.	Absorption systems	Practical	Class and homework assignments, weekly and monthly exams
١٤	٢	The student should distinguish between thermoelectric cooling, steam jet refrigeration, and vortex tube cooling.	compression -Non systems	Theoretical	Class and homework assignments, weekly and monthly exams
١٤	٣	The student must understand the principles of	Thermoelectric cooling	Practical	Class and homework assignments,

		thermoelectric refrigeration.			weekly and monthly exams
١٥	٢	The student should be familiar with food preservation technologies, including refrigeration, freezing, canning, drying, adding preservatives, and packaging.	Food preservation techniques	Theoretical	Discussion and dialogue
١٥	٣	The student should be capable of identifying real-world refrigeration systems in actual implemented projects.	Field visits	Theoretical Practical +	

11. Course evaluation	
according to the tasks assigned to the student, such as daily preparation, daily oral tests, monthly or written tests, reports... etc.	Grade distribution out of ١٠٠
Daily Preparation	١٠
Daily Oral Exam	٢٠
Monthly and Written Exam	٤٠
Report Preparation	٢٠
Practical Activity	١٠

12. Learning and Teaching Resources	
Required Textbooks (Curriculum Books, if an	Remember all methodological books if found
Main References (Sources)	Remember the references (sources) if found 1- Modern Air – Conditioning Practice by Harris. 2-Principle & Refrigeration by Dossat. 3-Refrigeration & Air – conditioning by ARORA. 4-Handbook of air-conditioning system design by carrier air-conditioning company. 5-Refrigeration and Air-conditioning by Stoecker. 6-Refrigeration & Air-conditioning by Ballany.
Recommended Books	Write the name of the recommended reference for each

and References Scientific Journals and) Reports…)	course 1- Refrigeration & Air-conditioning by Jordan & Priester 2- Commercial Refrigeration by Andarase
InternetReferences and Websites	Mention the websites (such as the department's YouTub channel or any link that can be used, depending on the (specialization Websites that are interested in refrigeration and air .conditioning systems

Level Two / First Semester
Heat Transfer

1. Course Name: Heat Transfer	
2. Course code: TRA201	
3. Semester/Year: First Semester/Second Year/Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available forms of attendance: Mandatory.	
6. Number of study hours (total)	
(2 theoretical + 3 practical) weekly * 15 weeks = 75 hours	
7. Name of course supervisor (mention all names, if there is more than one name)	
Name: Anmmar Mahmoud Ahmed Email: anmarket.ahmed@ntu.edu.iq	
8. Course objectives (general objectives of the course)	
Course Objectives	1. Through this course, students will learn about t importance of the physical, thermal, and engineeri properties of natural and manufactured materials in c practical lives by studying the effect of changing t thermal conductivity of the heat-conducting medium a the extent to which geometric dimensions, such thickness and heat transfer area, affect the heat transfer the heat-conducting material. 2. Students will be able to understand the importance of t Fourier equation for heat transfer by conduction applying it to several different dimensional media a systems, including Cartesian, cylindrical, and spherical. 3. Students will be able to calculate the amount of h transferred from or to any system through the walls of t system and draw temperature distribution diagrams with any wall to identify weak points and locations of hi thermal loads.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy.

	3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	1. The student will be able to distinguish between the methods of heat transfer. 2. Understand the importance of each method of heat transfer. 3. Understand the working principle of each method of heat transfer in a simplified manner and its applications in their specialty. 4. Solve simple and applied engineering problems in this field.	Basic principles and importance of heat transfer	theoretical	Classroom and homework assignments, weekly and monthly exams
1	3	1- The student will be able to distinguish between the methods of heat transfer. 2- Understand the importance of each method of heat transfer. 3- Understand the working principle of each method of heat transfer in a simplified manner and its applications in their specialty.	Basic principles and importance of heat transfer	practical	Classroom and homework assignments, weekly and monthly exams
2	2	1. To understand the principle and mechanism of heat transfer by conduction in a simplified manner. 2. To familiarize the student with its applications in their field. 3. To learn the theories and methods for	Heat transfer by conduction	theoretical	Classroom and homework assignments, weekly and monthly exams

		calculating the total amount of heat transferred and the heat flux. 4. To distinguish between the total amount of heat transferred and the heat flux. 5. To draw and determine temperature distribution curves within the studied space. 6. To solve simple and applied engineering problems in this field.			
2	3	1- Distinguish between tangible and latent loads. 2- Understand the importance of both types. 3- Calculate the magnitude of tangible and latent loads. 4- Determine the scope of application of these two loads.	Calculation of sensible and latent load	practical	Classroom and homework assignments, weekly and monthly exams
3	2	1. The student will be able to distinguish between thermal conduction and thermal convection and the reasons for each method in general. 2. The student will be able to understand the importance of convection heat transfer. 3. The student will be able to understand and master the principles of the theories of calculating heat transfer by free and forced convection, the workings of each method in a simplified manner, and their	convection heat transfer	theoretical	Classroom and homework assignments, weekly and monthly exams

		applications in their field. 4. The student will be able to solve simple and applied engineering problems in this field.			
3	3	1- Distinguish between tangible and latent loads. 2- Understand the importance of both types. 3- Calculate the magnitude of tangible and latent loads. 4- Determine the scope of application of these two loads.	Calculation of sensible and latent load	practical	Classroom and homework assignments, weekly and monthly exams
4	2	1. The student will be able to distinguish between the method of heat transfer by radiation. 2. Understand the importance and method of calculating the amount of heat transfer by radiation. 3. Understand the principle of how this method works in a simplified manner and its applications in their field. 4. Solve simple and applied engineering problems in this field.)	Heat transfer by radiation	theoretical	Classroom and homework assignments, weekly and monthly exams
4	3	1- Distinguish between heat transfer by radiation and heat transfer by absorption. 2- Calculate the magnitude of solar radiation coefficients (absorption, reflectance, and refraction). 3- Understand the importance of radiation, solar	Heat transfer by radiation	practical	Classroom and homework assignments, weekly and monthly exams

		radiation, and their applications.			
5	2	The student will understand the basic principles of steady-state conduction heat transfer through a homogeneous, flat wall. The student will know the factors affecting the rate of heat transfer, such as thermal conductivity, cross-sectional area, temperature difference, and wall thickness. The student will learn to apply Fourier's Law in one dimension to calculate the amount of heat transferred through a wall. The student will calculate the heat transfer rate using appropriate analytical relationships, accurately applying international and local units. The student will analyze the effect of changes in the geometric and material properties of the wall on thermal performance. The student will apply the theoretical model to practical engineering problems involving insulated walls or walls subjected to specific boundary conditions (such as constant temperature or convective heat transfer from both sides). The student will draw the linear temperature	Steady conduction heat transfer with time through a single homogeneous plane wall (made of a single material)	theoretical	Classroom and homework assignments, weekly and monthly exams

		distribution through a homogeneous wall and interpret it in light of the hypotheses used. Design a wall layer suitable for a specific application condition, taking into account the minimum heat loss or thermal insulation required.			
5	3	The student will understand the principle of thermal equilibrium and conductive heat transfer across a contact interface between two dissimilar metals. The student will understand the importance of using a standard piece with a known thermal conductivity as a reference in thermal experiments. The student will learn how to properly set up a practical experiment, including installing thermal probes and adjusting heating and cooling sources. The student will accurately measure temperatures at different points on each metal using appropriate thermal sensors (such as a thermocouple). The student will calculate the rate of heat transfer through the system based on the assumption that conduction is in a steady state and that lateral heat loss is neglected.	Calculating the thermal conductivity coefficient between two different metals using a standard piece	practical	Classroom and homework assignments, weekly and monthly exams

		The student will use Fourier's law to calculate the thermal conductivity of an unknown metal by comparing the thermal gradients in both metals. The student will analyze temperature distribution curves along the sample and deduce the relative conductivity of each metal. The student will discuss potential sources of error in the experiment, such as heat loss, poor thermal contact, or an unstable heat source. Evaluate the accuracy of the obtained results by comparing them with known reference values for the two minerals. Prepare a comprehensive experimental report including the procedure steps, collected data, graphs, calculations, and a critical analysis of the results.			
6	2	The student will understand the principle of steady-state conduction heat transfer through a wall composed of multiple layers of different materials. The student will understand the relationship between material properties (such as thermal conductivity) and the thickness of each layer	Steady conduction heat transfer with time through a homogeneous composite wall (composed of several materials)	theoretical	Classroom and homework assignments, weekly and monthly exams

		in determining the overall thermal behavior of a composite wall. The student will learn how to represent a composite wall as an equivalent thermal model using an electrical circuit analogy (series thermal resistance). The student will calculate the overall thermal resistance of a composite wall by summing the thermal resistances of each layer in series. The student will apply Fourier's law to calculate the rate of heat transfer through a composite wall, taking into account the constant heat flux in a steady state. The student will determine the temperature distribution across the different layers by calculating the thermal differences between common surfaces. The student will analyze the effect of different material arrangements on the overall thermal performance (e.g., placing insulation on the exterior or interior surfaces). The student will design multi-layer thermal walls that meet the design requirements for insulation or heat dissipation in engineering		

		applications. Draw a temperature distribution diagram across a composite wall and explain the resulting linear or fractional change in each layer. 10- Discuss special cases such as the presence of contact resistance or convection at external surfaces.			
6	3	The student will understand the physical principles of conductive heat transfer across an interface between two dissimilar metals in a steady state. The student will know the basic assumptions used in the absence of a standard piece, such as the assumption of constant heat flux across both metals. The student will learn to set up a suitable thermal experiment to accurately measure the temperature distribution along each metal, using uniformly distributed sensors (such as a thermocouple). The student will calculate the thermal gradient (temperature/distance) for each metal using the data collected from the experiment. The student will estimate the heat flux across the entire system using the Fourier equation, rearranging it	Calculating the thermal conductivity coefficient between two different metals without using a standard piece	practical	Classroom and homework assignments, weekly and monthly exams

		to find the conductivity coefficient of the unknown metal. The student will analyze the results by comparing the ratios of the thermal slopes of the two metals and inferring the unknown coefficient when the coefficient of one of the metals is known. The student will discuss the effect of thermal contact at the interface between two metals and how to reduce the effect of contact resistance. Design an alternative experiment using thermal insulation techniques and accurately stabilize the thermal load to obtain more accurate results. Address potential experimental errors, such as lateral heat loss or uneven contact between surfaces, and suggest ways to reduce them. Prepare a detailed scientific report that includes a schematic diagram of the experiment, data, calculations, graphs, analysis, and final conclusions regarding the thermal conductivity of the metal under study.			
7	2	1- The student will understand the principle of steady-state conduction heat transfer through walls with different properties.	Time-stable conductive heat transfer - the difference between a single homogeneous wall and a compound heterogeneous wall,	theoretical	Classroom and homework assignments, weekly and monthly exams

		2- The student will know the structural and thermal differences between: • A single homogeneous wall: composed of a single material with a constant thermal conductivity. • A heterogeneous composite wall: composed of multiple layers of different materials with varying thermal conductivities. 3- The student will learn the mathematical models associated with each type: • Fourier's law for a homogeneous wall. • The series thermal resistance model for a composite wall. 4- The student will compare the performance of the two types of walls in reducing or facilitating heat loss, depending on the engineering application. 5- The student will calculate: • The rate of heat transfers through each type of wall using appropriate equations. • The thermal distribution within the composite wall. • The overall thermal resistance of the system. 6- The student will analyze the effect of using different materials (such as concrete, aluminum, thermal insulation) on heat transfer through	the difference between the two types, and their importance in refrigeration and air conditioning technology applications		

		walls in thermal systems. 7- Explain the reason for choosing a composite wall in refrigeration and air conditioning systems to: • Improve thermal insulation. • Reduce unwanted heat loss or gain. • Increase system efficiency. 8- Design multi-layer walls with calculated thermal efficiency for specific applications in cooled or insulated buildings. 9- Evaluate the response of a composite wall to ambient climate changes (summer and winter) compared to a homogeneous wall in HVAC systems. 10- Conclude the importance of the trade-off between cost and insulation efficiency when selecting the appropriate wall type in the thermal design of buildings and refrigeration facilities.			
7	3	The student will understand the physical concept of the thermal conductivity of solids as a physical property that reflects the material's ability to conduct heat. The student will understand the relationship between heat flux and thermal gradient in solids,	Calculating the thermal conductivity coefficient of different solid materials	practical	Classroom and homework assignments, weekly and monthly exams

		according to Fourier's law. The student will learn the experimental methods used to measure thermal conductivity, such as: The hot plate method The thermal bar method The laser flash method The student will prepare the experiment by: Preparing a solid sample in the appropriate geometric shape (cylinder, disk, plate). Attaching thermal probes to specific points to measure the thermal gradient. Providing a constant heat source at one end (e.g., an electric heater). The student will measure temperatures at different points of the sample with a specific and constant time resolution. The student will calculate the thermal conductivity of a solid using theoretical and experimental relationships. Analyze the results by comparing the measured values with reference values for similar materials and evaluate the accuracy of the measurement. Discuss potential sources of experimental error, such as: Lateral heat loss. Non-ideal thermal			

		conductivity at boundaries. Sample heterogeneity or thickness variations. Develop suggestions for improving the accuracy of the experiment, such as using appropriate insulators, increasing the number of sensors, or better controlling the source temperature. Prepare a comprehensive scientific experimental report that includes the experimental objective, instruments used, methodology, measured data, graphs, calculations, analysis, and conclusions.			
8	2	The student will understand the concept of a thermally composite wall, as it consists of several layers of different materials connected in series or parallel. The student will know how to define and calculate the thermal resistance of each layer using the formula derived from Fourier's law. The student will learn how to combine the thermal resistances of the different layers: In series: In parallel if there are multiple heat paths. The student will calculate the total heat transfer rate through a composite wall at steady state using the formula studied.	Thermal conduction in composite walls, thermal resistances, arrangement and selection of material layers for composite wall formation and thermal resistance network drawing	theoretical	Classroom and homework assignments, weekly and monthly exams

		The student will analyze the effect of arranging different materials in a wall (such as placing an insulating material in the middle or at the ends) on reducing heat loss and increasing energy efficiency. Design a composite wall consisting of different layers based on the following considerations: Required insulation level Economic cost of materials Moisture or flame resistance Aesthetics or structural weight Draw a thermal resistance network diagram (TRN) showing the relationship between heat flux and temperature difference along the wall, indicating each layer and its resistance. Interpret the thermal distribution graph across the wall and illustrate the temperature behavior in each layer. Evaluate the use of composite walls in the design of exterior walls, cold rooms, or load-bearing walls in green buildings. Document a case study or application report demonstrating the application of the above concepts to a real-world engineering			

		example (such as the wall of a refrigerated container or a pharmaceutical storage room).			
8	3	The student will understand the physical concept of thermal conductivity as a physical property that determines a material's ability to conduct heat. The student will know the difference between heat transfer in solids (such as metals) and liquids, in terms of transfer mechanisms (transfer by atomic motion versus molecular conduction). The student will learn to prepare and conduct appropriate practical experiments to measure the thermal conductivity of both metals and liquids, using: For metals: the guarded hot rod method or the hot plate. For liquids: the transient hot wire method or the insulated cell. The student will accurately measure the heat flux (qqq) and temperature gradient (ΔT\Delta TΔT) using appropriate sensors (thermocouples) installed in specific locations. The student will calculate the thermal conductivity of a material using the relationship derived from Fourier's law.	Calculating the thermal conductivity of metals and liquids	practical	Classroom and homework assignments, weekly and monthly exams

		The student will analyze the differences between the behavior of metals and liquids in thermal conductivity (e.g., copper vs. water or oil). Discuss sources of experimental error, such as: Lateral or radiative heat loss. Natural convection in liquids. Sample heterogeneity or contamination. Develop methods for improving experimental measurements (e.g., using better thermal insulation, improving the thermal stability of the source). Evaluate results by comparing them to standard values documented in the scientific literature or engineering specifications. Prepare a detailed scientific report that includes: An illustration of the experiment. Practical steps. Tables and data. Graphs showing the relationship between ΔT and distance or time. Calculations and analysis. Conclusions and recommendations.			
9	2	The student will understand the concept of thermal conductivity in composite walls and how heat is transferred	Thermal conduction in composite walls, thermal resistances, arrangement and selection of material	theoretical	Classroom and homework assignments, weekly and

		through multiple layers of different materials. The student will understand the definition of thermal resistance for each layer in a composite wall and the factors affecting it (thickness, thermal conductivity, cross-sectional area). The student will learn how to calculate the thermal resistance for each layer and construct the total wall resistance based on the layer arrangement (series or parallel). The student will calculate the total heat transfer rate through a composite wall using the sum of the thermal resistances. The student will design the arrangement of the material layers in a composite wall to achieve the highest thermal insulation efficiency, taking into account the material properties. The student will draw the thermal resistance network for a composite wall and explain the relationship between the resistances of the different layers and the temperature difference. The student will analyze the effect of the selection and arrangement of different materials on the thermal performance of a wall in refrigeration and air	layers for composite wall formation and thermal resistance network drawing		monthly exams

		conditioning applications. The student will evaluate the effectiveness of composite walls in reducing heat losses and compare it to single homogeneous walls. The student will discuss the economic and engineering considerations when selecting and arranging materials in the design of composite walls. 10- To prepare a scientific report or case study that includes calculations, graphs, and analysis of the results of designing a thermal composite wall.			
9	3	1- The student will understand the basics of conductive heat transfer in cylindrical walls, distinguishing between conduction in flat and cylindrical shapes. 2- The student will know the basic physical laws of heat conduction in cylindrical walls, including the heat flux formula. 3- The student will learn how to set up a practical experiment by accurately measuring temperatures on the inner and outer surfaces of a cylindrical wall made of a specific material. 4- The student will measure temperatures at critical points (inner	Calculating the thermal conductivity coefficient through cylindrical walls	practical	Classroom and homework assignments, weekly and monthly exams

		and outer surfaces) using accurate temperature sensors. 5- The student will calculate the heat transfer rate (Q) through the cylindrical wall using appropriate measurement methods (e.g., measuring the thermal energy lost). 6- The student will determine the thermal conductivity coefficient (k) of the material by rearranging the cylindrical heat conduction equation based on experimental measurements. 7- The student will analyze the effect of wall dimensions (layer thickness and radius) and material properties on the efficiency of thermal conduction. 8- The student will discuss potential sources of error in the experiment, such as lateral heat loss, contact resistance, or temperature instability. 9- Develop methods to improve the accuracy of measurements, such as proper cylinder insulation and the installation of heat sources. 10- Prepare a detailed scientific report including a description of the experiment, data, calculations, graphs, analysis, and conclusions regarding the thermal conductivity coefficient.		

10	2	1- The student will understand the concept of conduction heat transfer in cylindrical walls, distinguishing between a single cylindrical wall and a composite cylindrical wall. 2- The student will know the basic equations for conduction heat transfer in a single cylindrical wall. 3- The student will learn how to deal with a composite cylindrical wall composed of multiple concentric cylindrical layers, where the materials and thermal properties differ. 4- The student will calculate the thermal resistance of each cylindrical layer using the relationship derived from Fourier's law and the energy conservation equation in the cylindrical coordinate system. 5- The student will calculate the total thermal resistance of a composite cylindrical wall by summing the thermal resistances of successive layers. 6- The student will apply Fourier's law to calculate the heat transfer rate of a composite cylindrical wall. 7- The student will plot the temperature distribution along the radius of the cylindrical	Thermal conduction through a single and compound cylindrical wall	theoretical	Classroom and homework assignments, weekly and monthly exams

		wall and explain the difference between conduction in a single and composite wall. 8- The student will analyze the effect of varying thickness and conductivity of each layer on the thermal performance of a composite wall. 9- Design a composite cylindrical wall using multiple materials to achieve specific thermal insulation properties or specific design requirements. 10- Prepare a scientific report including theoretical explanations, numerical calculations, graphs, and practical applications on thermal conductivity in cylindrical walls.			
10	3	1- The student will understand the mechanism of convection heat transfer, especially on cylindrical surfaces. 2- The student will understand the difference between natural convection and forced convection and how they affect the rate of heat transfer in cylindrical walls. 3- The student will learn how to set up a practical experiment to measure temperatures inside and outside the cylinder under specific convection conditions. 4- The student will measure the temperatures on the	Calculating the convective heat transfer coefficient for cylindrical walls	practical	Classroom and homework assignments, weekly and monthly exams

		surface of the cylindrical wall and the surrounding medium using accurate thermal sensors. 5- The student will calculate the heat flux by measuring the thermal energy supplied or lost from the cylinder. 6- The student will determine the convection heat transfer coefficient (h) using the equation for calculating the amount of heat transferred by convection, known as Newton's law of convection. 7- The student will analyze the effect of factors such as air speed, the type of surrounding fluid, and the cylinder dimensions on the convection coefficient. 8- The student will discuss sources of experimental error such as radiative heat loss, irregular airflow, and temperature instability. 9- The student will develop methods to improve measurement accuracy, such as using appropriate thermal insulation and preparing uniform heat sources. 10- Prepare a comprehensive experimental report that includes: • Description of the experiment and setup • Measured data • Detailed calculations		

		• Graphs for analyzing the results • Recommendations and conclusions			
11	2	1- The student will understand the mechanism of conduction heat transfer in cylindrical objects (such as pipes) and its impact on the efficiency of refrigerated fluid transport systems. 2- The student will know the equations for steady-state heat conduction through a single cylindrical wall and with a multi-layer composite wall. 3- The student will learn to calculate the thermal resistance of each layer in multi-layer pipes, whether metallic or insulated. 4- The student will calculate the heat loss or heat gain that occurs during the transport of fluids in pipes (such as ammonia or Freon) due to thermal conduction across the cylindrical wall. 5- The student will design a thermal insulation system for refrigerated pipes that achieves minimal unwanted heat transfer by selecting appropriate materials and thicknesses. 6- The student will analyze the effect of material properties (thermal conductivity), insulation thickness, and pipe radius on the	Thermal conduction through a single and composite cylindrical wall (examples of insulation for refrigerant pipes)	theoretical	Classroom and homework assignments, weekly and monthly exams

		rate of thermal conductivity. 7- The student will differentiate between the behavior of a single wall (e.g., an uninsulated copper pipe) and a composite wall (a copper pipe plus a foam or rubber insulation layer). 8- Draw the temperature distribution across a cylindrical wall and illustrate the logarithmic behavior of the temperature gradient. 9- Evaluate the insulation efficiency of refrigeration systems by comparing the energy loss in an insulated pipe with an uninsulated one. 10- Prepare an engineering report explaining the effect of the thermal design of cylindrical walls (single and composite) on the performance of the refrigerant transport pipe network.			
11	3	1- The student will understand the concept of the overall heat transfer coefficient (U) for composite flat walls and its role in determining the overall heat loss or gain through the wall. 2- The student will know the difference between: The thermal conductivity coefficient (k): specific to a single material.	Finding the overall heat transfer coefficient for composite flat structural walls theoretically	practical	Classroom and homework assignments, weekly and monthly exams

		The convection heat transfer coefficient (h): specific to the medium (indoor or outdoor air). The overall transfer coefficient (U): takes into account both convection and conduction across the entire system. 3- The student will learn how to represent a composite wall as a series of thermal resistances: External thermal convection Thermal conductivity of each layer Internal thermal convection 4- The student will calculate: the overall thermal resistance and the overall transfer coefficient. 5- The student will apply the calculations to examples of structural flat walls composed of multiple materials (such as brick, insulation, gypsum) used in buildings or cold rooms. 6- The student will draw a temperature distribution diagram across a wall and illustrate how the temperature decreases through each layer according to its resistance. 7- Analyze the effect of changes in insulation thickness or the conductivity coefficient of a given material on			

		the U-value and, consequently, on the thermal insulation efficiency. 8- Design a composite wall with the required thermal specifications (e.g., achieving a U-value not exceeding 0.4 W/m²·K) according to green building or energy efficiency standards. 9- Compare the performance of multiple walls in terms of insulation efficiency using the resulting U-values and evaluate the thermal differences. 10- Prepare a comprehensive theoretical engineering report that includes material specifications, detailed calculations, graphic representation, and thermal analysis of the wall under study.			
12	2	1- The student will understand the principle of steady-state conduction in cylindrical bodies and the importance of this concept in fluid transport systems such as cooling and heating pipes. 2- The student will know the basic equation for heat transfer through a single cylindrical wall: 3- The student will learn how to analyze thermal conduction through a composite (multi-layer) cylindrical wall using the series thermistors	Thermal conduction through a single and compound cylindrical wall	theoretical	Classroom and homework assignments, weekly and monthly exams

		model. 4- The student will calculate the thermal resistance of each layer using the studied equation and then calculate the total thermal resistance. 5- The student will analyze the effect of using different materials in a composite wall (such as metals and insulators) on reducing heat loss or controlling temperature. 6- The student will differentiate between conduction in a single wall and a composite wall in terms of: a. Calculation method b. Thermal performance c. Practical applications (such as hot water pipes or Freon pipes in refrigeration equipment) 7- The student will design a composite cylindrical wall from selected materials (metal + insulator) to reduce heat transfer under specific operating conditions. 8- Draw the thermal resistance network for a cylindrical wall and illustrate the thermal distribution along the radius. 9- Evaluate the importance of using composite cylindrical walls in improving energy efficiency and reducing heat loss in engineering systems.			

		10- Prepare an applied thermal report that includes equations, numerical calculations, graphic diagrams, and technical analysis of the case studied.			
12	3	1- The student will understand the physical concept of the overall heat transfer coefficient (U) as a comprehensive description of convection and conduction heat transfer through a composite wall. 2- The student will know the difference between the individual coefficients: a. k: The thermal conductivity coefficient of each material within the wall b. h: The convection heat transfer coefficient on surfaces (internal and external) c. U: The overall convection + conduction coefficient combined 3- The student will learn how to set up a practical experiment to measure U, including: a. Applying heat to one side of the composite wall b. Measuring the air temperature on both sides c. Measuring the heat flux using a heat flux sensor or a heat plate 4- Accurately measure the temperatures on the internal and external surfaces of the wall and the ambient	Finding the overall heat transfer coefficient for composite flat structural walls practically	practical	Classroom and homework assignments, weekly and monthly exams

		temperature using thermocouples. 5- The student will calculate the heat flux (q) passing through the wall using: a. A heat flux meter b. Or measuring the energy consumption of a known heat source 6- The student will deduce the overall heat transfer coefficient (U) from the studied relationship. 7. Compare the measured practical values with the theoretical results calculated from the summation of the thermal resistances. 8- Discuss sources of experimental error, such as: a. Lateral heat loss b. Temperature instability c. Accuracy of measuring devices 9- Evaluate the insulation efficiency of the composite wall used and compare the results with other walls in terms of U-value. 10- Prepare a comprehensive practical report that includes: o The objective of the experiment. o The equipment and tools used. o The experimental diagram. o Measurement data. o Calculations. o Analysis and comparison. o Conclusions and recommendations.			

13	2	1- The student will understand that thermal conductivity (k) varies from one material to another, and that composite walls are usually composed of heterogeneous materials that vary in their ability to conduct heat. 2- The student will know how to calculate heat transfer in composite walls through: o Arranging layers in series, where heat is forced to pass through each layer sequentially. o Arranging layers in parallel, where heat is transferred through more than one thermal path in parallel. 3- The student will learn how the arrangement of materials within a wall affects its thermal resistance: o Placing insulation in the middle versus placing it on the outside or inside. o Arranging materials from highest to lowest conductivity. 4- The student will calculate the total thermal resistance: o In series. o In parallel. 5- The student will analyze the effect of layer arrangement in building applications such as: o External walls in hot and cold regions. o Roofs exposed to	The importance of variable thermal conductivity of composite walls (the effect of arranging material layers in series and parallel as applied examples of thermal insulation in building and facility walls)	theoretical	Classroom and homework assignments, weekly and monthly exams

		sunlight. o Walls in refrigeration and freezing rooms. 6- Design a composite wall with improved thermal distribution by selecting low-conductivity materials (such as polyurethane or glass wool) and arranging them in strategic locations. 7- Evaluate the differences in thermal performance between different composite wall designs of the same thickness but with different layer arrangement. 8- Draw thermal resistance network models for both parallel and series applications, and demonstrate how temperature differences are distributed across layers. 9- Discuss the preferred engineering recommendation for layer arrangement to achieve the highest energy efficiency and the lowest overall heat transfer coefficient (U). 10- Prepare an applied study or thermal report demonstrating the actual impact of varying conductivities and material arrangement on the insulation efficiency of a building or facility model.			
13	3	1. The student will understand that air spaces between walls or windows are not ideal insulators. Rather,	Calculating the total heat load and heat transfer through air spaces	practical	Classroom and homework assignments, weekly and

		heat is transferred through them by simple conduction, natural convection, and thermal radiation. 2. The student will be able to identify the factors affecting heat transfer through air spaces, such as: a. The thickness of the space b. The direction of heat transfer (vertical or horizontal) c. The type of air (static or moving) d. The temperature of the two surfaces e. The presence of reflective metal layers 3. The student will learn how to conduct a practical experiment that includes: a. A test chamber containing a defined air space between two surfaces b. Temperature measuring instruments on both sides of the space c. A heat flux meter or its derivation from the power used 4. The student will measure the temperature difference across the air space and the amount of heat transferred per square meter of surface. 5. The student will be able to calculate the equivalent heat transfer coefficient through the air space (effective U-value) using: 6. The student will be able to distinguish			monthly exams

		between the thermal resistance of an air space calculated experimentally and the theoretical one based on standard specifications (such as ASHRAE or ISO). 7. Evaluate the effect of engineering factors (increasing the thickness of the void, adding a reflective metal layer, or tight sealing) on reducing heat loss or gain. 8. Analyze the experimental results for the overall heat transfer coefficient and compare them with reference values for solid thermal insulation materials. 9. Design an insulation system based on studied air spaces in double walls or windows and test its thermal effectiveness. 10. Prepare a comprehensive practical engineering report containing: o Experimental objective o Experimental setup o Measured values o Calculations o Graphs o Discussion and conclusions.			
14	2	1- The student will understand the classification of materials according to their thermal conductivity into: a. Thermally conductive materials: k > 50k > 50k > 50	Applications of materials engineering in the field of refrigeration and air conditioning technologies - Conductive materials - Semiconductor materials - Insulating	theoretical	Classroom and homework assignments, weekly and monthly exams

		W/m·K (such as copper, aluminum) b. Thermally semiconductive materials: 1 < k < 101 < k < 101 < k < 101 < k < 10 W/m·K (such as some ceramics and reinforced plastics) c. Thermally insulating materials: k < 0.1k < 0.1k < 0.1 W/m·K (such as polystyrene, glass wool, polyurethane) 2- The student will understand the importance of each type in refrigeration and air conditioning system components: a. Conductors: refrigerant transport pipes, heat exchangers, metal fins b. Insulators: cold room walls, insulated pipes, pressure units c. Semiconductors: structural parts, mounting brackets, transition layers 3- The student will understand how the thermal conductivity of materials affects system performance: a. Thermal efficiency b. Thermal loss c. Temperature stability d. Required unit size and capacity 4- Distinguish between commonly used materials in the thermal design of HVACR systems in terms of: a. Density b. Thermal resistance c. Cost d. Sustainability	materials - According to the value of thermal conductivity		

		5- Analyze the environmental aspects of using certain materials (such as HFC-containing insulation or natural insulators). 6- Compare the performance characteristics of different insulation materials, such as: a. Polyurethane (PU) b. Glass wool c. Expanded polystyrene (XPS) foam 7- Calculate the thermal resistance of a wall or pipe based on the thickness and conductivity of the material. 8- Design a balanced thermal system (such as a refrigeration unit or cold room) by selecting appropriate materials for various components. 9- Evaluate the impact of selecting a material with inappropriate thermal conductivity on system performance and energy consumption. 10- Prepare a design study or report that includes: o Material properties o Justified selection of each component o Thermal impact analysis o Recommendations for improving efficiency			
14	3	1- The student will understand the three methods of heat	General review	practical	Classroom and homework

		transfer (conduction, convection, and radiation) and distinguish the basic physical properties of each. 2- The student will know the basic equations for each type of heat transfer, including: Fourier's law of conduction Newton's law of convection Stefan-Boltzmann radiation law 3- The student will learn the difference between thermal conductivity in: Simple plane walls (single material) Compound plane walls (multiple layers) Simple cylindrical walls Compound cylindrical walls (multiple concentric layers) 4- The student will calculate the thermal resistance and overall heat transfer coefficient of different walls using the appropriate formulas for each geometric shape. 5- The student will distinguish between the geometric effects on heat transfer: Area Thickness Inner and outer radii (for cylinders) Layer arrangement 6- The student will analyze the practical applications of heat transfer in:			assignments, weekly and monthly exams

		HVAC systems Wall and ceiling insulation Chilled fluid pipes Heat exchangers 7- The student will plot the temperature distribution through different walls and show their changes across layers or radii. 8- Design an effective thermal insulation system by selecting the appropriate geometric shape and materials to reduce heat loss. 9- Evaluate the performance of different thermal systems by comparing heat flux values and transfer coefficients in the studied cases. 10- Prepare a comprehensive thermal report documenting the theoretical and practical differences between engineering models and recommending the best design solutions.			
15	5	1- The student will understand the three methods of heat transfer (conduction, convection, and radiation) and distinguish the basic physical properties of each. 2- The student will know the basic equations for each type of heat transfer, including: Fourier's law of conduction Newton's law of	General Review 1- The three methods of heat transfer. 2- Thermal conduction in flat walls (simple and compound). 3- Thermal conduction in cylindrical walls (simple and compound).	Theoretical + practical	Discussion and dialogue

		convection Stefan-Boltzmann radiation law 3- The student will learn the difference between thermal conductivity in: Simple plane walls (single material) Compound plane walls (multiple layers) Simple cylindrical walls Compound cylindrical walls (multiple concentric layers) 4- The student will calculate the thermal resistance and overall heat transfer coefficient of different walls using the appropriate formulas for each geometric shape. 5- The student will distinguish between the geometric effects on heat transfer: Area Thickness Inner and outer radii (for cylinders) Layer arrangement 6- The student will analyze the practical applications of heat transfer in: HVAC systems Wall and ceiling insulation Chilled fluid pipes Heat exchangers 7- The student will plot the temperature distribution through different walls and show their changes across layers or radii. 8- Design an effective thermal insulation system by selecting the			

		appropriate geometric shape and materials to reduce heat loss. 9- Evaluate the performance of different thermal systems by comparing heat flux values and transfer coefficients in the studied cases. 10- Prepare a comprehensive thermal report documenting the theoretical and practical differences between engineering models and recommending the best design solutions.			

11. Course Evaluation

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

Daily preparation	10
Daily oral exam	20
Monthly and written tests	40
Reporting	20
Practical activity	10

12. Learning and Teaching Resources

Required textbooks (curricular books, any)	not available
Main references (sources)	1- FUNDAMENTALS OF HEAT and MASS TRANSFER,7TH ED. By: FRANK P. INCROPERA, DAVID P. DEWITT 2- HEAT TRANSFER.A PRACTICAL APPROACH, 2ND ED. By: YOUNIS CENGAL
Recommended books and references (scientific journals, reports...)	1- Reference lectures on heat transfer by the professor of mechanical engineering (retired professor Basil Ibrahim Ahmed Al-Taie) for technical institute students. 2- Reports on thermal engineering.

Electronic References, Websites	Sites interested in thermal engineering a thermal materials engineering such as: 1- Khan Academy | Free Online Cours Lessons & Practice 2- MIT OpenCourseWare | Free Online Cou Materials 3- (19) Khan Academy - YouTube 4- (19) MIT OpenCourseWare - YouTube

Second Level / Second Semester
Air Conditioning Systems Design

1. Course Name: Air Conditioning Systems Design	
2. Course Code: TRA202	
3. Semester / Year: semester/ Second year/courses	
4. Description Preparation Date: 1/ 7 / 2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 3 practical) weekly * 15 weeks = 75 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Najah Abdullah Hamad Email: najahabdullahhamad@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. Provide students with knowledge related to the design of air conditioning systems. 2. Reinforce sustainability concepts and equip students with practical skills to design, install, operate, and maintain advanced air conditioning systems, preparing them for the job market. 3. Familiarize students with modern technologies used in this field.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The student should be able to understand the methods of designing air ducts and their types	General idea about air ducts, their design methods, and types	Theoretical	Classroom and homework assignments, weekly and monthly exams
1	3	The student should be able to identify the performance and efficiency of the central heat pump	General idea about the importance of the heat pump and how to determine its performance and efficiency	Practical	Classroom and homework assignments, weekly and monthly exams
2	2	The student should be able to identify the types of pressure losses in fittings (1)	Types of pressure losses in fittings	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	3	The student should be able to understand how to connect pumps in series	Connecting pumps in series	Practical	Classroom and homework assignments, weekly and monthly exams
3	2	The student should be able to calculate pressure losses in fittings (2)	Methods of calculating pressure losses in fittings	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	3	The student should be able to understand how to connect pumps in parallel	Connecting pumps in parallel	Practical	Classroom and homework assignments, weekly and monthly exams
4	2	The student should be able to determine air motion energy and air	General idea about determining air motion energy and air	Theoretical	Classroom and homework assignments, weekly and

		distribution in rooms	distribution in rooms		monthly exams
4	3	The student should be able to identify different types of pumps through a scientific film	Presentation of a scientific film to identify different types of pumps	Practical	Classroom and homework assignments, weekly and monthly exams
5	2	The student should be able to distinguish between different fans and their types	General idea about identifying fans and their types	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	3	The student should be able to differentiate between the performance of series and parallel pipe networks	Determining the performance of series and parallel pipe networks	Practical	Classroom and homework assignments, weekly and monthly exams
6	2	The student should be able to determine fan laws and specifications	Identifying fan laws and specifications	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	3	The student should be able to identify the balance mass of the cooling tower	Balance mass of the cooling tower	Practical	Classroom and homework assignments, weekly and monthly exams
7	2	The student should be able to distinguish between different types and sources of vibration	Vibration and its sources	Theoretical	Classroom and homework assignments, weekly and monthly exams
7	3	The student	Heating balance	Practical	Classroom and

		should be able to determine the heating balance of the cooling tower	of the cooling tower		homework assignments, weekly and monthly exams
8	2	The student should be able to identify pipe design methods and their types	Pipe design and types	Theoretical	Classroom and homework assignments, weekly and monthly exams
8	3	The student should be able to calculate the heat transfer coefficient in the cooling tower	Heat transfer coefficient calculation in the cooling tower	Practical	Classroom and homework assignments, weekly and monthly exams
9	2	The student should be able to determine methods for pump calculations	Pump calculations	Theoretical	Classroom and homework assignments, weekly and monthly exams
9	3	The student should be able to identify the causes of pressure loss in pipes and bends (1)	Causes of pressure loss in pipes and bends	Practical	Classroom and homework assignments, weekly and monthly exams
10	2	The student should be able to differentiate between types of air conditioning systems	Types of air conditioning systems	Theoretical	Classroom and homework assignments, weekly and monthly exams
10	3	The student should be able to calculate pressure loss in pipes and bends (2)	Pressure loss calculation in pipes and bends	Practical	Classroom and homework assignments, weekly and monthly exams
11	2	The student should be able to	Water and air systems	Theoretical	Classroom and

		distinguish between water-based and air-based systems			homework assignments, weekly and monthly exams
11	3	The student should be able to differentiate between types of pressure losses in pipes and bends (3)	Difference between types of pressure losses in pipes and bends	Practical	Classroom and homework assignments, weekly and monthly exams
12	2	The student should be able to apply air conditioning systems in buildings	Application of air conditioning systems in buildings	Theoretical	Classroom and homework assignments, weekly and monthly exams
12	3	The student should be able to calculate the sensible heat in the system	Sensible heat calculation in the system	Practical	Classroom and homework assignments, weekly and monthly exams
13	2	The student should be able to distinguish between air filtration methods	Air filtration methods	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	3	The student should be able to calculate the latent heat in the system	Latent heat calculation in the system	Practical	Classroom and homework assignments, weekly and monthly exams
14	2	The student should be able to differentiate between various air washing methods	Air washing methods	Theoretical	Classroom and homework assignments, weekly and monthly exams
14	3	The student should be able to distinguish between	Air filtration and its types	Practical	Classroom and homework

		air filtration types			assignments, weekly and monthly exams
15	2	The student should be able to distribute energy in air conditioning systems	Energy distribution in air conditioning systems	Theoretical	Classroom and homework assignments, weekly and monthly exams
15	3	The student should be able to gain field experience through a scientific visit	Scientific field visit	Practical	Discussion and dialogue

11. Course Evaluation

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

Daily preparation	10
Daily oral exam	20
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources

Required textbooks (curricular books, if any	not available
Main references (sources)	1- PRINCIPLES OF HEATING VENTILATING AND AIR CONDITIONING by ASHRAE 2- مبادئ هندسة التكييف و التثليج للدكتور خالد الجودي
Recommended books and references (scientific journals, reports...)	1- Books on air conditioning system design. 2- Reports on air conditioning syster design.
Electronic References, Websites	Sites that care air conditioning syster design.

Second Level / First Semester

Course Description Form

1. Course Name: Refrigeration and air conditioning maintenance	
2. Course Code: TRA203	
3. Semester / Year: First semester/second year/courses	
4. Description Preparation Date: 1/7/2025	
5. Available Attendance Forms: mandatory	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 4 practical) weekly * 15 weeks = 90 hours	
7. Course administrator's name (mention all, if more than one name)	
Name: Mohammed Nazar Yousif Email: mohammednazar1983@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1-Educating students and providing them with the necessary skills and experience to maintain and operate air conditioning and refrigeration equipment. 2-The student will gain knowledge of the working parts of refrigeration and air conditioning equipment. 3-The student will learn about the periodic maintenance of refrigeration and air conditioning equipment.
9. Teaching and Learning Strategies	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The student should know the	General idea about refrigeration and air	Theoretical	Classroom and homework assignments,

		types of maintenance and their importance.	conditioning equipment and maintenance of equipment - and types of maintenance		weekly and monthly exams
1	4	The student should identify the faults and how to treat them.	General idea about the importance of maintenance for refrigeration and air conditioning equipment - loading and unloading process - external inspection.	Practical	Classroom and homework assignments, weekly and monthly exams
2	2	The student will identify common types of faults in refrigeration and air conditioning systems.	Mechanical circuit of a compressor refrigeration system. Maintenance of each part. Expected failures for each part, as well as failures of auxiliary parts.	Theoretical	Classroom and homework assignments, weekly and monthly exams
2	4	The student will identify the importance of the parts of the compression refrigeration system.	General idea of the parts of the compression refrigeration system (main parts and accessories)	Practical	Classroom and homework assignments, weekly and monthly exams
3	2	The student will be able to explain the basic principles of the compression refrigeration cycle and identify faults.	Use of external inspection method - to identify mechanical and electrical faults	Theoretical	Classroom and homework assignments, weekly and monthly exams
3	4	The student will learn about the mechanical and electrical circuit of a home refrigerator.	Maintenance of home refrigeration appliances (refrigerator) (mechanical and electrical circuit)	Practical	Classroom and homework assignments, weekly and monthly exams
4	٢	The student will be able to maintain home refrigeration appliances.	Maintenance of home refrigeration appliances (refrigerator - freezer - water cooler) mechanical	Theoretical	Classroom and homework assignments, weekly and monthly exams

			circuit		
4	٤	The student should be able to differentiate between the components of home refrigeration appliances.	Maintenance of home refrigeration appliances (refrigerator - freezer - water cooler) mechanical circuit	Practical	Classroom and homework assignments, weekly and monthly exams
5	٢	The student should be able to distinguish between electrical and mechanical faults in refrigeration devices.	Electrical circuit study - identifying faults - causes and treatment for the home set	Theoretical	Classroom and homework assignments, weekly and monthly exams
5	٤	The student will be able to maintain the water cooler and identify common faults.	Maintenance of home refrigeration equipment (water cooler) (mechanical and electrical circuit)	Practical	Classroom and homework assignments, weekly and monthly exams
6	٢	1- The student will explain the methods for detecting refrigerant leaks and the tools used for this purpose. 2- The student will measure the pressure and adjust the refrigerant charge according to specifications.	Replacing cycle parts - Charging - Discharging - Adding oil - Leakage check	Theoretical	Classroom and homework assignments, weekly and monthly exams
6	٤	The student should identify the difference between the normal and reverse cycle of the wall-mounted air conditioner.	Wall-mounted air conditioner maintenance – normal and reverse cycle / How to identify, inspect, and repair faults	Practical	Classroom and homework assignments, weekly and monthly exams
7	٢	Room wall air conditioning unit	Refrigeration and air conditioning	Theoretical	Classroom and homework assignments,

		maintenance (regular and reverse cycle air conditioning unit)	maintenance		weekly and monthly exams
7	٤	1- The student must correctly carry out the charging, discharging, and full discharge processes. 2- The student must be able to add oil to the compressor.	Maintenance Operations - Welding (Types) - vacuum and charging- Oil Change and Addition	Practical	Classroom and homework assignments, weekly and monthly exams
8	٢	The student must replace faulty refrigeration components such as the compressor, condenser, thermostat, etc.	Replacement of parts (mechanical and electrical circuits)	Theoretical	Classroom and homework assignments, weekly and monthly exams
٨	٤	The student should appreciate the importance of maintenance in extending the life of the equipment and improving its efficiency.	Reciprocating compressor maintenance - compressor inspection - compressor maintenance - bearing replacement - leakage fluid - valves	Practical	Classroom and homework assignments, weekly and monthly exams
٩	٢	1- The student will be able to identify reciprocating compressor faults. 2- The student will cooperate positively within the maintenance team or laboratory.	Reciprocating compressor – compressor check – compressor faults –	Theoretical	Classroom and homework assignments, weekly and monthly exams
٩	٤	1- The student will identify faults in the car's air conditioning system.	Car air conditioning maintenance - cleaning parts - draining and charging the system	Practical	Classroom and homework assignments, weekly and monthly exams

		2- The student will protect the environment by using gases safely and avoiding their leakage.	- adding oil to the compressor - opening the compressor and replacing the leak seal		
10	2	1. The student must properly disassemble and reassemble the components of a vehicle's air conditioning system. 2. The student must demonstrate a commitment to developing their own skills and keeping up with developments in maintenance techniques.	Compressor parts maintenance - seat replacement - leakage fluids - valve maintenance	Theoretical	Classroom and homework assignments, weekly and monthly exams
10	4	To comply with the occupational gas pathology laboratory test when working with electrical components.	Electrical circuit of the car air conditioner with various tests	Practical	Classroom and homework assignments, weekly and monthly exams
11	2	The student should know the importance of maintaining separate and integrated air conditioning units.	Split and integrated air conditioning maintenance – device installation – device description	Theoretical	Classroom and homework assignments, weekly and monthly exams
11	4	The student will identify the most important faults and maintenance methods for separate and integrated air conditioning units.	Maintenance of split and complete air conditioning units / Description of parts, maintenance of basic parts and accessories (filters - fans - rotary shafts - oil filters, etc.)	Practical	Classroom and homework assignments, weekly and monthly exams
12	2	The student should be able to	Types of air-cooled or water-cooled	Theoretical	Classroom and homework assignments,

		differentiate between the types of air-cooled and water-cooled devices.	equipment. Maintenance of parts. Compressor - Condenser - Evaporator - Filter - Fans and shafts		weekly and monthly exams
12	4	1- The student must excel in identifying faults in all parts. 2- The student must assume responsibility for completing tasks on time.	Electrical circuit maintenance - Method of checking and identifying faults for all parts, studying control devices and electrical control panel - fault identification table	Practical	Classroom and homework assignments, weekly and monthly exams
13	2	1- The student will use measuring tools (ammeter, voltmeter, manometer) accurately. 2- The student will detect faults using electrical circuit diagrams.	vacuum and charge - Oil change - Compressor replacement - Checking the control devices, electrical control panel and fault finding table	Theoretical	Classroom and homework assignments, weekly and monthly exams
13	4	1- The student will be able to install and replace parts for commercial refrigeration units. 2- The student must document the maintenance process through a detailed maintenance log or form.	Commercial refrigeration unit maintenance – parts installation – parts replacement.	Practical	Classroom and homework assignments, weekly and monthly exams
١٤	٢	The student will be able to distinguish between the types of commercial refrigeration units.	Types of commercial refrigeration units - How to install the unit	Theoretical	Classroom and homework assignments, weekly and monthly exams
١٤	٤	The student should know the	Commercial refrigeration units -	Practical	Classroom and homework assignments,

		methods of discharging, charging and leakage testing.	vacuum, charging and leak testing.		weekly and monthly exams
١٥	2	The student will become familiar with the control devices and the control panel.	Electrical circuit maintenance (control devices and control panel)	Theoretical	Classroom and homework assignments, weekly and monthly exams
15	4	The student will be able to maintain a central air conditioning unit with a reciprocating and centrifugal compressor in the case of two or more compressors for a combined cycle.	Maintenance of a central air conditioning unit with a reciprocating and centrifugal compressor in the case of two or more compressors for a combined cycle	Practical	Classroom and homework assignments, weekly and monthly exams

11. Course Evaluation

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

Daily preparation	10
Daily oral exam	10
Classroom activity	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main reference (sources)	1- Refrigeration and Air Conditioning Technology. 2- Modern Refrigeration and Air Conditioning. 3- Air Conditioning and Refrigeration Repair Made Easy,
Recommended books and references (scientific journals, reports...)	1-ASHRAE Journal. 2- International Journal of Refrigeration.
Electronic	1-

References, Websites	https://www.youtube.com/watch?v=fJcMV9EWYAU&list=PL_rxhivlh6RC7XzllHNvZOKW7mKw0g5AK

Second Level / First Semester

Fundamentals of Control Systems

1. Course: Fundamentals of Control Systems	
2. Course Code : TRA204	
3. Semester / Year: First Semester / Second Year / Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available Forms of Attendance: Mandatory	
6. Number of Credit Hours (Total)	
(2 theoretical + 3 practical) per week * 15 weeks = 75 hours	
7. Course administrator name (list all names, if more than one)	
Name: Abdullah Mohammed Abdulwahab Email: abdullahmalfakhrey@ntu.edu.iq	
8. Course Objectives (General Objectives of the Course)	
Course Objectives	• Providing students with basic knowledge of the concepts and principles of measurement and control. • Understand the different types of control systems, their classifications, and uses • Application of calibration principles and practical operation of thermal and pressure control devices. • Analysis of electrical and electronic circuits of control systems. • Use control devices safely and effectively in refrigeration and air conditioning applications. • Enable students to link theory to practi application and understand the importance of control techniques in engineering systems
9. Teaching and Learning Strategies	

Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Identify the general concepts of the course and the importance of control systems	Course Introduction, Control Systems Concepts, Control Objectives	Lecture + Presentation	Oral assessment
1	3	Preparing for laboratory work and understanding control tools	Learn about the laboratory environment and tools	Field tour + practical explanation	Oral Question
2	2	The student can understand the functions of control systems in thermal applications	Principles of control, reasons for their use, types of control devices	Lecture + Classroom Discussion	Written quiz
2	3	Adjusting temperature and humidity controllers	Calibration of thermostats, humidity and pressure with installation	Practical	Practical Report
3	2	Classification of control devices (ON-OFF, proportional, etc.)	Types of control devices by power source and procedure	Lecture + Analysis Examples	writing exercise
3	3	Running Circuits ON-OFF and measuring the response	Experiment with the types of control devices and mechanism and according to the nature of the action taken	Practical	Practical Report
4	2	The student can Classify the control devices (ON-OFF, proportional, etc.)	Types of control devices by power source and procedure	theoretical + Analysis Examples	writing exercise
4	3	Build a simplified multi-element control system	Assembling a typical control system	Practical	Discussions + Practical Report
5	2	The student should	Components of	Theoretical	Analytical

		distinguish between ruler, sensor, Variables, debugging module	the Model System and Basic Terms		assignment
5	3	Understanding the components of thermostats and pressure	Dismantling and installation of control regulators	Practical	Discussions
6	2	Interpret the relationship between inputs and responses	Measurement vs. control, concepts of deviation and diffraction	Presentation + Interactive Exercise	Descriptive test
6	3	The student should learn how to track variables during system operation (deviation measurement and response)	Deviation measurement and response	Practical	Discussions + Practical Report
7	2	Able to explain the work of pressure and heat regulators humidity and flow rate Theoretically	Thermal and pressure control systems	Theoretical + Analysis and compare	Theoretical monthly test
7	3	The student should know the how to monitor and performance analysis of control system	Installation of a thermal sensor and a pressure and humidity sensor with a circuit	Practical	Discussions + Practical Report
8	2	The student must understand and control the properties of variables and the difference between the terms measurement and control	Measurement, the difference between measurement and control, and the principle of action Measuring and sensing devices for various factors in refrigeration devices	Presentation + Questions Answers + Discussion	Classroom and homework
8	3	Practical test			
9	2	The student should understand the features, components and types of electrical control circuits	Services Systems Electric control	theoretical + Analysis and compare	Class duties
9	3	Assemble and connect elements according to a diagram	Construction of a simple electrical control circuit	Teamwork + direct supervision	Field Assessment
10	2	The student must be	Features and	Discussions	Class duties

		able to demonstrate the Interpret electrical circuit symbols and diagrams	types Electrical circuits, their components, types of circuit drawing Electrical		
10	3	Uptime programming and performance monitoring	Test Relays and Timers	practical + Process Control	Field Assessment + Report
11	2	Distinguish between conventional and electrical control and electronic	Circuits & Systems Electronic control	theoretical + Analysis and compare	Test, Report
11	3	Know the difference between electrical and electronic sensors and modern technologies used in refrigeration and air conditioning systems	Comparison of some electronic and electrical sensors, the nature of use and the mechanism of action	Seminars and practical review of some sensors	Discussions
12	2	The student should know the components and parts of some important electronic circuits in refrigeration and air conditioning systems	Study of the air conditioner card and some simple and advanced electronic circuits And to identify timers and modern types of relays	theoretical + Analysis and compare	Discussions
12	3	The student should know how to Insert an electronic sensor into a control system	Installation of a simple electronic circuit	Teamwork + direct supervision	Field Assessment
13	2	The student should understand the integration of electronic control with sensors	Electronic sensors and programming	Theoretical presentation + discussion	Class assignments and weekly and monthly exams
13	3	The student should be able to deal with an Electronic controller software	Programming a control circuit	Realistic simulation	ical Group Pract Assessment + Discussions
14	2	The student should understand the features, components and types of air control circuits	Pneumatic control circuits and systems	Theoretical presentation + discussion	Discussions
14	3	The student should be identify the components of an air control circuits in	Pneumatic control circuits and systems (Controllers and	practical	Discussions + Report

		refrigeration and air conditioning systems	Sensitizers)		
15	5	Scientific visit	Various control systems (electrical, electronic and pneumatic)	Theoretical + Practical	Discussion and dialogue

11.Course Evaluation

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

Daily preparation and activity	20
Daily oral exam	10
Monthly and written tests	40
Reporting	20
Practical activity	10

12.Learning and Teaching Resources

Required textbooks (curricular bool if any)	
Main references (sources)	• Engineering Measurement & instrumentation by L.f. Adams • Control systems for heating & ventilation and Air- condition, by Haines
Recommended books and references (scientific journals, reports...)	• Instrumentation for Engineering Measurements by James W. Dally , William F. Riley , Kenneth G. McConnell • Introduction to Instrumentation, Sensors, an Process Control by Dunn, William C
Electronic References, Websites	

First Level / Second Semester
Drawing of air conditioning systems

1. Course Title: Drawing Air Conditioning Systems	
2. Course Code TRA205 :	
3. Semester / Year: Second Semester / First Year / Courses	
4. Date of preparation of this description: 1/7/2025	
5. Available Forms of Attendance: Mandatory	
6. Number of Hours (Total)	
(3 Practical) Weekly*15 Weeks = 45 Hours	
7. Name of the course administrator (mention all names, if there is more than one)	
Name: Rafal Khalid Jassim Email: mti.lec228.rafal@ntu.edu.iq	
8. Course Objectives (General Course Objectives)	
Course Objectives	1- Introducing the student to the components of basi refrigeration and air conditioning systems compressor, condenser, Understand parts such as .evaporator, and pipes 2. Acquire the skill of reading and interpreting simp technical drawings. Ability to distinguish various technical codes and graphics of HVAC systems. 3. Enable the student to draw the diagrams of the refrigeration and air conditioning systems manually and/or using a computer (e.g. AutoCAD). Acquire basic practical skills in industrial drawing. 4. Learn to represent the distribution of ducts and cooling pipes inside buildings Drawing of air distribution systems and connections between units and components. 5. Motivating the student to think logically in the design and implementation of simplified air conditioning systems. Differentiate between systems by location, size, and nature of use. 6. Qualifying the student to participate in the

	implementation of technical works related to air conditioning and refrigeration systems at the sites. Work within a technical team to understand and app executive drawings.

9. Teaching and Learning Strategies
Remember all the teaching and learning strategies that follow each course

Strategy	1- Acquire manual and digital drawing skills using engineering tools and software. 2- Training on realistic mini-projects that simulate real operating systems.. 3- Computers equipped with drawing programs such as AutoCAD. 4- Educational videos and examples of real projects. 5- Periodic reviews before the exams. 6- Training the student to prepare real executive drawings that can be used in the field. 7- Developing the student's artistic and professional sense to be ready to work immediately after graduation.

10.Course structure

week	Hours	Required Learning Outcomes	Unit Name/Topic	Method of education	Evaluation Method
١	3	The student will become familiar with the basic AutoCAD commands and instructions and apply them in drawing simple geometric shapes.	Introduction to Orders and Instructions	practical	Review

٢	3	The student will master the use of the Line command in AutoCAD to draw accurate engineering drawings using coordinates.	Panels that only include the use of fonts	practical	Classroom and homework, weekly and monthly exams
٣	3	The student will be able to draw, design and connect air ducts using basic AutoCAD commands accurately according to engineering drawings.	Duct connection	practical	Classroom and homework, weekly and monthly exams
٤	3	The student will perform an actual ductwork drawing using real architectural and structural drawings.	Duct Projection	practical	Classroom and homework, weekly and monthly exams
٥	3	The student draws mechanical parts symbols manually or using design software (such as AutoCAD).	Mechanical Parts Codes for Systems Air conditioning and refrigeration	practical	Classroom and homework, weekly and monthly exams
٦	3	The student draws the basic mechanical circuit and advanced types manually or using computer programs.	Mechanical Circuits Cooling Systems	practical	Classroom and homework, weekly and monthly exams
٧	3	The student will draw electrical circuits for different air conditioning and refrigeration systems (symbolic and	Electrical Circuits HVAC & Refrigeration Systems	practical	Classroom and homework, weekly and monthly exams

		linear drawing).			
٨	3	The student analyzes the unit diagram and deduces the distribution of internal components.	Drawing a section for units Coil & Fan	practical	Classroom and homework, weekly and monthly exams
٩	3	That the student understands the function of the Supply Air Duct and the Return Air Duct.	Drawing a section for a file unit and a fan with the drive line and tow line illustration and its representation on the ceiling	practical	Classroom and homework, weekly and monthly exams
١٠	3	The student should be able to distinguish between the horizontal (Plan View) and vertical (Riser Diagram) when representing pipes between floors.	Diagram drawing of water pipes Cooling Up Room Machines with a propeller on a certain floor	practical	Classroom and homework, weekly and monthly exams
١١	3	The student should be able to distinguish between the technical symbols for each element according to the technical code or engineering guide.	Two-Dimensional Drawing Cooling Water System Condensation and Charging Installed with valves Control Devices	practical	Classroom and homework, weekly and monthly exams
١٢	3	The student will draw a 3D cooling and condensing system using drawing software (such as AutoCAD 3D, Revit MEP, or SolidWorks).	Drawing a water system Cooling & Condensing and charging in a stereoscopic style (3D) Composite It has valves on it Control Devices	practical	Classroom and homework, weekly and monthly exams
١٣	3	The student will draw an accurate diagram of the	Drawing a System Diagram Control for Air	practical	Classroom and homework,

		control system for the air conditioning unit using AutoCAD commands and technical symbols approved for air conditioning systems.	**Conditioning Unit**		**weekly and monthly exams**
١٤	**3**	**The student will be able to accurately draw the control system diagram for an air exchanger unit and a home cooling panel using AutoCAD and approved electrical and mechanical symbols.**	**Drawing a System Diagram Control for Exchanger Unit Air Cooling Panel Household**	**practical**	**Classroom and homework, weekly and monthly exams**
١٥	**3**	**The student will draw an accurate diagram of the control system for a separate cooling panel using basic AutoCAD commands and approved technical symbols.**	**Drawing a System Diagram Control Cooling Panel Separate**	**practical**	**Classroom and homework, weekly and monthly exams**

11. Course Evaluation

Distribution of scores out of 100 according to the tasks assigned to the student such as daily preparation, daily oral tests, monthly or written tests, reports... Etcetera.

Daily Preparation	10
Daily Operation Testing	25
Monthly and Process Testing	50
Practical activity	15

12. Learning and Teaching Resources	
Required textbooks (curriculum books, if applicable)	Remember all textbooks, if any.
Key Reference(s)	Mention reference(s) if any A variety of engineering sketchbooks prepared the department that includes all the requirements drawing air conditioning systems
Recommended books and references (scientific journals, reports...)	Write the name of the recommended reference for each course 1- Books that are concerned with air conditioning systems. 2- Special reports for the drawing of air conditioning systems
References and Websites	Remember the websites (such as the departmer YouTube channel or any link that can be used a according to the Websites that are interested in designing a drawing air conditioning systems

Second Level / Second Semester

Computer Applications

1. Course Name: Computer applications
2. Course Code: TRA206
3. Semester / Year: Second semester/second year/courses
4. Description Preparation Date: 1/ 7 / 2025
5. Available Attendance Forms: mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
(1 theoretical +1 practical) weekly * 15 weeks = 30 hours
7. Course administrator's name (mention all, if more than one name)
Name: Bassam abbas ali Email: bassamabbasalnajjar@ntu.edu.iq
8. Course Objectives

Objectives	1. Learn the basic rules for dealing with and managing software applications to help complete projects and prepare statistics and graphs. 2. Learn and master accounting software, particularly Excel.
9. Teaching and Learning Strategies Remember all the teaching and learning strategies used for each course.	
Strategy	1- Self-direction strategy. 2- Collaborative learning strategy. 3- Role-playing strategy. 4- Discussion and dialogue strategy. 5- Lecture strategy. 6- Research and discovery strategy. 7- Brainstorming strategy.
10. Course structure	

week	Hours	Required learning outcomes	Unit name/topic	Teaching method	Evaluation method
1	2	-The student will understand how to write mathematical formulas. -The student will master the use of basic mathematical symbols (addition, subtraction, multiplication, and division) . -The student will be able to use cell references in formulas. -The student will apply mathematical operations to solve problems.	Simple mathematical operations in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
2	2	-The student will learn the basic components of a worksheet and their importance. -The student will distinguish between different worksheets and how to navigate between them. -The student will perform basic operations on them, such as adding, deleting, and renaming. -The student will understand the importance of clearly naming worksheets to facilitate data organization.	Worksheet in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
3	2	- The student will determine basic cell formatting options, such as font, size, and color. -The student will select different number formats	Simple cell formatting in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		(such as currency and date) to suit the data type. -The student will perform cell formatting operations to make the data clearer and easier to read. -The student will demonstrate a scientific understanding of the importance of formatting in making data professional and organized without changing its actual value.			
4	2	-The student will understand the concept of conditional formatting and its role in visually analyzing data. -The student will list the different types of conditional formatting (such as cell highlighting rules and data bars) -The student will implement a simple conditional formatting rule to highlight specific values in data. -The student will draw preliminary conclusions through visual data formatting.	Conditional Formatting in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
5	2	The student will understand the difference between a worksheet and a workbook. -The student will list the basic components of a worksheet (columns, rows, and cells) -The student will	Worksheets in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		perform basic navigation within the worksheet using the keyboard and mouse. -The student will adhere to the correct print settings for the worksheet.			
6	2	The student will understand the concept of columns and rows and how to identify them in a worksheet. -The student will distinguish between columns and rows based on their naming (letters and numbers) -The student will perform insertion, deletion, and resizing operations on columns and rows. -The student will complete the task of organizing data into rows and columns for easy reading and analysis.	Columns and Rows in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
7	2	-The student will understand the concepts of sorting and filtering and their role in dealing with data. -The student will distinguish between sorting (arranging data) and filtering (displaying only a portion of it) -The student will perform simple sorting and filtering operations on data. -The student will complete the task of	Sorting and Filtering in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		extracting the required information by filtering a set of data.			
8	2	The student will understand the purpose of the four functions: SUM, AVERAGE, MAX, and MIN. -The student will identify the appropriate function to perform a specific calculation (for example, the MAX function to find the highest value) -The student will implement the correct formula for each of these functions. -The student will complete the task of summarizing a set of data using these functions effectively.	Functions in Excel: SUM, AVERAGE, MAX, MIN	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
9	2	The student will understand the basic structure of the IF function and how to use it to make decisions based on a specific condition. -The student will distinguish between the simple addition function SUM and the conditional addition function SUMIF. -The student will implement the SQRT function to calculate the square root of any numeric value. -The student will complete the task of summing data that meets	Functions in Excel: SUM, AVERAGE, MAX, MIN	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		a specific condition using the SUMIF function.			
10	2	The student will understand how to use the SIN and COS functions to calculate the sine and cosine values of angles. -The student will apply the INT function to obtain the integer part of any decimal number. -The student will implement the POWER function to calculate the value of a number raised to a specific power. -The student will connect the use of these functions to mathematical and engineering solutions to problems.	Functions in Excel: SIN, COS, INT, POWER	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
11	2	- The student will understand how to use the SIN and COS functions to calculate sine and cosine. -The student will identify the purpose of the INT function in rounding decimal numbers to the nearest whole number. -The student will implement the POWER function to calculate the value of a number raised to a specific power. -The student will solve mathematical and engineering problems effectively using these functions.	Functions in Excel: MAX, MIN, ABS, FACT	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

12	2	- The student will distinguish between the COUNT function for counting numeric cells, the COUNTA function for counting non-blank cells, and the COUNTBLANK function for counting empty cells. -The student will understand the basic structure of the COUNTIF function and how to use it to count cells that meet a specific condition. -The student will apply different counting functions to various data sets to arrive at accurate statistics. -The student will discuss the importance of these functions in summarizing data and making decisions based on numerical information.	Functions in Excel: COUNT COUNTA COUNT BLANK COUNTIF	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
13	2	- The student will understand how to use the NOW and TODAY functions to insert the current date and time into a worksheet. -The student will apply the DATEDIF function to calculate the time difference between two different dates (in days, months, or years) -The student will implement the CONCATENATE function to combine the contents of two or more	Functions in Excel: NOW TODAY DATEDIF CONCATENATE MOD	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		cells into a single cell. -The student will analyze how to use the MOD function to obtain the remainder and its importance in various mathematical operations.			
14	2	- The student will learn the importance of charts in transforming data into clear visual information. -The student will distinguish between different types of charts (such as bar charts, pie charts, and line charts) and when to use each type. -The student will apply the basic steps for creating a chart from a given data set. -The student will connect a good chart to the data it reflects and choose the best type of chart to present a particular idea.	Charts in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams
15	2	-The student will understand the various print settings, such as print range, orientation, and margins. -The student will perform a Print Preview to ensure that the workbook will appear as intended. -The student will apply custom print settings, such as repeating column rows or row headings on	Print the workbook in Excel	Theoretical + practical	Classroom and homework assignments, weekly and monthly exams

		each printed page. -The student will consider the importance of printing data clearly and organized to facilitate reading and analysis.			

11. Course Evaluation	
Grades are distributed out of 100 based on the tasks assigned to the student, such as daily preparation, daily oral tests, monthly or written tests, reports, etc	
Daily preparation	10
daily oral tests	20
monthly or written tests	40
Preparing reports	20
Practical activity	10

12. Learning and teaching resources	
Required textbooks (curriculum books, if available	Remember all the textbooks if any
Main References (Sources)	Cite references (sources), if any. Computer and Office Applications Book, Part 3 (Microsoft Office)
Recommended books and references (scientific) journals, reports...	Write the name of the recommended reference for each course. 1- Books that focus on software.
Electronic references and websites	Remember the websites (such as the department's YouTube channel or any link that can be used according to the specialization Sites that are interested in software applications.