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

2025-2026

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission, and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form
2025-2026

University: Northern Technical University
Faculty/Institute: College of Oil and Gas Techniques Engineering / Kirkuk
Scientific Department: Fuel and Energy Techniques Engineering
Academic or Professional Program Name: Baccalaureate of Fuel and Energy Techniques Engineering
Final Certificate Name: Baccalaureate in Fuel and Energy Engineering Techniques.
Academic System: Course-based System
Description Preparation Date: 30/06/2026
File Completion Date: 30/06/2026

Signature:
Head of Department: Lec. Dr. Isam Ezzulddin Yousif
Date: 30/06/2026

Signature:
Deans Assistant for Scientific Affairs: Ass. Prof Dr. Sherwan M. Najim
Date: 30/06/2026

Division of Quality Ăssurance and University Performance
Manager Name: Lec. Dr. Saad Saleem Merie
Date: 1/7/2026

Signature:

الجامعة التقنية الشمالية
شعبة ضمان الجودة وتقويم الاداء الجامعي
كلية هندسة تقنيات النفط والغاز

مصادقة السيد العميد : أ.م.د عبيد مجيد علي

1. Program Vision

Leadership in education and research in the field of fuel and energy technology engineering and mastery of technology transfer to a society that enjoys science and knowledge to keep pace with development and progress in the world.

2. Program Mission

The Department of Fuel and Energy Engineering seeks to provide high-quality educational experience to prepare engineering cadres in the field of fuel and energy to meet the needs of the labor market, who possess technical skills in education and research.

3. Program Objectives

1. Preparing qualified and trained technical engineers according to international quality standards, capable of facing challenges in the field of fuel and energy engineering.
2. Conducting applied research and studies and encouraging innovation in the field of fuel and energy production
3. Building strategic partnerships to enhance cooperation between the academic and industrial sectors.
4. Disseminating scientific knowledge in the field of sustainable energy
5. Providing educational and training opportunities that enhance students' practical and leadership skills.
6. Graduating qualified engineers committed to social and environmental responsibility.

4. Program Accreditation

The program has been applied for accreditation.

5. Other external influences

There is no sponsor for this program.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	12	22	14.29	Basic course
College Requirements	14	31	20.13%	Core and Support
Department Requirements	31	99	64.29%	Core
Summer Training	2	0	%0	-
Other	59	154	%100	-

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
First Level	**NTU 100**	**Human Rights**	**theoretical**	**practical**
			1	**0**
First Level	**NTU101**	**English Language (1)**	**Theoretical**	**practical**
			2	**0**
First Level	**NTU102**	**Computer Principles (1)**	**theoretical**	**practical**
			1	**2**
First Level	**NTU103**	**Computer Principles (2)**	**theoretical**	**practical**
			1	**2**
First Level	**NTU104**	**Arabic Language**	**theoretical**	**Practical**
			2	**0**
First Level	**NTU105**	**Sport**	**theoretical**	**practical**

			1	1
First Level	NTU106	Democracy	theoretical	practical
			1	0
First Level	OECK105	Engineering Mechanics	theoretical	practical
			3	0
First Level	OECK101	Mathematics (1)	theoretical	practical
			2	0
First Level	OECK102	Mathematics (2)	theoretical	practical
			2	0
First Level	OECK103	Engineering Drawing	theoretical	practical
			1	2
First Level	OECK104	Workshops	theoretical	practical
			0	3
First Level	PCHE111	Principles of Chemical Engineering	theoretical	practical
			6	0
First Level	ANCH112	Analytical Chemistry	theoretical	practical
			4	2
First Level	ORCH110	Organic Chemistry	theoretical	practical
			4	2
Second Level	NTU200	English language (2)	theoretical	practical
			2	0
Second Level	NTU201	Professional Ethics	theoretical	practical
			2	0
Second Level	OECK201	Mathematics (3)	theoretical	practical
			3	0
Second Level	OECK202	Mathematics (4)	theoretical	practical
			3	0
Second Level	OECK203	Engineering Physics	theoretical	practical
			2	0
Second Level	OECK204	Summer Training	theoretical	practical
			0	0
Second Level	REF210	Petroleum Refining	theoretical	practical
			2	2
Second Level	MAB211	Material Balances	theoretical	practical

			2	0
Second Level	ENB212	Energy Balances	theoretical	practical
			2	0
Second Level	PHCH213	Physical Chemistry	theoretical	practical
			2	2
Second Level	ELTE214	Electrical Technology	theoretical	practical
			2	2
Second Level	FLUD215	Fluid Mechanics (1)	theoretical	practical
			2	2
Second Level	FLUD216	Fluid Mechanics (2)	theoretical	practical
			2	2
Second Level	EOS217	Energy Sources	theoretical	practical
			2	0
Second Level	CPML218	Computer Programming - MATLAB	theoretical	practical
			2	2
Second Level	STAT219	Engineering Statistics	theoretical	practical
			2	2
Third Level	NTU300	English Language (3)	theoretical	practical
			2	0

Third Level	OECK301	Engineering Analysis	theoretical	practical
			3	0
Third Level	OECK302	Numerical Analysis	theoretical	practical
			2	2
Third Level	OECK303	Summer Training (2)	theoretical	practical
			0	0
Third Level	HEAT310	Heat Transfer (1)	theoretical	practical
			2	2
Third Level	HEAT311	Heat Transfer (2)	theoretical	practical
			2	2
Third Level	MASS312	Mass Transfer (1)	theoretical	practical
			2	2
Third Level	MASS313	Mass Transfer (2)	theoretical	practical
			2	2

Third Level	THMD314	Thermodynamic (1)	theoretical	practical
			2	2
Third Level	THMD315	Thermodynamic (2)	theoretical	practical
			2	2
Third Level	NGP316	Natural Gas Processing	theoretical	practical
			3	0
Third Level	REN317	Renewable Energy	theoretical	practical
			3	0
Third Level	OSH318	Occupational Health and Safety	theoretical	practical
			2	0
Third Level	ICE350	Internal Combustion Engine	theoretical	practical
			3	0
Fourth Level	NTU400	English language (4)	theoretical	practical
			2	0
Fourth Level	NTU401	Research Methodology	theoretical	practical
			2	0
Fourth Level	OECK401	Project (1)	theoretical	practical
			0	3

Fourth Level	OECK403	Project (2)	theoretical	practical
			0	3
Fourth Level	OECK400	Engineering Project Management	theoretical	practical
			3	0
Fourth Level	OECK402	Engineering Economics	Theoretical	practical
			2	0
Fourth Level	PPE410	Power Plants Engineering	theoretical	practical
			4	0
Fourth Level	CHRE411	Chemical Reactors Engineering	theoretical	practical
			4	0
Fourth Level	Unit412	Unit Operations	theoretical	practical
			2	2
Fourth Level	PED413	Plants and Equipment Design	theoretical	practical
			4	2

Fourth Level	**Cob414**	**Combustion Technology**	**theoretical**	**practical**
			3	**0**
Fourth Level	**Ctrl415**	**Control and Measuring Engineering**	**theoretical**	**practical**
			2	**2**
Fourth Level	**Sol452**	**Solar PV Systems**	**theoretical**	**practical**
			2	**0**
Fourth Level	**MS455**	**Modeling and Simulation**	**theoretical**	**practical**
			2	**2**

8. **Expected learning outcomes of the program**	
Knowledge	
Learning Outcomes (A1)	The ability to identify, formulate, and solve engineering problems in the field of energy engineering and renewable energies by applying the principles of engineering, science, and mathematics.
Learning Outcomes (A2)	The ability to apply the engineering design process to produce solutions that meet specific needs while taking into account public health and safety, global, cultural, social, environmental, economic, and other factors as appropriate to the specialty.
Learning Outcomes (A3)	Ability to develop and conduct appropriate experiments, analyze and interpret data, and use engineering judgment to draw conclusions.
Learning Outcomes (A4)	The ability to recognize the ongoing need to acquire new knowledge, choose appropriate learning strategies, and apply this knowledge.
Skills	
Learning Outcomes (A5)	Ability to communicate effectively with a wide range of audiences

Learning Outcomes (A6)	Ability to work effectively as a member or leader of a team that sets goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.
Ethics	
Learning Outcomes (A7)	The ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

9. Teaching and Learning Strategies

1. Explain engineering theories related to the field of fuel, its sources, and fuel conversion processes.
2. Form discussion groups during or outside of lectures to discuss scientific engineering topics that require critical thinking and analysis.
3. Provide students with basics and additional topics related to previous learning outcomes and practical problem-solving skills.
4. Solve a set of practical examples by faculty members specializing in fuel and energy technology engineering.
5. Assign students homework on complex problems in preparation for the practical problem-solving phase.
6. Participate in student problem-solving during lectures.
7. The department's scientific laboratories are supervised by faculty members specializing in fuel and energy technology engineering.
8. Student development courses are conducted by specialized faculty members.
9. Periodic advisory seminars are held to educate and raise student awareness.
10. Study circles are small groups of students who meet together to discuss a specific academic topic.

11. Voluntary work carried out by students, such as tree planting campaigns and laboratory equipment maintenance.

10. Evaluation methods

• Assessing student understanding during lectures through interactive discussions.

• Daily exams with questions related to practical problems.

• Lab reports measure experimental understanding, data analysis, and scientific report writing.

• Participation scores for competitive questions among students.

• Online assignments.

• Grading assigned scientific projects.

• Grading assigned homework and reports.

• Presentations measure the student's ability to communicate information and ideas clearly and effectively.

• Assessing the application of knowledge in a real-world work environment through field training.

• Midterm exams based on the curriculum, in addition to the final exam.

• Active participation in the classroom demonstrates student commitment and responsibility.

• Adherence to the deadlines for submitting assignments and reports.

• Midterm and final exams demonstrate student commitment and achievement in knowledge and skills.

1. 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			Obaid Majeed Ali	
assistant professor	Fuel and Energy Techniques Engineering	Chemical Engineering			Murad Abdul Wahid Reda	
assistant professor	Fuel and Energy Techniques Engineering	Chemical Engineering			Mohamed Qader Abdul Rahman	
assistant professor	mechanical engineering	Mold Technology Engineering			Sherwan M.Najim	
Lecturer	Fuel and Energy Techniques Engineering	Thermal Engineering			Assn Souad Mohamed	
Assistant Lecturer	Fuel and Energy Techniques Engineering	Thermal Engineering			Hanan Mohamed Akbar	
Lecturer	Mechanical Engineering	Power Generation			Essam Ezz El Din Yousef	
Assistant Lecturer	Chemical Engineering	Petroleum Operations			Maha Adnan Dawood	

Assistant Lecturer	Chemical Engineering	Reactor Design			Nour Ahmed Awad	
Lecturer	Law	Commercial Law			Osama Ibrahim Ali	
Lecturer	Mathematics	Mathematics			Saad Salim Marai	
Lecturer	Fuel and Energy Techniques Engineering	Thermal Engineering			Qais Adnan Ali Zainal	
Lecturer	Electronics and Control Engineering	Control			Faisal Ghazi Bashaw	
Assistant Lecturer	Law	Law			Avesta Salar Omar	
Assistant Lecturer	Petroleum Engineering	Reservoir and Production Engineering			Bayan Hikmat Safi	
Assistant Lecturer	Mechanical Engineering	Power Mechanics			Kolan Aziz Bakr	
Assistant Lecturer	Electronics and Control	Nanoelectronics			Meliya Hamid Majeed	
Assistant Lecturer	Fuel and Energy Techniques Engineering	Thermal Engineering			Rasha Sabah Awad	
Assistant Lecturer	Fuel and Energy Techniques Engineering	Thermal Engineering			Maryam Abdul Wahid Jassim	
Assistant Lecturer	Energy Engineering	Energy			Aya Aws Saad	

Assistant Profressor	business management	business management				Hussein Nour El-Din Ezzat
Assistant Lecturer	Chemical Engineering	Chemical Engineering				Wissam Falah Hassan
assistant professor	Nuclear Engineering	Magnetizable fluids				Sami Reda Aslan
assistant professor	Mechanical Engineering	Refractories				Ahmed Ali Hussein

Professional Development

Mentoring new faculty members

The department's academic committee mentors new faculty members through:

1. Attending classes with former faculty members for two months as an observer.
2. Undergoing a one-month training period at the university's Continuing Education Center.
3. Mentored by the department head in the first year.
4. Attending training courses in their field of specialization.
5. Attending courses on teaching and learning.
6. Attending courses on how to publish scientific research.

Professional development of faculty members

The department's academic committee has a plan for college development:

1. A periodic academic lecture delivered by a faculty member on professional development for all faculty members.
2. Periodic lectures on social issues for all faculty members and students.
3. An annual conference within the department with the participation of all faculty members.
4. Participation in conferences at various universities inside and outside Iraq.
5. Contribution to the publication of research in local, regional, and international journals (Scopus and Direct Science).
6. Participation in various committees at the university and the ministry.
7. Participation in the American Conference on Faculty Development.
8. Participation of all faculty members in a workshop on learning based on the new teaching method.
9. All faculty members contribute to obtaining accreditation from ICAEE, thus making the college a professional in the accreditation process.
10. Courses within the college in the field of specialization.
11. Courses within higher education and scientific research institutions via electronic communication.
12. Training courses abroad
13. Individual or joint scientific research (applied or theoretical).
14. Scientific seminars and symposia.

11. Acceptance Criterion

- Admission requirements for students must be approved in accordance with the regulations of the Ministry of Higher Education and Scientific Research (Central Admission).
- Passing the department's personal interview.
- Applicants must be fit for a medical examination.
- Preparatory school graduation average.
- Department capacity.

12. The most important sources of information about the program

- Textbooks.

- Supporting resources (secondary textbooks).
- The internet, self-study websites, and websites of reputable international and Iraqi universities.
- Market needs.
- Local trends in the governorate.
- Studies and surveys.

13. Program Development Plan

1. The field of fuel and energy is evolving globally, so some program courses are subject to change.
2. Every four years, four chemical courses related to fuel and energy have been added. A university course on the crimes of the Ba'ath Party has been added to the second level, and it is considered a university course.
3. Course content is reviewed by the Advisory Board at each meeting, with the aim of updating the curricula to keep pace with the labor market and meet the requirements of oil companies in Iraq.
4. Work is underway to develop the department's educational laboratories.
5. Work is underway 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	C1	
First Level	NTU102	Computer Principles (1)	Basic					●			
	NTU103	Computer Principles (2)	Basic					●			
First Level	OECK101	Mathematics (1)	Basic	●							
	OECK102	Mathematics (2)	Basic	●							
First Level	PCHE111	Principles of Chemical Engineering	Basic	●							
First Level	OECK104	Workshops	Basic					●	●		
First Level	OECK103	Engineering Drawing	Basic					●	●		

First Level	**NTU106**	**Democracy**	**Basic**							●
First Level	**NTU101**	**English Language (1)**	**Basic**					●		
First Level	**NTU105**	**Sport**	**Basic**					●	●	
First Level	**NTU104**	**Arabic Language**	**Basic**					●		
First Level	**NTU 100**	**Human Rights**	**Basic**							●
First Level	**OECK105**	**Engineering Mechanics**	**Basic**				●			
First Level	**ANCH112**	**Analytical Chemistry**	**Basic**			●				
First Level	**ORCH110**	**Organic Chemistry**	**Basic**			●				
Second Level	**NTU201**	**Professional Ethics**	**Basic**							●

Second Level	**OECK203**	**Engineering Physics**	**Basic**				●			
Second Level	**NTU200**	**English language (2)**	**Basic**					●		
Second Level	**OECK201**	**Mathematics (3)**	**Basic**	●						
	OECK202	**Mathematics (4)**	**Basic**	●						
Second Level	**OECK204**	**Summer Training**	**Basic**					●	●	
Second Level	**FLUD215**	**Fluid Mechanics (1)**	**Basic**			●				
	FLUD216	**Fluid Mechanics (2)**	**Basic**			●				
Second Level	**EOS217**	**Energy Sources**	**Basic**		●					
Second Level	**REF210**	**Petroleum Refining**	**Basic**		●					

Second Level	**MAB211**	**Material Balances**	**Basic**		●					
Second Level	**ENB212**	**Energy Balances**	**Basic**		●					
Second Level	**CPML218**	**Computer Programming - MATLAB**	**Basic**					●	●	
Second Level	**ELTE214**	**Electrical Technology**	**Basic**			●				
Second Level	**PHCH213**	**Physical Chemistry**	**Basic**		●					
Second Level	**STAT219**	**Engineering Statistics**	**Basic**	●						
Third Level	**NTU300**	**English Language (3)**	**Basic**					●		
Third Level	**OECK301**	**Engineering Analysis**	**Basic**		●					
Third Level	**OECK302**	**Numerical Analysis**	**Basic**		●					

Third Level	**OECK303**	**Summer Training (2)**	**Basic**					●	●	
Third Level	**HEAT310**	**Heat Transfer (1)**	**Basic**		●	●				
	HEAT311	**Heat Transfer (2)**	**Basic**		●	●				
Third Level	**MASS312**	**Mass Transfer (1)**	**Basic**		●	●				
	MASS313	**Mass Transfer (2)**	**Basic**		●	●				
Third Level	**THMD314**	**Thermodynamic (1)**	**Basic**		●	●				
	THMD315	**Thermodynamic (2)**	**Basic**		●	●				
Third Level	**NGP316**	**Natural Gas Processing**	**Basic**		●					
Third Level	**REN317**	**Renewable Energy**	**Basic**				●			
Third Level	**OSH318**	**Occupational Health and Safety**	**Basic**							●

Third Level	**ICE350**	**Internal Combustion Engine**	**Basic**		●					
Fourth Level	**NTU400**	**English language (4)**	**Basic**					●		
Fourth Level	**NTU401**	**Research Methodology**	**Basic**	●						
Fourth Level	**OECK401**	**Project (1)**	**Basic**					●	●	
	OECK403	**Project (2)**	**Basic**					●	●	
Fourth Level	**OECK400**	**Engineering Project Management**	**Basic**	●						
Fourth Level	**OECK402**	**Engineering Economics**	**Basic**	●						
Fourth Level	**PPE410**	**Power Plants Engineering**	**Basic**		●					

Fourth Level	**CHRE411**	**Chemical Reactors Engineering**	**Basic**		●	●				
Fourth Level	**Unit412**	**Unit Operations**	**Basic**		●	●				
Fourth Level	**PED413**	**Plants and Equipment Design**	**Basic**		●					
Fourth Level	**Cob414**	**Combustion Technology**	**Basic**		●	●				
Fourth Level	**Ctrl415**	**Control and Measuring Engineering**	**Basic**		●					
Fourth Level	**Sol452**	**Solar PV Systems**	**Basic**		●		●			
Fourth Level	**MS455**	**Modeling and Simulation**	**Basic**		●			●		

Course Description Form

First Level

Course Description Form

1. Course Name:

Computer Principles (1)

2. Course Code:

NTU 102

3. Semester / Year:

2025-2026

4. Description Preparation Date:

10/9/2025

5. Available Attendance Forms:

Attendance in the classroom

6. Number of Credit Hours (Total) / Number of Units (Total)

3/2

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

Name: Milia Hamid Majeed
Email: milia.hameed@ntu.edu.iq

8. Course Objectives

Course Objectives	• Develop Microsoft Office skills and solve problems through the application of technologies. • Ability to create and edit documents, spreadsheets, and presentations using Microsoft Office programs. • Ability to manage email and calendars using Microsoft Outlook. • Understanding of administrative fundamentals and their application in project management. Ability to communicate effectively with the team and manage meetings effectively.

9. Teaching and Learning Strategies

Strategy	The main strategy used in teaching this unit is to encourage students to engage in exercises while simultaneously honing and expanding their critical thinking skills. This will be achieved through classroom instruction, interactive lessons, and simple experiments that include sample activities of interest to students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3		Introduction - What is Computer,	Attendance in the classroom	Participation in the semester
2	3		Basic Applications of Computer	Attendance in the classroom	Participation in the semester
3	3		Components of Computer System,	Attendance in the classroom	Participation in the semester
4	3		Central Processing Unit (CPU),	Attendance in the classroom	Participation in the semester

5	3		Concepts of Hardware and Software	Attendance in the classroom	Participation in the semester
6	3		Introduction to Internet, WWW and web browsers	Attendance in the classroom	Participation in the semester
7	3		Operating Computer using GUI Based Operating System	Attendance in the classroom	Participation in the semester
8	3		Basics of Pop 2025-2026 Systems; The User Interface	Attendance in the classroom	Participation in the semester
9	3		Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an application	Attendance in the classroom	Participation in the semester
10	3		Viewing of File, Folders and Directories, Creating and Renaming of files and folders,	Attendance in the classroom	Participation in the semester
11	3		Opening and closing of different Windows; Using help; Creating Short cuts,	Attendance in the classroom	Participation in the semester
12	3		Basics of O.S Setup	Attendance in the classroom	Participation in the semester
13	3		Common utilities	Attendance in the classroom	Participation in the semester
14	3		Understanding Word Processing:	Attendance in the classroom	Participation in the semester
14	3		Using Spread Sheet	Attendance in the classroom	Participation in the semester

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

11.Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Beginning Programming All-in-One For Dummies Author: Wallace Wang
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://www.w3schools.in/computer-fundamentals/output-devices

Course Description Form

1. Course Name:

Computer Principles (2)

2. Course Code:

NTU 103

3. Semester / Year:

2025-2026

4. Description Preparation Date:

10/9/2025

5. Available Attendance Forms:

Attendance in the classroom

6. Number of Credit Hours (Total) / Number of Units (Total)

3/2

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

Name: Milia Hamid Majeed
Email: milia.hameed@ntu.edu.iq

8. Course Objectives

Course Objectives	• Develop Microsoft Office skills and solve problems through the application of technologies. • Ability to create and edit documents, spreadsheets, and presentations using Microsoft Office programs. • Ability to manage email and calendars using Microsoft Outlook. • Understanding of administrative fundamentals and their application in project management. Ability to communicate effectively with the team and manage meetings effectively.

9. Teaching and Learning Strategies

Strategy	The main strategy used in teaching this unit is to encourage students to engage in exercises while simultaneously honing and expanding their critical thinking skills. This will be achieved through classroom instruction, interactive lessons, and simple experiments that include sample activities of interest to students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3		Introduction - What is Microsoft Office,	Attendance in the classroom	Participation in the semester
2	3		Introduction to Word	Attendance in the classroom	Participation in the semester
3	3		How to run the Word program and get to know its main interface	Attendance in the classroom	Participation in the semester
4	3		Create and edit documents	Attendance in the classroom	Participation in the semester

5	3		Insert a table into a word processing document	Attendance in the classroom	Participation in the semester
6	3		Write an equation or formula	Attendance in the classroom	Participation in the semester
7	3		Introduction to Excel	Attendance in the classroom	Participation in the semester
8	3		How to run the Excel program and get to know its main interface	Attendance in the classroom	Participation in the semester
9	3		Entering and editing data in Excel	Attendance in the classroom	Participation in the semester
10	3		Edit and format cells in Excel	Attendance in the classroom	Participation in the semester
11	3		Opening and closing of different Windows; Using help; Creating Short cuts,	Attendance in the classroom	Participation in the semester
12	3		Functions	Attendance in the classroom	Participation in the semester
13	3		Common utilities	Attendance in the classroom	Participation in the semester
14	3		Page preparation	Attendance in the classroom	Participation in the semester
14	3		Preparing for printing	Attendance in the classroom	Participation in the semester

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

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Engineering Mechanics
2. Course Code:
OECK 105
3. Semester / Year:
1ST semester/ First year 2025-2026
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
45/3
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Mohammed Qader Abdulrahman Email: mohammed83@ntu.edu.iq
8. Course Objectives

Course Objectives	• Studying mechanics enables you to understand how the world works, whether it is natural or mechanical. • If you dedicate enough time to studying carefully, you will be well-prepare for advanced engineering studies. • Knowledge of mechanics is considered an essential tool for a mechanical engineer. • Our goal is to understand what is known as classical mechanics. • The concepts of classical mechanics include the study of forces, motion, energy, work, momentum, heat, and how they are related. • These ideas can be applied to solving engineering problems. • The ideas behind classical mechanics have radically and permanently changed the world. • Most historians agree that no other discovery has had such an impact on human thought. • Students come to engineering mechanics with an initial understanding of basic principles learned from physics in school, along with experience applying them to problem-solving.

	• The focus here is on practicing fundamental skills. • The course emphasizes practicing these skills and understanding the content. • In this course, students are required to complete essential readings, attend class, and complete homework assignments. • The instructor/lecturer is not the sole source of knowledge but rather a teacher, explainer of mechanical concepts, problem solver, and standard-setter. • Students practice their skills individually and learn to collaborate with other • Students test their skills in situations where performance is measured.

9. Teaching and Learning Strategies

Strategy	• The main strategy used in teaching this unit is to encourage students actively participate in exercises. • At the same time, the strategy aims to enhance and expand students' criti thinking skills. • This is achieved through classroom teaching. • Interactive lessons are conducted to engage students. • A variety of simple experiments are studied as part of the learning proces • Some assessment activities that are relevant and engaging to students included.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Understanding engineering mechanics terminology	Introduction	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
2	3	Explaining the topic of static bodies and the effect of forces on them	Basics of Statics	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
3	3	Methods of analyzing forces acting on bodies	Force Analysis	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures +	Daily quizzes Mid-term exam Daily assignments

				group discussion + brainstorming	
4	3	Types of vectors and their explanation	Vector addition	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
5	3	Understanding the concept of moment and its mechanism	Moment	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
6	3	Mechanism of couple moments	Moment of couple	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
7	3	Calculating the resultant force and how to find its location	Resultant location	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
8	3	Understanding the topic of body equilibrium	Equilibrium	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
9	3	Concept of the center of the body	Center of gravity	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
10	3	Knowing how to find the center of any shape, whether regular or irregular	The center for more than one shape	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
11	3	Concept of moment of inertia	Moments of Inertia	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
12	3	Method for finding the moment of	Moments of Inertia for	Interactive lectures + group discussion + brainstorming +	Daily quizzes Mid-term exam Daily assignments

		inertia for multiple shapes	more than one shape	discussion Interactive lectures + group discussion + brainstorming	
13	3	Concept of strength of materials	Strength of material	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
14	3	Understanding the fundamentals of the kinematics of bodies	Basics of dynamics	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
15	3	Assessing students based on their understanding of engineering mechanics	Exam	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments
16	3	Understanding engineering mechanics terminology	Introduction	Interactive lectures + group discussion + brainstorming + discussion Interactive lectures + group discussion + brainstorming	Daily quizzes Mid-term exam Daily assignments

11. Course Evaluation

The grade distribution out of 100 is based on the tasks assigned to the student, such as daily preparation, presentations, daily, oral, and monthly exams, written exams, and field visit reports.
Effort 40, Final 60, Practical work 10, Theory 30

12. Learning and Teaching Resources

Required textbooks (curricular books, if any	J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: Statics (V.1), Dynamics (V.2)', 5th edition, Wiley 2002.
Main references (sources)	F. P. Beer and E. R. Johnston, 'Vector Mechanics for Engineers: Statics (V.1), Dynamics (V.2)', 3rd SI edition, TMH, 1998.
Recommended books and references (scientific journals, reports…)	I. H. Shames, 'Engineering Mechanics: Statics & Dynamics', 4th edition, PHI, 1996.
Electronic References, Websites	https://www.wiley.com/en-us/Engineering+Mechanics%3A+Statics%2C+9th+Edition-p 9781119392620

Course Description Form

1. Course Name:
Engineering Drawing
2. Course Code:
OECK 103
3. Semester / Year:
Second semester / (2025-2026
4. Description Preparation Date:
(10/9/2025 ,
5. Available Attendance Forms:
presence
6. Number of Credit Hours (Total) / Number of Units (Total)
Number of theoretical hours (1 hour) Number of practical hours (2 hours) Number of units (2)
7. Course administrator's name (mention all, if more than one name)
Name: Rasha Sabah Aweid Email: rashasabah@ntu.edu.iq
8. Course Objectives

Course Objectives	1. Lectures. 2. Assigning students to do homework or writing research papers so that students can acquire self-learning and presentation skills. 3. Take sudden exams. 4. Conducting semester and final exams at the specified dates. 5. Inform students about how grades are calculated for students during the semester. 6. Providing textbooks and help books that they need in the vocabulary of the course. 7. Demonstrations such as: the sm board

9. Teaching and Learning Strategies	
Strategy	Lectures Graduation projects Creative thinking among students and keep up with the latest scientific methods available in teaching

	learning.interactive tutorials and by considering type of simple experime involving some sampling activities that are interesting to the students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
16 Week	80	1.Broad education to understand impact of engineering soluti globally and economically. 2. Ability to work in multidisciplin teams. 3. The possibility of applying cogni sciences such as mathematics, p sciences and engineering. - 4. The ability to use the techniqu skills and tools of contempor engineering in the engineering fiel 5. The ability to design systems meet the required needs thro realistic determinants in terms economics. - 6. The possibility of designing implementing experiments, analy the results and translating them i reality.	Engineeri Drawing	Class Lecture Lab Practical	Quizzes. Assignments Projects / Lab. Report. Midterm Exam. 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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	. A.W.Bound, " Engineering Drawing".
Recommended books and references (scientific journals, reports…)	. Dhananjay A Jolhe, "Engineering drawing

Electronic References, Websites	

Course Description Form

1. Course Name:
Democracy
2. Course Code:
NTU 106
3. Semester / Year:
First, 2025-2026
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
class
6. Number of Credit Hours (Total)15 / Number of Units (Total)
15 Hours 1 Credit
7. Course administrator's name (mention all, if more than one name)
Name: Avesta Salar Omer Email: Avesta.sala@ntu.edu.iq
8. Course Objectives

Course Objectives	**Introducing students to the principles a foundations of democracy, pluralis freedom of expression, and religion.** **Raising students' political and cultu awareness.** **Empowering them to exercise their polit rights in a peaceful and informed manr** **Enabling students to analyze the polit reality in Iraq in a more scientific manner.**
9. Teaching and Learning Strategies	
Strategy	Educational Strategies Active Learning: 1. Organize classroom discussion groups topics such as freedom of expression and social justice. 2. Use brainstorming to analyze the foundations and princip of democracy in Iraq during the various political phases it h experienced. Cooperative Learning: 1. Divide students into small groups discuss the concept and principles of democracy.

	2. Organize group presentations on the experiences advanced democratic countries. Interactive Lectures: 1. Engage students by asking open-end questions during the lecture. Field Visits and Guest Speakers: 1. Visit civil socie organizations, courts, or the High Commission for Hum Rights. 2. Invite activists, lawyers, and academics to share th experiences. Educational Resources: 1. Books and reliable sources in Aral and English. 2. Awareness-raising and educational videos. 3. Legal articles and analyses. Evaluation: 1. Short and varied tests, including objective and ess questions. 2. Prepare analytical reports on the experiences of advanc democratic countries and compare them with the practi reality in Iraq. 3. Encourage Students evaluate their work and t performance of their classmates.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	1	Statement of the concept of democracy	Definition of democracy and its characteristics	An interactive lecture combining theoretical explanation wit student opinions	Through open-ended questions - the topic the student benefited most from the student's opinion on the lecturer's topic
secand	1	Teaching the stud the concept of bureaucracy, aristocracy and theocracy	Bureaucracy, aristocracy, theocracy	An interactive lecture that combines theoretical explanation with student feedback.	5-minute test at the end of the lecture

Third	1	Introducing stude to direct democra Cy	Images and types of democracy	Divide the students into groups to discuss the topic, then present ideas and discuss them collectively.	By evaluating each group's work for another group
Fourth	1	Introducing the student to indirect democracy	Images and types of democracy	Divide the students into groups to discuss the topic, then present ideas and discuss them collectively.	By evaluating each group's work for another group.
Fifth	1	The role of the Ira Human Rights Commission in consolidating the principles of democracy in Iraq.	Field visit to the Office of the High Commissioner for Human Rights	A lecture on the role of the Human Rights Commission in resolving violence cases and reports submitted by the Commission to the government.	Preparing an evaluation form to evaluate the lecture by students
Sixth	1	The position of Ira constitutions on democracy	Iraq and Democracy	Divide the students into groups to present a simple report on the position of the Iraqi constitutions on human rights.	The report is evaluated by the subject teacher based on the efforts made by the student and the sources used in the report.
Seventh	1	Statement of Iraq' position on politic democracy	political democracy	An interactive lecture that combines theoretical explanation with student feedback.	5-minute test at the end of the lecture
Eighth	1	A test for students on the material studied in previou lectures.	Test	Test	It is evaluated through the students' test results

Ninth	1	The right of man t express his Opinion	freedom of opinion	Divide the students into groups to discuss the topic, then present ideas and discuss them collectively.	By evaluating each group's work for another group.
Tenth		The right of a pers to choose a religio and practice religious rituals	freedom of belief	Interactive lecture integrating and explaining the theoretical aspects with student opinions	5-minute quiz at the end of the lecture
Eleventh	1	Introducing the student to the concept of separation of powers	Elements of political democracy	Through an open lecture, discussion with the students, and a presentation of judicial decisions from first-instance courts, appeal courts, and supreme cassation bodies, and their role in protecting human rights	hrough open-ended questions - the topic the student benefited most from - the student's opinion on the lecturer's topic
Twelft	1	Introducing the student to the concept of multi-partyism	Multiparty	Divide students into groups to discuss the topic, then present ideas and discuss them collectively	5-minute quiz at the end of the lecture
Thirteenth	1	Introducing the student to the concept of freedor of the media	freedom of the media	An interactive lecture that integrates theoretical explanation with student opinions	Through open-ended questions - the topic the student benefited most from - the student's opinion

					on the lecture topic
Fourteenth	1	The role of politica parties in democra	Democracy and political parties	Divide students into groups to discuss the topic, then present ideas and discuss them collectively	Preparing an evaluation form to assess human rights by students
Fifteenth	1	Introducing the student to the concept of democracy in light humanitarian cris	Democracy and humanitarian crises	Divide students into groups to discuss the topic, then present ideas and discuss them collectively..	Preparing an evaluation form to assess human rights by students

11.
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 As follows: First, daily tests 10 points, assignments 5 points, seminar 10 points, daily attendance 5 points, midterm exam 10 points, final exam 60 points.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Articles of the Universal Declaration Human Rights - Reports of the Hum Rights Commission Reports of international organizatic working in the field of humanitari affairs, such as the UNAMI mission Iraq Judicial decisions
Electronic References, Websites	Website of the United Nations Hi Commissioner for Human Rights

	Website of the National Institute Human Rights

Course Description Form

1. Course Name:
Human Rights
2. Course Code:
NTU 100
3. Semester / Year:
First Year,2025-2026
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
Class
6. Number of Credit Hours (Total)15 / Number of Units (Total)
15 Hours 1 Credit
7. Course administrator's name (mention all, if more than one name)
Name: Avesta Salar Omer Email: Avesta.sala@ntu.edu.iq
8. Course Objectives

Course Objectives	**A historical overview of human rights a their historical development.** **A statement of the international and regio position on the Universal Declaration Human Rights.** **A statement of the position of I constitutions on human rights and the ba rights stipulated in the current I Constitution of 2005.**
9. Teaching and Learning Strategies	
Strategy	Educational Strategies Active Learning: 1. Organize classroom discussions on top such as freedom of expression and social justice. 2. Use brainstorming to analyze Iraqi human rights issues. Cooperative Learning: 1. Divide students into small groups study human rights cases.

	2. Organize group presentations on articles from internatio conventions. Interactive Lectures: 1. Engage students by asking open-end questions during the lecture. Field Visits and Guest Speakers: 1. Visit civil soci organizations, courts, or the High Commission for Hum Rights. 2. Invite activists, lawyers, and academics to share th experiences. Educational Resources: 1. Books and reliable sources in Ara and English. 2. Awareness-raising and educational videos. 3. Legal articles and analyses. Assessment: 1. Short and varied tests, including objective and ess questions. 2. Prepare analytical reports on human rights issues in Iraq. 3. Encourage students to evaluate their own work and t performance of their peers.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	1	A statement on human rights and their historical development	Human Right	An interactive lecture combining theoretical explanation wit student opinions	Through open-ended questions - the topic the student benefited most from the student's opinion on the lecturer's topic
secand	1	Statement of the position of religio in the heavenly religions with human rights	Human rights in heavenly religions	An interactive lecture that combines theoretical explanation with student feedback.	5-minute test at the end of the lecture
Third	1				

		International law position on human rights	International and regional recognition of human rights	Divide the students into groups to discuss the topic, then present ideas and discuss them collectively.	By evaluating each group's work for another group
Fourth	1	The role international organizations human rights	NGOs and their role in defending human rights	Divide the students into groups to discuss the topic, then present ideas and discuss them collectively.	By evaluating each group's work for another group.
Fifth	1	The role of the Human Rights Commission in Ira in the recent crise that occurred in Ir	Field visit to the Office of the High Commissioner for Human Rights	A lecture on the role of the Human Rights Commission in resolving violence cases and reports submitted by the Commission to the government.	Preparing an evaluation form to evaluate the lecture by students
Sixth	1	The position of Ira constitutions on human rights	Human Rights in Iraqi Constitutions: Between Theory and Realit	Divide the students into groups to present a simple report on the position of the Iraqi constitutions on human rights.	The report is evaluated by the subject teacher based on the efforts made by the student and the sources used in the report.
Seventh	1	The current Iraqi constitution's position on human rights	Human rights under the new Iraqi constitution	An interactive lecture that combines theoretical explanation with student feedback.	5-minute test at the end of the lecture
Eighth	1		Test	Test	It is evaluated through the students' test results.

Ninth	1	A test for students on the material studied in previou lectures. The most importa basic rights that a human being enjo	Essential human rights	Divide the students into groups to discuss the topic, then present ideas and discuss them collectively.	By evaluating each group's work for another group.
Tenth	1	The most importa modern rights enjoyed by human in light of the development takir place in international societies	Modern Rights	Interactive lecture integrating and explaining the theoretical aspects with student opinions	5-minute quiz at the end of the lecture
Eleventh	1	The Role of the Judiciary in Huma Rights	Judicial Guarantees	Through an open lecture, discussion with the students, and a presentation of judicial decisions from first-instance courts, appeal courts, and supreme cassation bodies, and their role in protecting human rights	hrough open-ended questions - the topic the student benefited most from - the student's opinion on the lecturer's topic
Twelft	1	The role of society human rights	Public opinion and its role in ensuring human rights and freedom	Divide students into groups to discuss the topic, then present ideas and discuss	5-minute quiz at the end of the lecture

Thirteenth	1	The Role Political Parties in Human Rights	Political Parties	them collectively An interactive lecture that integrates theoretical explanation with student opinions	Through open-ended questions - the topic the student benefited most from - the student's opinion on the lecture topic
Fourteenth	1	Human Rights in t Context of Current Humanitarian Cris	Human Rights and Violations	Divide students into groups to discuss the topic, then present ideas and discuss them collectively	Preparing an evaluation form to assess human rights by students
Fifteenth	1		Human Rights and Violations	Divide students into groups to discuss the topic, then present ideas and discuss them collectively..	Preparing an evaluation form to assess human rights by students

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 As follows: First, daily tests 10 points, assignments 5 points, seminar 10 points, daily attendance 5 points, midterm exam 10 points, final exam 60 points.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	

Recommended books and references (scientific journals, reports…)	Articles of the Universal Declaration Human Rights - Reports of the Hum Rights Commission Reports of international organizatio working in the field of humanitari affairs, such as the UNAMI mission Iraq Judicial decisions
Electronic References, Websites	Website of the United Nations Hi Commissioner for Human Rights Website of the National Institute Human Rights

Course Description Form

1. Course Name:
Organic Chemistry
2. Course Code:
3. Semester / Year:
First / 2025-2026
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
Lecture - Lab
6. Number of Credit Hours (Total) / Number of Units (Total)
2/2
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Lecturer Bayan H. Al-Jaleel Email: bayan.hikmat@ntu.edu.iq
8. Course Objectives

Course Objectives	By the end of this course, students will be able to: 1. Understand the structural and functional basics of organic compounds. 2. Classify organic compounds by functional groups and reaction types. 3. Explain mechanisms of common organic reactions such as substitution, addition, and elimination. 4. Apply organic chemistry principles in laboratory settings through synthesis and analysis of organic compounds. 5. Use basic laboratory equipment and techniques (e.g., distillation, filtration, chromatography). 6. Demonstrate safety, responsibility, and collaboration in the lab environment.

9. Teaching and Learning Strategies	
Strategy	• Theoretical lectures supported by PowerPoint and interactive examples. • Weekly 2-hour **practical laboratory sessions**.

	• Practice problems and exercises on reaction mechanisms. • Case studies on industrial or natural organic compounds. • Short student presentations on relevant topics. • Mini-quizzes after major topics. • Weekly lab reports reflecting understanding and experimental performance.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2+2	Understand basics and historical background	Introduction to Organic Chemistry	Lecture	Intro Quiz
2	2+2	Analyze structural representation of compounds	Bonding, Hybridization, Lewis Structures	Lecture + Exercises	Quiz
3	2+2	Describe physical and chemical properties	Alkanes and Haloalkanes	Lecture + Lab	Lab Report
4	2+2	Understand SN1 & SN2 mechanisms	Nucleophilic Substitution Reactions	Lecture + Simulation	Short Quiz
5	2+2	Differentiate electrophilic additions and regioselectivity	Alkenes and Alkynes	Lecture + Experiment	Practical Report
6	2+2	Identify aromatic systems and reactions	Aromatic Compounds	Lecture + Group Activity	Oral Presentation
7	2+2	Compare chemical reactivity of groups	Alcohols, Ethers, Phenols	Lecture + Lab	Quiz
8	2+2	Analyze nucleophilic additions	Carbonyl Compounds (Aldehydes & Ketones)	Lecture + Practice	Report
9	2+2	Execute organic conversions	Carboxylic Acids & Derivatives	Lecture + Lab	Practical Test

10	2+2	Distinguish basicity and reactions	Amines and Nitrogen Compounds	Lecture	Written Quiz
11	2+2	Interpret spectra of organic compounds	Spectroscopy (IR, NMR, MS)	Lecture + Training	Data Analysis
12	2+2	Perform qualitative/quantitative analysis	Unknown Compound Identification	Lab Only	Detailed Report
13	2+2	Connect organic chemistry to biological systems	Organic Biochemistry	Interactive Lecture	Class Discussion
14	2+2	Consolidate concepts for final exam	Course Review	Workshop	Group Review
15	2+2	Comprehensive assessment	Final Theoretical and Practical Exam	Written + Practical	Final Exam

11. Course Evaluation

Quizzes and Theory Tests 15%

Lab Reports 25%

Participation and In-Class Tasks 10%

Midterm Practical Exam 10%

Final Theoretical Exam 25%

Final Practical Exam 15%

Total 100%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• **Solomons, T.W. Graham & Fryhle, Craig B.** (2022). *Organic Chemistry*, 12th Edition. Wiley. • **David Klein.** (2021). *Organic Chemistry*, 4th Edition. Wiley.
Main references (sources)	• Morrison, R. T., & Boyd, R. N. (2010). *Organic Chemistry*, 7th Edition. Pearson. • McMurry, J. (2021). *Organic Chemistry*, 10th Edition. Cengage Learning.
Recommended books and references (scientific journals, reports…)	• **Journal of Organic Chemistry** – American Chemical Society. • **Tetrahedron Letters** – Elsevier.

	• **Organic Letters** – ACS peer-reviewed journal. • **Reaxys** – Database for reaction mechanisms and synthesis.
Electronic References, Websites	• https://pubchem.ncbi.nlm.nih.gov – Comprehensive compound database. • https://www.masterorganicchemistry.com – Simplified organic chemistry explanations. • https://www.khanacademy.org/science/organic-chemistry – Free video tutorials. • https://www.chemguide.co.uk – Detailed chemistry tutorials.

Course Description Form

1. Course Name: Mathematics (1)
2. Course Code: OECK 101
3. Semester / Year: 2025-2026
4. Description Preparation Date: 10/9/2025
5. Available Attendance Forms: Mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
Number of credit hours =34 Number of unit (Total)=4
7. Course administrator's name (mention all, if more than one name)
Name: Mohammed Z. Hasan Email:mohamop49@ntu.edu.iq
8. Course Objectives

Course Objectives	**1. Lectures.** **2. Assigning students to do homework or writing research papers so tha students can acquire self-learning and presentation skills.** **3. Take sudden exams.** **4. Conducting semester and final exams at the specified dates.** **5. Inform students about how grades are calculated for students during the semester**

9. Teaching and Learning Strategies

Strategy	**1. Broad education to understand the impact of engineering solutions globa and economically. 2. Ability to work in multidisciplinary teams.** **3. The possibility of applying cognitive sciences such as mathematics, pu sciences and engineering.** **4. The ability to use the techniques, skills and tools of contempor engineering in the engineering field.** **5. The ability to design systems to meet the required needs through realis determinants in terms of economics.**

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	4	System of Real Numbers, Functions	Learn the Unit	Explanation ar exam	Daily Exam
2	4	Functions andtheir Graph	Learn the Unit	Explanation ar examples	Daily Exam
3	4	Domain & Ranges	Learn the Unit	Explanatio-n a examples	Daily Exam
4	4	Trigonometric Functions	Learn the Unit	Explanation ar examples	Daily Exam
5	4	Exponential function Logarithms Function	Learn the Unit	Explanation ar examples	Daily Exam
6	4	Limits & Continuity	Learn the Unit	Explanation ar examples	Daily Exam
7	4	Differentiation	Learn the Unit	Explanation ar examples	Daily Exam
8	4	Differentiation Rules	Learn the Unit	Explanation ar examples	Daily Exam
9	4	Derivative as a rule change	Learn the Unit	Explanation ar examples	Daily Exam
10	4	Derivative trigonometric functio	Learn the Unit	Explanation ar examples	Daily Exam
11	4	Integration	Learn the Unit	Explanation ar examples	Daily Exam
12	4	The Definite Integrals	Learn the Unit	Explanation ar examples	Daily Exam
13	4	Polar Coordination	Learn the Unit	Explanation ar examples	Daily Exam
14	4	Graphing in Po Coordination	Learn the Unit	Explanation ar examples	Daily Exam
15	4	Double Integration	Learn the Unit	Explanation ar examples	Daily Exam
16	4	Preparatory w before the final Exam	Learn the Unit	Explanation and examples	Daily Exam

11. Course Evaluation

Daily exam:20 Monthly Exam :20 Homework:10 Final Exam:50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	

Main references (sources)	Thomas Calculus 12th edition George B. Thom Maurice D. Weir, Joel R. hass	
Recommended books and references (scientific journals, reports…)	CALCULUS-Solutions. pdf	
Electronic References, Websites	web	

10/9/2025

10/9/2025

Course Description Form

1. Course Name:
English language 1
2. Course Code:
NTU101
3. Semester / Year: the second
First 2025-2026
4. Description Preparation Date
10/9/2025
5. Available Attendance Forms:
My presence
6. Number of Credit Hours (Total) / Number of Units (Total) 3/ 4
2*15 =30
7. Course administrator's name (mention all, if more than one name)
Name: Faisal Ghazi Bshaw Email: feysal70@ntu.edu.iq
8. Course Objectives

Course Objectives	**The objectives of teaching English are: • enable students to learn and understand writ and spoken English. • To teach learn functional English and hone their readi writing, and listening skills. • To deve students' ability to use English in everyday and real-life situations.**
9. Teaching and Learning Strategies	
Strategy	English language learning strategies include a variety methods and techniques that help learners effectively acqu English language skills. These strategies include focusing communication, using language in authentic contex leveraging technology, engaging in interactive activities, a practicing the language regularly.
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	The student's ability learn the basics of English language	Basic Grammar Review: Verb Tenses (Present, Past, Future)	Homework.	exam + report
1 2	2 2	The ability of the studer learn the present per tense	Present perfect tense	Participate in discussions on selected topics.	exam + report
3 4	2	The ability of the studer learn auxiliary verbs	Auxiliary verbs: can, could, might, may, must, should		exam + report
5	2	Teaching the student h to deal with and write email	Writing letters and emails	Regular, personalized feedback will be provided to support individual progress and address misconceptions early.	exam + report
6	2	Ability and stude knowledge of conditio sentences	Conditional sentences (type 1)		exam + report
7	2	The ability of the studer learn to know the data questions	• Reported speech (statements and questions)		exam + report
8	2	Student evalua through the midterm ex	• Mid-term evaluation	Constructive feedback will help enhance critical thinking and communication skills	exam + report
9 10	2	Ability and stude knowledge of adject and comparatives Student dealing v passive sentences	• Comparative and superlative adjectives and adverbs • Passive voice		exam + report exam + report
11	2	Student dealing v compound verbs	• Compound verbs		exam + report
12	2	Ability and stude knowledge of verbs words indicating the fut	• Future forms: Going to, will, and present continuous.		exam + report
13	2	The student learns ab prepositions, place, movement.	• Prepositions: time, place, and movement		exam + report

14 15	2 2 2	The student learns verbs for commands requests. • Relative clauses Review to determine student's comprehens ability before the f exam	• Narrated speech (commands and requests) The student learns how to deal with relative clauses. Review to determine the student's comprehension ability before the final exam		exam + report exam + report

11. Course Evaluation

Component Weighted Notes
Daily Preparation and Participation 10% includes class participation, attendance, and preparation.
Daily Oral Questions/Quiz 10%: Short oral assessments to test understanding of current topics.
Homework and Assignments 10%: Problem-solving tasks, case studies, or energy calculations.

Monthly or biweekly quizzes 20%: Written tests to assess theoretical knowledge.
Final Written Exam 50%: A comprehensive assessment of all course topics.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Words in English (Book 4)
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Organic Chemistry
2. Course Code:
ORCH110
3. Semester / Year:
2025-2026
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
Mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
Number of credit hours =90 Number of unit (Total)=5
7. Course administrator's name (mention all, if more than one name)
Name: Galawesh Norri Taher Email: Galawesh66@ntu.edu.iq

8. Course Objectives	
Course Objectives	1-Understanding what is organic chemistry 2. This course deals with the basic concept of organic chemistry. 3. This is the basic subject for all organi base compounds. 4. Understanding different type of carbo base compounds. 5. The properties and the preparation organic copmpounds.

9. Teaching and Learning Strategies	
Strategy	In this model, the main strategy that will be delivered is encouraging the students' participation in the class, developing their lab skill, and refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by

	considering type of simple experiments involving some sampling activities that are interesting to the students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Summarize what is meant by organic chemistry.	Introduction (what is organic chemistry)	Explanation and exam	Daily exam
2	4	Discuss the various types of organic compounds	Hybridization of carbon	Explanation and examples	Daily exam
3	4	Understanding the preparation of these compounds from other available	Chemical bonding (covalent bond, ionic bond)	Explanation and examples	Daily exam
4	4	Summarize what is meant by organic chemistry	ALKANES PARAFFINE, IUPAC NAME OF ALKANES, COMMON NAME OF ALKANES	Explanation and example	Daily exam
5	4	Understanding the properties and the importance of these compounds.	PROPERTIES OF ALKANES, ISOMERS	Explanation and examples	Daily exam

6	4	Discuss the chemical reaction of these compounds	PREPARATION OF ALKANES	Explanation and examples	Daily exam
7	4	Understanding the properties and the importance of these compounds.	REACTIONSOF ALKANES, COMBUSTION	Explanation and examples	Monthly exam
8	4	evaluating the student's intellectual curiosity and imagination	ALKENES, AUPIC NAME OF ALKENES, COMMON NAME OF ALKENE	Explanation and examples	Monthly exam
9	4	Written and oral communication skills,	PROPERTIES, PREPARATION OF ALKENE	Explanation and examples	Monthly exam
10	4	Evaluating the student's intellectual curiosity and imagination	REACTION OF ALKENE	Explanation and examples	Monthly exam
11	4	Providing the ability to design systems to meet the required needs in the field of fuel and energy engineering	SUBSTITUTION REACTION	Explanation and examples	Daily exam
12	4	evaluating the student's intellectual curiosity and imagination	ALKYNES, NOMENCLATURE, PROPERTIES, INDUSTRIAL SOURCE	Explanation and examples	Daily exam
13	4	Written and oral communication skills,	PREPARATION OF ALKYNES, PREPARATION OF ALKYNES.	Explanation and examples	Daily exam

14	4	Providing the ability to design systems to meet the required needs	TAUTAMERISM, ALICYCLIC HYDROCARBONS , PREPARATION OF CYCLIC COMPOUNDS, REACTIONS	Explanation and examples	Daily exam
15	4	Providing the ability to design systems to meet the required needs	Cycloalkane undergo chiefly addition reactions, Aromatic compounds, Reactions of Aromatic compounds	Exam	Finally exam

11. Course Evaluation

Theoretically 20	Practical 20	Works of tear 10	final exam 50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	David Basic principles and calculation in chemical engineeri
Recommended books and references (scientific journals, reports…)	Richard M. Felder.Elementary princip of chemical processes
Electronic References, Websites	web

Course Description Form

Second Level

Course Description Form

1. Course Name:
English 2
2. Course Code:
NTU 200
3. Semester / Year:
First / Second
4. Description Preparation Date:
1/10/2025
5. Available Attendance Forms:
Lecture
6. Number of Credit Hours (Total) / Number of Units (Total)
2
7. Course administrator's name (mention all, if more than one name)
Name: Hasnaa Saleh Khalaf Email: hasnaa_hwj@ntu.edu.iq
8. Course Objectives

Course Objectives	By the end of this course, students will be able to: 1. Understand and use daily vocabulary and grammar in familiar social situations. 2. Speak about everyday life, past events, and future plans using accurate tenses. 3. Comprehend pre-intermediate reading and listening materials. 4. Write short texts, personal emails, and descriptive or opinion-based paragraphs. 5. Engage in conversations related to work, time, health, travel, and hobbies. 6. Gain confidence in using English in basic academic and real-life contexts.

9. Teaching and Learning Strategies	
Strategy	• Communicative, student-centered approach • Pair and group work • Role-play and real-life simulation • Listening and video-based lessons • Grammar integrated with speaking and writing

	• Writing workshops and peer feedback • Active use of visual and audio materials

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduce self and others – Use present simple and continuous	Unit 1: You and Me	Role-play + grammar task	Oral Evaluation
2	2	Talk about jobs – Use past simple	Unit 2: Working Life	Reading + speaking	Quiz
3	2	Write short stories using past tense	Unit 3: The Past	Listening + writing	Writing task
4	2	Talk about free time and feelings	Unit 4: Happy Days	Video + discussion	Speaking rubric
5	2	Personal letter / Email	Writing Workshop I	Planning + writing	Written task
6	2	Use was/were + could	Unit 5: Adventures	Reading and discussion	Quiz
7	2	Talk about holidays – Use adjectives and too/enough	Unit 6: Time Off	Interactive task	Participation
8	2	Skills review (Units 1–6)	Midterm Exam	Review + exam	Midterm
9	2	Use comparatives and used to	Unit 7: Then and Now	Grammar game + writing	Paragraph task
10	2	Talk about achievements – Use past perfect	Unit 8: Life Stories	Interview + reading	Oral evaluation

11	2	Vocabulary of nature – Use will/won't	Unit 9: The World Around Us	Watching + prediction task	Quiz
12	2	Opinion paragraph	Writing Workshop II	Peer review + editing	Writing assessment
13	2	Describe food and recipes	Unit 10: What's Cooking?	Listening + description	Mini project
14	2	Vocabulary, grammar, skills revision	Final Review	Games + group work	Participation
15	2	Full CEFR-based assessment	Final Exam	Speaking + writing + listening	Final Exam

11. Course Evaluation

Participation, Homework 10%

Quizzes & Speaking Tasks 20%

Writing Assignments 10%

Midterm Exam 10%

Final Exam (All Skills) 50%

Total 100%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• *New Headway – Pre-Intermediate Student's Book* By Liz and John Soars – Oxford University Press
Recommended books and references (scientific journals, reports…)	• *English Grammar in Use – Elementary & Pre-Intermediate* by Raymond Murphy • *Oxford Word Skills – Pre-Intermediate & Intermediate* • *Check Your English Vocabulary* by Rawdon Wyatt • Picture dictionaries and grammar workbooks for A2–B1 level
Electronic References, Websites	https://www.oxfordlearnersdictionaries.com https://learnenglish.britishcouncil.org https://www.esl-lab.com https://www.englishpage.com

Course Description Form

1. Course Name:
Energy Resources
2. Course Code:
ESOU217
3. Semester / Year:
second semester
4. Description Preparation Date:
01/09/2024
5. Available Attendance Forms:
in class
6. Number of Credit Hours (Total) / Number of Units (Total)
2
7. Course administrator's name (mention all, if more than one name)
Name: Mustafa Hussein Bahaulddin Email: mustafa.hussein@ntu.edu.iq
8. Course Objectives

Course Objectives	On completion of the module the student is expected to be able to: • an appreciation of recent history and current trends in the energy sector. • an understanding of the impact energy has on the local and global environment. • the ability to undertake an evaluation of energy conversion technologies. • a working knowledge of legislative, econor and environmental constraints and drivers.

9. Teaching and Learning Strategies	
Strategy	• Teaching energy can be a topic that is personal, local or global. Various teaching methods can suit each approach. For specific examples, see activities or courses for teaching about energy. • Case studies to delve into particular geographic regions or types of energy • Hands-on labs with energy technology (solar cells, turbines) (example: Using Lab Measurements to Determine the Feasibility of a Photovoltaic Panel) • Modeling:Use of data sets to examine energy trends over time, imports/exports, sources and uses of energy, and energy pricing

	• Using a quantitative approach to examining energy choices (example: Back of the Envelope Calculations: Renewable Energy) • Personal energy use analysis and taking actions to conserve (example: Action to Enhance Sustainability) • Campus energy audits: Field trips to a local energy plant, transmission lines, mine, or renewable energy installation (example: Urban Environmental Excursions) • Town hall meeting-style discussions in class to explore options as well as pros and cons of various local energy sources (example: The Great Energy Debate) • Explore policy implications for alternative energy sources (example: A mock legislative debate to enhance and integrate student understanding of climate change science, policy, economics and ethics) • Using GIS or local energy maps (where does our power come from, where does it go?) • Life cycle analyses

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	• Understand the global and societal importance of energy in modern life. • Identify the main drivers of energy demand and consumption. • Recognize the environmental and economic impacts of energy systems.	Introduction - The importance of energy	Theoretical lecture with PowerPoint	Oral questions to assess students' understanding
2	2	• Define fuel and energy in scientific terms. • Classify fuels based on origin and usage (solid, liquid, gas; renewable vs. non-renewable).	Fuel, fuel classifications, Energy,	Oral review of previous lecture	Question via Google Classroom

		• Compare different fuel types in terms of efficiency and environmental impact.			
3	2	• Distinguish between renewable and non-renewable energy sources. • Understand the role of each type in the global energy mix. • Analyze the advantages and limitations of each energy type.	Renewable and non-renewable energy	Interactive explanation using the board	Oral group -based questions to support collaborative thinking
4	2	• Describe the key characteristics of various energy resources (availability, cost, efficiency). • Understand the basic principles of energy conversion processes. • Evaluate conversion efficiency for common energy systems	characteristics of energy resources, energy conversion.	Lecture supported by video	Assignment on via Google Classroom
5	2	• Explain the formation and extraction of petroleum and oil. • Identify the components and types of oil reservoirs. • Understand the chemical	Non-Renewable Sources of Energy, Petroleum, oil reservoirs, compositions	Interactive lecture and brainstorming	Quick quiz

		composition of crude oil and its refining process.			
6	2	• Define solid fossil fuels and describe their types (e.g., coal, peat, lignite). • Analyze the characteristics and properties of various coal types. • Compare solid fuels in terms of usage and environmental effects.	Solid fossil fuel \ Definitions, Characteristics, kinds,	Interactive group-led lecture on compressor types, pros & cons	Divide students into groups, each with a unique question, to present a unified answer
7	2	• Perform proximate and ultimate analysis of coal. • Calculate the heating value of coal using standard methods. • Interpret analysis data to evaluate fuel quality.	Coal analysis, Heating value calculation for coal. Wood Characteristics, kinds, and Wood Heating value	Written test	Written exam
8	2	• Define natural gas and its various types (e.g., dry, wet, associated). • Understand the physical and combustion characteristics of natural gas. • Calculate the energy content and heating value of gaseous fuels.	Natural Gas \ Definitions, characteristics, kinds, Heating value for gaseous fuel.	PowerPoint lecture with practical data show	Oral review with questions from previous lectures
9	2	• Explain the basic principles of nuclear energy generation.	Nuclear Energy \ Kinds of nuclear energy, Kinds of Nuclear	Lecture with case study	Oral question

		• Differentiate between types of nuclear reactions and reactor designs. • Evaluate the applications and safety concerns of nuclear energy.	reactors, applications		
10	2	• Describe the role of hydrogen as a clean energy carrier. • Compare different hydrogen generation methods. • Understand hydrogen storage technologies and fuel cell operation. Evaluate the practical applications and challenges of hydrogen energy.	Renewable Sources of Energy \ Hydrogen Energy, Methods of Hydrogen generations, Hydrogen storage and fuel cells, applications	Interactive lecture and brainstorming	Quick quiz
11	2	• Understand the sources and types of biomass energy. • Explain the production and utilization of biogas and biodiesel. • Evaluate the feasibility and limitations of bioenergy projects. • Analyze recycling methods and sustainability of energy crops.	Biomass Energy \ Biogas, Biogas utilization units, Biodiesel, Recycling Energy corps, Applications and limitations of Bio energy	Group activity	Oral questions
12	2	• Understand the working principles	Hydroelectric Energy \ Principles Assessing the	Video and discussion	Student-led presentation

		of hydroelectric power systems. • Assess site characteristics for small-scale hydro installations. • Describe the function and design of impulse turbines. • • Evaluate the efficiency and sustainability of hydroelectric systems.	resource for small installations, An impulse turbine, Hydroelectric systems		
13	2	• Understand the fundamentals of solar radiation and its measurement. • Use various methods to estimate solar radiation for energy projects. Analyze solar resource data for system design and evaluation.	Solar Energy \ Measurements of solar radiation, Estimation of solar radiation	Written test	Oral exam
14	2	• Describe the geophysical basis of geothermal energy. • Differentiate between types of geothermal reservoirs (dry rock, aquifers). • Understand methods of extracting and	geothermal energy \ introduction, Geophysics, Dry rock and hot aquifer analysis, Harnessing Geothermal Resources	Lecture with images	Oral exam

		utilizing geothermal energy. • Evaluate the potential and challenges of geothermal energy projects.			
15	2	• Explain the principles of wind energy and turbine operation. • Identify different types of wind turbines and their efficiencies. • Analyze wind characteristics and their influence on energy production. • Evaluate wind energy potential for electricity generation.	wind energy \ Introduction, Turbine types and, Characteristics of the wind, Power extraction by a turbine, Electricity generation	Lecture	Interactive questions
16	2	Comprehensive materia review	Preparatory week before the final Exam	Review session	Preparatory quiz / questions

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Goldmberg J., Johansson, Reddy A.K.N., Energy for a Sustainable World, John Wiley
Main references (sources)	Goldmberg J., Johansson, Reddy A.K.N., Energy for a Sustainable World, John Wiley
Recommended books and references (scientific journals, reports…)	Narbel P.A., Hansen J.P., Lien J.R., 2014. Energy Technologies and Economics. Cham: Springer
Electronic References, Websites	

Course Description Form

1. Course Name:	
Mathematics (4)	
2. Course Code:	
OECK 202	
3. Semester / Year:	
2nd semester/ second year	
4. Description Preparation Date:	
9/2024	
5. Available Attendance Forms:	
In class	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 hours / 3 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Saad Saleem Merie Email: saad.saleem@ntu.edu.iq	
8. Course Objectives	
Course Objectives	• To equip students with the knowledge and understanding of mathematical concepts, notation and techniques relevant to mechanical engineering. • To develop skills and confidence in mathematical modelling and problem solving. • To support students in understanding mathematical aspects of other modules
9. Teaching and Learning Strategies	
Strategy	• Implementing active learning in a class room requires preparation and some changes to the lecture. However, the lecture content is not changed or replaced with new material. The same lecture content is delivered to the students in a better way and the lecture time is used more effectively. The following are some of the techniques of active learning and cooperative learning I personally use in

my engineering classes to enhance student's understanding and retention of the material:

- One Minute Paper: Students are asked to write a one minute note (about the previous lecture, the homework or the material in general) to the instructor on a piece of paper. This provides a fast way for the teacher to have a quick feedback on students understanding of what was covered previously.
- Muddiest Point: When there is a long lecture with multiple topics covered, the students are given the chance to discuss the material covered in the lecture and list the most difficult parts of the lecture.
- Clarification Pause: During the lecture, the students are given the time to go over the material written on the board, think about it and ask if they have any questions. Then, the lecturer answers the different questions raised before resuming the next part of the lecture.
- Questions and answers: Usually during the lecture, questions are raised about the new material presented and questions are solved on the board. A sample of the questions asked include "Why do you think this topic is important?" or "what is the relation between what we were talking about and this technique?" or "which technique is best?"
- Critical Thinking, Group Discussion: Students are given a handout with multiple problems and they are asked to apply what they learned in the lecture to solve the problems in groups. They are asked to discuss it together and come up with a single solution that all members agree on.
- Critical Thinking, Think-pair-share: Students are asked to work individually on a problem for a short time; then students pair up to compare their answers. Then they have to explain their answer and share it with the rest of the class.
- Peer Teaching: If one member of the team solves the problem correctly, He will explain it to the rest of the group and discuss with them why his/her answer is correct and their answer is not. This allows the students to find out what went wrong and the mistake they made in solving the problem. This technique will help the student to avoid these mistakes when doing the homework or the exams.

- Active Review Sessions: For each exam, students are given a practice test with a set of problems a week in advance. They are encouraged to work on the practice test individually first and then in groups to discuss the answers. During the review session, the students are asked questions about the problems in the practice test and they are given the choice to decide which problems they want the professor to concentrate on.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	The student understands the fundamental concepts of Matrix.	Matrix Definition	Presentation using the board	Solving questions on the board
2	3	The student will be able to perform multiplication, addition and subtraction operations between matrices.	Matrix Operations	Interactive explanation on the board	Written activity
3	3	The student learns about special types of matrices.	Special forms of Matrices	Presentation combined with board explanation	Online exam via Google Classroom
4	3	The student learns the concept of the determinant of a square matrix.	Determinants	Interactive explanation on the board	Written activity
5	3	The student applies various concepts and laws to matrices.	Minors and cofactors	Presentation combined with board explanation	Board-based exam
6	3	The student understands Cramer's method for solving number systems.	Cramer’s Rule	Presentation combined with board explanation	Assignment submission via Google Classroom
7	3	The student uses the Gaussian method for	Gaussian Elimination Method	Presentation combined with board explanation	Group activity

		elimination on a square matrix.			
8	3	exam	Mid-Term Exam	Exam	Written activity
9	3	The student is trained to extract the matrix adjoint..	The Adjoint of a Matrix	Presentation combined with board explanation	Group activity
10	3	The student learns about Singular and non-Singular matrices..	Singular and Non-Singular Matrices	Presentation combined with board explanation	Assignment submission via Google Classroom
11	3	The student calculates the inverse of the square matrix.	The Inverse of a Matrix	Presentation combined with board explanation	Group activity
12	3	Study of solving systems of equations using matrices	Solution of Simultaneous equations with Matrices	Presentation combined with board explanation	Written activity
13	3	The student learns to find eigenvalues.	Eigen values	Presentation combined with board explanation	Assignment submission via Google Classroom
14	3	The student learns to find eigenvectors.	Eigen vectors	Presentation combined with board explanation	Written activity
15	3	Final Exam	Preparing for the final Exam	Exam	Written activity

11.

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Calculus
Main references (sources)	Advanced Engineering Mathematics
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Computer Programming – MATLAB
2. Course Code:
CPML218
3. Semester / Year:
2nd semester/ second year
4. Description Preparation Date:
1/9/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
60 hours / 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Saad Saleem Merie Email: saad.saleem@ntu.edu.iq
8. Course Objectives

Course Objectives	•Introducing students to programming methods and the use of MATLAB to solve mathematical and engineering problems. • Enabling students to write lines of code and use them for analysis and deriving results.
9. Teaching and Learning Strategies	
Strategy	• Implementing active learning in a class room requires preparation and some changes to the lecture. However, the lecture content is not changed or replaced with new material. The same lecture content is delivered to the students in a better way and the lecture time is used more effectively. The following are some of the techniques of active learning and cooperative learning I personally use in my engineering classes to enhance student's understanding and retention of the material: • One Minute Paper: Students are asked to write a one minute note (about the previous lecture, the homework or the material in general) to the instructor on a piece of paper. This

	provides a fast way for the teacher to have a quick feedback on students understanding of what was covered previously. • Muddiest Point: When there is a long lecture with multiple topics covered, the students are given the chance to discuss the material covered in the lecture and list the most difficult parts of the lecture. • Clarification Pause: During the lecture, the students are given the time to go over the material written on the board, think about it and ask if they have any questions. Then, the lecturer answers the different questions raised before resuming the next part of the lecture. • Questions and answers: Usually during the lecture, questions are raised about the new material presented and questions are solved on the board. A sample of the questions asked include "Why do you think this topic is important?" or "what is the relation between what we were talking about and this technique?" or "which technique is best?" • Critical Thinking, Group Discussion: Students are given a handout with multiple problems and they are asked to apply what they learned in the lecture to solve the problems in groups. They are asked to discuss it together and come up with a single solution that all members agree on. • Critical Thinking, Think-pair-share: Students are asked to work individually on a problem for a short time; then students pair up to compare their answers. Then they have to explain their answer and share it with the rest of the class. • Peer Teaching: If one member of the team solves the problem correctly, He will explain it to the rest of the group and discuss with them why his/her answer is correct and their answer is not. This allows the students to find out what went wrong and the mistake they made in solving the problem. This technique will help the student to avoid these mistakes when doing the homework or the exams. • Active Review Sessions: For each exam, students are given a practice test with a set of problems a week in advance. They are encouraged to work on the practice test individually first and then in groups to discuss the answers. During the review session, the students are asked questions about the problems in the practice test and they are given the choice to decide which problems they want the professor to concentrate on.

10. Course Structure(Theoretical)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Knowledge and practical application	Starting MATLAB , Using MATLAB as a calculator , Quitting MATLAB	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
2	2	Knowledge and practical application	Creating MATLAB variables , Overwriting variable , Error messages	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
3	2	Knowledge and practical application	Making corrections ,Controlling the hierarchy of operations or precedence ,Controlling the appearance of floating point number	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
4	2	Knowledge and practical application	Managing the workspace , Keeping track of your work session , Entering multiple statements per line	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
5	2	Knowledge and practical application	Miscellaneous commands , Tutorial lessons : Mathematical functions ,Examples	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
6	2	Knowledge and practical application	Basic plotting : overview, Creating simple plots , Adding titles, axis labels, and annotations	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
7	2	Knowledge and practical application	Multiple data sets in one plot , Specifying line styles and	Board + Exam + In-class questions +	Exams and reports

			colors , Exercises	Homework + Feedback	
8	2	Knowledge and practical application	Matrix generation :Entering a , Entering a matrix ,Matrix indexing	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
9	2	Knowledge and practical application	Colon operator , Linear spacing ,Colon operator in a matrix	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
10	2	Knowledge and practical application	Creating a sub-matrix ,Deleting row or column , Dimension	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
11	2	Knowledge and practical application	Continuation ,Transposing a matrix ,Concatenating matrices	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
12	2	Knowledge and practical application	Matrix generators ,Special matrices , Exercises	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
13	2	Knowledge and practical application	Array operations :Matrix arithmetic operations ,Array arithmetic operations , Solving linear equations ,Matrix inverse ,Matrix functions	Board + Exam + In-class questions + Homework + Feedback	Exams and reports
14	2	Knowledge and practical application	M-File Scripts: Examples ,Script side-effects ,M-File functions, Anatomy of a M-File function ,Input and output arguments ,Input to a script file, Output commands	Board + Exam + In-class questions + Homework + Feedback	Exams and reports

15	2	Knowledge and practical application	Control flow: The ‘‘if...end’’ structure ,Relational and logical operators , The ‘‘for...end’’ loop , The ‘‘while...end’’ loop	Board + Exam + In-class questions + Homework + Feedback	Exams and reports

11. Course Structure(Practical)

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understanding and practical application	Starting MATLAB , Using MATLAB as a calculator , Quitting MATLAB	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
2	2	Understanding and practical application	Creating MATLAB variables , Overwriting variable , Error messages	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
3	2	Understanding and practical application	Making corrections ,Controlling the hierarchy of operations or precedence ,Controlling the appearance of floating point number	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
4	2	Understanding and practical application	Managing the workspace , Keeping track of your work session , Entering	Practical application on the computer	Oral questions + practical exam + attendance +

			multiple statements per line		homework + application follow-up on MATLAB
5	2	Understanding and practical application	Miscellaneous commands , Tutorial lessons : Mathematical functions ,Examples	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
6	2	Understanding and practical application	Basic plotting : overview, Creating simple plots , Adding titles, axis labels, and annotations	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
7	2	Understanding and practical application	Multiple data sets in one plot , Specifying line styles and colors , Exercises	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
8	2	Understanding and practical application	Matrix generation :Entering a , Entering a matrix ,Matrix indexing	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
9	2	Understanding and practical application	Colon operator , Linear spacing ,Colon operator in a matrix	Practical application on the computer	Oral questions + practical exam + attendance + homework

					+ application follow-up on MATLAB
10	2	Understanding and practical application	Creating a sub-matrix ,Deleting row or column , Dimension	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
11	2	Understanding and practical application	Continuation ,Transposing a matrix ,Concatenating matrices	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
12	2	Understanding and practical application	Matrix generators ,Special matrices , Exercises	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
13	2	Understanding and practical application	Array operations :Matrix arithmetic operations ,Array arithmetic operations , Solving linear equations ,Matrix inverse ,Matrix functions	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB
14	2	Understanding and practical application	M-File Scripts: Examples ,Script side-effects ,M-File functions,	Practical application on the computer	Oral questions + practical exam + attendance +

			Anatomy of a M-File function ,Input and output arguments ,Input to a script file, Output commands		homework + application follow-up on MATLAB
15	2	Understanding and practical application	Control flow: The ‘‘if...end’’ structure ,Relational and logical operators , The ‘‘for...end’’ loop , The ‘‘while...end’’ loop	Practical application on the computer	Oral questions + practical exam + attendance + homework + application follow-up on MATLAB

12. Course Evaluation

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

13. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Available in the colle library
Main references (sources)	Available in the colle library
Recommended books and references (scientific journals, reports…)	Internet
Electronic References, Websites	

Course Description Form

1. Course Name: Energy Balances

2. Course Code: ENB212

3. Semester / Year: 1st / 2024-2025

4. Description Preparation Date: 01/09/2024

5. Available Attendance Forms: Attendance in class

6. Number of Credit Hours (Total) / Number of Units (Total): 30/2

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

Name: Dr. Morad Abdulwheed Radha
Email: morad.a.radha@ntu.edu.iq

8. Course Objectives

Course Objectives	This module explains how to analyze energy flow during various processes, whether industrial or natural. These lectures aim to understand how energy is transferred and transformed, how to calculate its inputs and outputs, as well as its consumption and generation in any system, and thus 1. Develop a conceptual understanding of material balances 2. Understand the features of open, closed, steady-state, and unsteady-state systems 3. Select a system suitable for solving a problem, either closed or open, steady- or unsteady-state, and fix the system boundary. 4. Express in words how to form the material balances for processes involving single or multiple components 5. Familiarize yourself with the strategy to assist you in solving material balance problems 6. Define or explain the following terms: system, closed system, nonflow system, open system, flow system, surroundings, property, extensive property, intensive property, state. 7. Dealing with chemical reaction processes calculations.

9. Teaching and Learning Strategies

Strategy	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, online lecture, and seminar and by considering type of simple experiments involving some sampling activities that are interesting to the students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Develop a conceptual understanding of energy material balances	Revision to Energy Balances	Interactive lectures + group discussion + brainstorming	Formative and summative assessments
2	2	Understanding the fundamentals and laws of energy	Energy forms	Interactive lectures + group discussion+ brainstorming	Formative and summative assessments
3	2	Energy calculations: work, heat transfer, internal energy and heat capacity	Energy forms calculations	Interactive lectures + Tutorial+ brainstorming	Formative and summative assessments
4	2	Formulating energy Balance equations for processes that do not involve a chemical reaction	Energy balances without chemical reaction	Interactive lectures + Tutorial + brainstorming	Formative and summative assessments
5	2	Formulating energy balance equations for processes that involve a chemical reaction	Energy balances with chemical reaction	Interactive lectures + group discussion brainstorming	Formative and summative assessments
6	2	Definition of enthalpy and its role in formulating energy balance equations for chemical processes	Enthalpy	Interactive lectures + group discussion brainstorming	Formative and summative assessments
7	2	Sensible heat (heat content changes within a phase)& latent heat (heat content changes in phase transitions)	Overall enthalpy Changes calculations	Field Trips	Formative and summative assessments
8	2	Types of interactive processes, and solving various problems.	Heats of reaction.	Interactive lectures + group discussion brainstorming	Formative and summative assessments
9	2	Combustion Reaction Terminology Solving Various Problems	Heats of formation.	Interactive lectures + group discussion brainstorming	Formative and summative assessments

10	2	Fuel Combustion and heating values calculations	Heat of combustion; Fuels and combustion	Interactive lectures + group discussion brainstorming	Formative and summative assessments
11	2	Formulating Energy Balances Equations and Their Applications in Open Systems	Energy balances On open system	Interactive lectures + group discussion brainstorming	Formative and summative assessments
12	2	Formulating Energy Balances Equations and Their Applications in Closed Systems	Energy balances On closed system	Interactive lectures + Tutorial+ brainstorming	Formative and summative assessments
13	2	Formulating simultaneous material & energy balances Equations and Their Applications	Simultaneous material and energy balances	Interactive lectures + group discussion brainstorming	Formative and summative assessments
14	2	Definition and understanding of humidity, bulb temperature, and wet bulb temperature	Humidity.	Interactive lectures + group discussion brainstorming	Formative and summative assessments
15	2	Understanding humidity chart, humidity volume, adiabatic refrigerant line	Psychometric charts in engineering calculations	Interactive lectures + group discussion+ brainstorming	Formative and summative assessments

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, activities.... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	David M. Himmelblau and James B. Riggs, "Basic Principles and Calculations in Chemical Engineering", Eighth Edition.
Main references (sources)	Richard M. Felder and Ronald W. Rousseau, "Elementary Principles of Chemical Processes", Third Edition, (1999).
Recommended books and references (scientific journals, reports…)	https://link.springer.com/ https://ebooks.health.elsevier.com/
Electronic References, Websites	https://link.springer.com/ and Websites in the textbook

Course Description Form

1. Course Name:
Fluid Mechanics 1 & 2
2. Course Code:
FLUD215 & FLUD216
3. Semester / Year:
2ND Semester/ Second Year
4. Description Preparation Date:
9/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
2 practical/ 2 theoretical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Obed Majeed Ali Email: obedmajeed@ntu.edu.iq
8. Course Objectives

Course Objectives	**• Understand the behavior and properties of flu** **• Understand the basic principles of fluid scie** **• Analyze the properties of fluids and the fact affecting them** **• Study the motion and behavior of fluids** **• Explore the properties and applications various fluids** **• Understand the laws of fluids** **• Identify the types of flow** **• Study the flow patterns in different sections** **• Delve into flow losses and their causes**

9. Teaching and Learning Strategies

Strategy	• Developing students' speaking and presentation skills. • Adopting the teamwork method within small groups to devel the spirit of cooperation and collaborative thinking. • Holding discussion groups among students to exchange vie on solutions to challenges related to fluid movement.

	• Encouraging students to use technological means to prepa simplified presentations and projects that address the concep and basics of fluid motion. • Activating the brainstorming method within the lecture stimulate interaction and active participation by students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Knowing the properties of fluids	Fluid Properties		
2	4	Understanding the properties of fluids	Fluid Properties Analysis		
3	4	Comparing the properties of fluids	Dimensional Analy	Theoretical +	Written tests
4	4	Understanding the effect of pressure	Fluid Pressure	Practical	Daily exams
5	4	How to measure pressure	Pressure Measurement	PowerPoint lecture with	Online tests
6	4	Understanding buoyancy	Buoyancy	answers to questions on	Homework
7	4	Understanding flui flow	Fluid Flow	the board.	assignments
8	4	Understanding momentum	Momentum Equatic	Practical test	Oral tests
9	4	Understanding energy analysis	Energy Equation	and experiments i the lab.	Practical test
10	4	Understanding flov in pipes	Flow in Pipes	Interactive	
11	4	Calculating pressur drop	Pressure Drop	learning through	
12	4	Understanding laminar flow	Laminar Flow	questions and answers with	
13	4	Understanding turbulent flow	Turbulent Flow	students.	
14	4	Understanding the effect of accessorie	Pressure Drop in Appendages		
15	4	Understanding flov measurement	Flow Measurement		
16	4	Understanding measuring devices	Flow Measuring Instruments		

17	4	Understanding equations	Flow Calculation		
18	4	Knowledge of pumping equipmen	Equations		
19	4	Knowledge of pow calculations	Pumping Equipmen		
20	4	Knowledge of efficiency calculations	Capacity		
21	4	Knowledge of applying equations	Efficiency		
22	4	Understanding flov	Mathematical		
23	4	Knowledge of applying equations	Equations		
24	4	Understanding	Porous Media		
25	4	Particle behavior	Laws and Equations		
26	4	Knowledge of drag force	Particle Mechanics Drag Force		
27	4	Knowledge of drag coefficient	Drag Coefficient		
28	4	Knowledge of fluidization	Fluidization		
29	4	Understanding the fluidization mechanism	Fluidization Mechanism		
30	4	Knowledge of fluidization velocit	Fluidization Velocit		

11. Course Evaluation

Grade Distribution out of 100 Based on Student Tasks such as: Assignments, Presentations, Daily Quizzes (5 Quizzes), Monthly and Written Exams, Laboratory Reports, In-Lab Activities, or Scientific Activities.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Fluid Mechanics by Victor

Recommended books and references (scientific journals, reports…)	Fluid Mechanics and Hydraulics by Jack
Electronic References, Websites	

Course Description Form

1. Course Name: Material Balances

2. Course Code: MAB211

3. Semester / Year: 1st / 2024-2025

4. Description Preparation Date: 01/09/2024

5. Available Attendance Forms: Attendance in class

6. Number of Credit Hours (Total) / Number of Units (Total): 30/2

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

Name: Dr. Morad Abdulwheed Radha
Email: morad.a.radha@ntu.edu.iq

8. Course Objectives

Course Objectives	1. Develop a conceptual understanding of material balances 2. Understand the features of open, closed, steady-state, and unsteady-state systems 3. Select a system suitable for solving a problem, either closed or open, steady- or unsteady-state, and fix the system boundary. 4. Express in words how to form the material balances for processes involving single or multiple components 5. Familiarize yourself with the strategy to assist you in solving material balance problems 6. Define or explain the following terms: system, closed system, nonflow system, open system, flow system, surroundings, property, extensive property, intensive property, state. 7. Dealing with chemical reaction processes calculations.

9. Teaching and Learning Strategies

Strategy	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved

	through classes, interactive tutorials, online lecture, and seminar and by considering type of simple experiments involving some sampling activities that are interesting to the students.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Develop a conceptual understanding of material balances	Revision to Material Balances	Interactive lectures + group discussion + brainstorming	Formative and summative assessments
2	2	Draw and understand the streams, components of flow diagrams	Flow diagrams	Interactive lectures + group discussion+ brainstorming	Formative and summative assessments
3	2	strategy solving material balance problems with single unit	Material Balances for a Single Component process	Interactive lectures + Tutorial+ brainstorming	Formative and summative assessments
4	2	strategy solving material balance problems with many units and Solving different Problems	Material Balances for multi component process	Interactive lectures + Tutorial + brainstorming	Formative and summative assessments
5	2	Types of nonreactive process	Balances on Nonreactive Process	Interactive lectures + group discussion brainstorming	Formative and summative assessments
6	2	Terminology for Applications of Stoichiometry Solving different Problems with Chemical reaction	Balances on reactive Process	Interactive lectures + group discussion brainstorming	Formative and summative assessments
7	2	Combustion process definitions with applicable problems	Balances on Combustion Process	Field Trips	Formative and summative assessments
8	2	Terminology and problems	Crystallisation Process	Interactive lectures + group discussion brainstorming	Formative and summative assessments
9	2	Solving problems Contain multi-units	Processes Involving Multiple Reactions	Interactive lectures + group discussion brainstorming	Formative and summative assessments

10	2	Recycle importance & solving problems	Recycle process without chemical reaction	Interactive lectures + group discussion brainstorming	Formative and summative assessments
11	2	Bypass importance & solving problems	Bypass process without chemical reaction	Interactive lectures + group discussion brainstorming	Formative and summative assessments
12	2	Purge importance & solving problems	Purge process without chemical reaction	Interactive lectures + Tutorial+ brainstorming	Formative and summative assessments
13	2	solving problems	Recycle process with chemical reaction	Interactive lectures + group discussion brainstorming	Formative and summative assessments
14	2	solving problems	Bypass process with chemical reaction	Interactive lectures + group discussion brainstorming	Formative and summative assessments
15	2	solving problems	Bypass process with chemical reaction	Interactive lectures + group discussion+ brainstorming	Formative and summative assessments

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, activities.... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	David M. Himmelblau and James B. Riggs, "Basic Principles and Calculations in Chemical Engineering", Eighth Edition.
Main references (sources)	Richard M. Felder and Ronald W. Rousseau, "Elementary Principles of Chemical Processes", Third Edition, (1999).
Recommended books and references (scientific journals, reports…)	https://link.springer.com/ https://ebooks.health.elsevier.com/
Electronic References, Websites	https://link.springer.com/ and Websites in the textbook

Course Description Form

1. Course Name:
Baath Party crimes
2. Course Code:
NTU 202
3. Semester / Year:
Second Year, 2024-2025
4. Description Preparation Date:
18-9-2024
5. Available Attendance Forms:
class
6. Number of Credit Hours (Total)30 / Number of Units (Total)
30 Hours 2 Credit
7. Course administrator's name (mention all, if more than one name)
Name: Avesta Salar Omer Email: Avesta.sala@ntu.edu.iq
8. Course Objectives

Course Objectives	**Introducing students to the concept of cri both linguistically and technically.** **Help students become familiar with theoretical and practical aspects of the crir committed by the defunct Ba'ath Party.** **Introducing students to Ba'athist violati against individuals, as well as internatic laws and conventions, which require furt research and study.**
9. Teaching and Learning Strategies	
Strategy	Educational Strategies Active Learning 1. Organize classroom discussion groups on t human rights violations committed by the former Ba'ath Par 2. Use brainstorming to analyze the human rights violatic committed by the former Ba'ath Party

	Cooperative Learning 1. Divide students into small groups study the Ba'ath crimes 2. Organize group presentations on Ba'ath crimes Interactive Lectures 1. Engage students by asking open-end questions during the lecture Field Visits and Guest Speakers 1. Visit the Political Prisone Foundation or the High Commission for Human Rights - Fi Visit to a retired judge to explain the role of the judiciary a the restrictions imposed on judicial authority during the era the former Ba'ath Party 2. Invite activists, lawyers, and academics to share th experiences Educational Resources 1. Reliable books and sources in Arabic and English 2. Awareness-raising and educational videos 3. Legal articles and analyses Evaluation 1. Short and varied tests including objective and ess questions 2. Preparing analytical reports Crimes and human rig violations committed by the former Ba'ath Party. 3- Encouraging students to evaluate their own work and t performance of their peers.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	2	Statement of the most important human rights violations that occurred in Iraq	Violations of human rights and freedoms		Through open-ended questions - the topic the student benefited most from the student's opinion on the lecturer's topic
Second	2	A statement of the most important political systems t the Iraqi people ha	A descriptive overview of the political systems in Iraq		5-minute test at the end of the lecture

		experienced since the British occupation			
Third	2	Baath violations o freedom of expression and th media and the lac separation of powers	The Baath regime's violation of public rights and freedoms		By evaluating each group's work for another group
Fourth	2	The most importa negatives of oppressive author and its impact on society	The impact of the Baath regime's behavior on society and its control over the state		By evaluating each group's work for another group.
Fifth	2	Statement on Baathist violations and the role of organizations in these violations	Field visit to the Office of the Human Rights Commission and the Political Prisoners Foundation		Preparing an evaluation form to evaluate the lecture by students
Sixth	2	Transitional justic in Iraq	The impact of the transitional phase in combating authoritarian politics		The report is evaluated by the subject teacher based on the efforts made by the student and the sources used in the report.

Seventh	2	Psychological effe of repressive behavior	Psychological field		5-minute test at the end of the lecture
Eighth	2	A test for students on the material th have covered in previous lectures	Test		It is evaluated through the students' test results
Ninth	2	The impact of repression on society and religio	Social field - religion and state		By evaluating each group's work for another group.
Tenth	2	The impact of oppressive author on culture and media	Culture, media and militarization of society		5-minute quiz at the end of the lecture
Eleventh	2	The negative effec of oppressive authority on the environment and population	The impact of repression and war on the environment and population		hrough open-ended questions - the topic the student benefited most from - the student's opinion on the lecturer's topic

Twelft	2	Environmental pollution resulting from the authority the tyrant	The use of internationally prohibited weapons and environmental pollution		Through open-ended questions - the topic the student benefited most from - the student's opinion on the lecture topic
Thirteenth	2	Climate change du to environmental pollution resulting from burning agricultural land	Scorched earth policy, draining the marshes, and forced migration		5-minute quiz at the end of the lecture
Fourteenth	2	Economic effects c repressive policy	Destruction of the agricultural and animal environment and radioactive contamination		Through open questions - the topic that the student benefited most from - the student's opinion about the lecture topic
Fifteenth	2	killing innocent people	Mass graves and bombing of places of worship		Preparing an evaluation form to assess human rights by students

11.
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. As follows: First, daily tests 10 points, assignments 5 points, seminar 10 points, daily attendance 5 points, midterm exam 10 points, final exam 60 points.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	The curriculum approved by t Ministry of Higher Education a Scientific Research
Recommended books and references (scientific journals, reports…)	Articles of the Universal Declaration Human Rights - Reports of the Hum Rights Commission Reports of international organizatic working in the field of humanitari affairs, such as the UNAMI mission Iraq Judicial decisions
Electronic References, Websites	Website of the United Nations Hi Commissioner for Human Rights Website of the National Institute Human Rights

Course Description Form

1. Course Name:
Physical Chemistry
2. Course Code:
PHCH2013
3. Semester / Year:
2ND Semester/ Second Year
4. Description Preparation Date:
01/09/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
2 practical/ 2 theoretical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Ass. Lec Aya Aws Saad Email: Aya.aws@ntu.edu.iq
8. Course Objectives

Course Objectives	• Understand the behavior and properties of gases. • Grasp the fundamental principles of thermodynamics, including energy laws and spontaneity. • Analyze chemical equilibrium and the key factors that influence it. • Study the structure of molecules and the nature of chemical bonds. • Explore quantum theory and how it applies to chemical systems. • Understand molecular symmetry and its effect on chemical behavior.

	• Learn the basics of solid-state chemistry. • Study surface chemistry and the processes that occur on solid surfaces. • Deepen understanding of molecular motion and kinetic theory.

9. Teaching and Learning Strategies

Strategy	• Develop students' skills in public speaking and effective Presentations in physical chemistry subjects. • Encourage teamwork through small group activities to promote collaboration and shared problem-solving. • Organize student discussion sessions to exchange ideas and explore solutions to challenges in physical chemistry. • Arrange field visits to specialized institutions to strengthen practical understanding and real-world application. • Motivate students to use technology for preparing simple Projects, posters, and presentations related to fundamental physical chemistry concepts. • Incorporate brainstorming activities during lectures to increase student engagement and active participation.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understanding definitions and fundamentals of physical chemistry	Introduction of Physical Chemistry basis	PowerPoint, Interactive Whiteboard	Oral questions to assess students' knowledge and understanding of the subject
2	2	Learning and understanding gas behavior, including general gas properties	Behavior of gases (Properties of gases)	Interactive Whiteboard, Illustrative Videos	Oral questions
3	2	Understanding ideal gas behavior and its related equations	Behavior of gases (Perfect Gas)	PowerPoint, Interactive Whiteboard	Oral questions presented to student groups to encourage thinking

					and collective answering
4	2	Understanding real gas behavior and its related equations	Behavior of gases (Real Gas)	Interactive Whiteboard, Solving Questions	Assignment on Google Classroom
5	2	Understanding the basics of thermodynamics, the definition of a thermodynamic system, its boundaries, and surroundings	Thermodynamics Basis (System, Boundaries, Surroundings)	Interactive Whiteboard, Solving Questions	Verbal review with interactive questions to evaluate students' understanding of the material
6	2	Understanding the fundamentals of thermodynamic processes	Thermodynamic Processes	Interactive Whiteboard, Solving Questions	Group activity
7	2	Understanding the First Law of Thermodynamics with practical examples and real-life applications	First Law Thermodynamics	Written Test	Google Classroom quiz to apply the First Law of Thermodynamics
8	2	Understanding the Second Law of Thermodynamics with applied examples and its connection to the law	Second Law Thermodynamics	PowerPoint Lecture with Practical Demonstration on Data Show	Verbal student review with questions about previous lectures
9	2	Understanding the Third Law of Thermodynamics with practical applications	Third Law Thermodynamics	Lecture with Case Analysis	Oral question
10	2	Learning Helmholtz and Gibbs energy concepts in thermal systems	The Helmholtz and Gibbs	Group Activity	Oral questions
11	2	Understanding theoretical and practical applications of thermodynamic laws	Applications of Laws of Thermodynamic	Interactive Lecture and Brainstorming	Google Classroom quiz with examples on Thermodynamic Laws
12	2	Understanding Maxwell's relations that connect thermal variables such as pressure, volume, temperature, and energy	Maxwell Relations	Problem Solving and Explanation on the Board	Student presentations

13	2	Learning the principles of electrochemical cells, including oxidation-reduction reactions, calculating cell potential using the Nernst equation, and connecting chemical reactions to the production or consumption of electrical energy	Electrochemical Cells	PowerPoint Explanation with Illustrative Video	Oral test
14	2	Understanding types of electrochemical cells such as galvanic and electrolytic cells	Types of Electrochemical Cells (Galvanic Cells Electrolytic Cells)	Lecture Supported by Pictures	Oral test
15	2	Applications of electrochemical cells, including batteries, fuel cells, and their use in hydrogen production	Applications Electrochemical Cells	Lecture with Illustrative Video	Interactive questions
16	2	Student preparation through comprehensive review of the material	preparatory week before the final exam	Review Session	Solving preparatory questions

11. Course Evaluation

Grade Distribution out of 100 Based on Student Tasks such as: Daily Preparation, Presentations, Daily Quizzes (5 Quizzes), Monthly and Written Exams, Laboratory Reports, In-Lab Activities, or Scientific Activities.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Atkins' Physical Chemistry - Eleventh Edition
Main references (sources)	-
Recommended books and references (scientific journals, reports…)	-
Electronic References, Websites	-

Course Description Form

1. Course Name:
Engineering Statistics
2. Course Code:
STAT219
3. Semester / Year:
1st semester/ second year
4. Description Preparation Date:
1/9/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
60 hours / 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Saad Saleem Merie Email: saad.saleem@ntu.edu.iq
8. Course Objectives

Course Objectives	• Introducing students to statistical methods and the use of scientific methods in collecting, organizing, presenting, and classifying various statistical data. • Enabling students to analyze available data, use statistical concepts and methods in analysis, and draw conclusions.
9. Teaching and Learning Strategies	
Strategy	• Implementing active learning in a class room requires preparation and some changes to the lecture. However, the lecture content is not changed or replaced with new material. The same lecture content is delivered to the students in a better way and the lecture time is used more effectively. The following are some of the techniques of active learning and cooperative learning I personally use in my engineering classes to enhance student's understanding and retention of the material:

	• One Minute Paper: Students are asked to write a one minute note (about the previous lecture, the homework or the material in general) to the instructor on a piece of paper. This provides a fast way for the teacher to have a quick feedback on students understanding of what was covered previously. • Muddiest Point: When there is a long lecture with multiple topics covered, the students are given the chance to discuss the material covered in the lecture and list the most difficult parts of the lecture. • Clarification Pause: During the lecture, the students are given the time to go over the material written on the board, think about it and ask if they have any questions. Then, the lecturer answers the different questions raised before resuming the next part of the lecture. • Questions and answers: Usually during the lecture, questions are raised about the new material presented and questions are solved on the board. A sample of the questions asked include "Why do you think this topic is important?" or "what is the relation between what we were talking about and this technique?" or "which technique is best?" • Critical Thinking, Group Discussion: Students are given a handout with multiple problems and they are asked to apply what they learned in the lecture to solve the problems in groups. They are asked to discuss it together and come up with a single solution that all members agree on. • Critical Thinking, Think-pair-share: Students are asked to work individually on a problem for a short time; then students pair up to compare their answers. Then they have to explain their answer and share it with the rest of the class. • Peer Teaching: If one member of the team solves the problem correctly, He will explain it to the rest of the group and discuss with them why his/her answer is correct and their answer is not. This allows the students to find out what went wrong and the mistake they made in solving the problem. This technique will help the student to avoid these mistakes when doing the homework or the exams. • Active Review Sessions: For each exam, students are given a practice test with a set of problems a week in advance. They are encouraged to work on the practice test individually first and then in groups to discuss the answers. During the review session, the students are asked questions about the problems in the practice test and they are given the choice to decide which problems they want the professor to concentrate on.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Knowledge and practical application	Statistics and its relationship to other sciences, statistical method, methods of collecting data, types of samples, classification and tabulation of data.	Practical + Theoretical	Exams and reports
2	4	Knowledge and practical application	Constructing simple and double frequency tables.	Practical + Theoretical	Exams and reports
3	4	Knowledge and practical application	Representing non-quantitative (descriptive) data using bar graphs. Representing quantitative data (frequency distributions), histograms, polygons, bar graphs, and cumulative frequency curves.	Practical + Theoretical	Exams and reports
4	4	Knowledge and practical application	Measures of central tendency, mean, median	Practical + Theoretical	Exams and reports
5	4	Knowledge and practical application	Mode, the relationship between the arithmetic mean, the	Practical + Theoretical	Exams and reports

			median, and the mode		
6	4	Knowledge and practical application	Dispersion measures, range	Practical + Theoretical	Exams and reports
7	4	Knowledge and practical application	Quarter deviation, standard deviation	Practical + Theoretical	Exams and reports
8	4	Knowledge and practical application	Correlation, concept of correlation, simple correlation coefficient	Practical + Theoretical	Exams and reports
9	4	Knowledge and practical application	Spearman's rank correlation	Practical + Theoretical	Exams and reports
10	4	Knowledge and practical application	Correlation of classified traits (coupling coefficient, compatibility coefficient)	Practical + Theoretical	Exams and reports
11	4	Knowledge and practical application	Time series concept, components of time series	Practical + Theoretical	Exams and reports
12	4	Knowledge and practical application	Estimating the general trend (the method of the two-half-means of the series)	Practical + Theoretical	Exams and reports
13	4	Knowledge and practical application	Moving average method, least squares method	Practical + Theoretical	Exams and reports
14	4	Knowledge and practical application	The concept of index numbers, simple index numbers (arithmetic mean method for price levels), weighted index numbers (Laspeyres' number, Paasche's number, optimal index (Fisher's number)	Practical + Theoretical	Exams and reports

15	4	Knowledge and practical application	Statistical tests (t-test, chi-square test)	Practical + Theoretical	Exams and reports

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Available in the college libra
Main references (sources)	Available in the college libra
Recommended books and references (scientific journals, reports…)	Internet
Electronic References, Websites	

Course Description Form

1. Course Name:
Computer
2. Course Code:
3. Semester / Year:
Second / Second 2024−2025
4. Description Preparation Date:
13/9/2024
5. Available Attendance Forms:
Lecture - Lab
6. Number of Credit Hours (Total) / Number of Units (Total)
2/2
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Lecturer Bayan H. Al-Jaleel Email: bayan.hikmat@ntu.edu.iq
8. Course Objectives

Course Objectives	By the end of the course, students will be able to: 1. Understand the fundamentals of computer networks and types of network topologies. 2. Identify key components and protocols used in networking. 3. Operate and navigate within common operating systems and GUIs. 4. Troubleshoot basic computer problems using standard techniques. 5. Explain e-banking systems and their features. 6. Explore introductory concepts of artificial intelligence (AI) and its applications in healthcare.

9. Teaching and Learning Strategies	
Strategy	• Interactive lectures and discussions • Lab-based hands-on activities • Demonstrations of software and network tools • Troubleshooting exercises

	• Video tutorials and multimedia presentations • Quizzes and group assignments

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2+2	Introduction to Computer Networks	Introduction to Organic Chemistry	Lecture	Quiz
2	2+2	Network Components	Bonding, Hybridization, Lewis Structures	Lecture + Demo	Assignment
3	2+2	Types of Networks (LAN/WAN/Internet)	Alkanes and Haloalkanes	Group Activity	Participation
4	2+2	Network Topologies	Nucleophilic Substitution Reactions	Diagramming + Lab	Lab Task
5	2+2	Data Transfer Protocols	Alkenes and Alkynes	Lecture	Quiz
6	2+2	Operating Systems Overview	Aromatic Compounds	Lecture + OS Demo	Quiz
7	2+2	GUI vs CLI	Alcohols, Ethers, Phenols	Practice Session	Lab Report
8	2+2	File Systems & User Interfaces	Carbonyl Compounds (Aldehydes & Ketones)	Hands-on Lab	Assignment
9	2+2	Troubleshooting Basics	Carboxylic Acids & Derivatives	Case-based Scenarios	Practical Quiz
10	2+2	Hardware/Software Problem Solving	Amines and Nitrogen Compounds	Practice Tasks	Report

11	2+2	Introduction to E-Banking	Spectroscopy (IR, NMR, MS)	Lecture + Video	Data Analysis
12	2+2	Mobile Banking & Security	Unknown Compound Identification	Debate & Case Study	Detailed Report
13	2+2	AI in Technology	Organic Biochemistry	Lecture + Brainstorm	Class Discussion
14	2+2	AI in Healthcare	Course Review	Video + Group Task	Group Review
15	2+2	Final Review and Exam	Final Theoretical and Practical Exam	Review + Exams	Final Exam

11. Course Evaluation

Quizzes and Theory Tests 15%

Lab Reports 25%

Participation and In-Class Tasks 10%

Midterm Practical Exam 10%

Final Theoretical Exam 25%

Final Practical Exam 15%

Total 100%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• **Computer Networks**, Andrew S. Tanenbaum (Latest Edition) • **Operating Systems Concepts**, Silberschatz et al. • **Digital Fundamentals**, Floyd
Main references (sources)	• Introduction to Computer Science □ ITL Education Solutions • Operating Systems: Internals and Design Principles □ William Stallings • Internet resources and current case studies provided by the instructor

Recommended books and references (scientific journals, reports…)	• **Journal of Organic Chemistry** – American Chemical Society. • **Tetrahedron Letters** – Elsevier. • **Organic Letters** – ACS peer-reviewed journal. • **Reaxys** – Database for reaction mechanisms and synthesis.
Electronic References, Websites	https://www.geeksforgeeks.org – Networking & OS https://www.tutorialspoint.com – Operating Systems, Networking https://www.khanacademy.org – Computing Basics https://www.coursera.org – AI & Computer Science

Course Description Form

1. Course Name:
Electric Technology
2. Course Code:
ELTE214
3. Semester / Year:
the second Semester 2024-2025
4. Description Preparation Date:
2024 / 9/13
5. Available Attendance Forms: My presence
6. Number of Credit Hours (Total) / Number of Units (Total)
3/ 4
7. Course administrator's name (mention all, if more than one name)
Name: Faisal Ghazi Bshaw Email: feysal70@ntu.edu.iq
8. Course Objectives

Course Objectives	**Introducing students to the fundamentals of electrical technology, types of connections, and practical proof of electrical theories. Electrical Technology Curriculum – Theoret Section / Second Grade / Department of F and Energy Technology Engineering**

9. Teaching and Learning Strategies	
Strategy	Educational technology strategies in the field of electricity include integrating technology into teaching to enhance learning of electrical concepts, providing interactive learning environments, enabling students to research and self-learn, and improving the quality of teaching.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	4		Resistance - Conductivit	In-person	exam + report
1-2	4	Ability to recognize hov temperature affects resistance value	Effect of temperature on resistance value	practical	
3-4	4	Ability to recognize connection of resistors	Ohm's Law - Series, Para and Mixed Resistors	In-person + practical	exam + report
5-6	4	The student's ability perform and recognize student's use of the volt divider law in solv electrical circuits.	Voltage and current divider uses in electrical circuits with solved examples	In-person + practical	exam + report
7-8	4	The ability to identify extent to which the stuc uses Kirchhoff's law voltage and current	Kirchhoff's laws of voltage and current	In-person + practical	exam + report
9-10	4	Ability to identify extent of student use knowledge ab converting the curr source and vice versa	Converting from star to triangular connection and vice versa, and converting voltage source to current source and vice versa.	In-person + practical	exam + report
11-12	4	The ability to identify extent to which the stuc deals with Theven theory	Thevenin's Theorem - Maximum Transmission Theorem Power	In-person + practical	exam + report
13	4	Ability to identify extent to which the stuc uses and deals v Norton's theory	Norton's theory	In-person + Practical	exam + report
15-14	4	The ability and learnin use the student's theory	Contract theory + Maxwell's theory	In-person + practical	exam + report

11. Course Evaluation

Distributing the score out of 1 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Electrical engineering
Main references (sources)	electrical measuring devices
Recommended books and references (scientific journals, reports…)	Peer-reviewed scientific journ in electrical engineering
Electronic References, Websites	

Course Description Form

1. Course Name: Engineering Physics
2. Course Code: OECK 203
3. Semester / Year: 2024-2025
4. Description Preparation Date: 10/09/2024
5. Available Attendance Forms: Mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
Number of credit hours =32 Number of unit (Total)=2
7. Course administrator's name (mention all, if more than one name)
Name: Mohammed Z. Hasan Email:mohamop49@ntu.edu.iq
8. Course Objectives

Course Objectives	**1. Lectures.** **2. Assigning students to do homework or writing research papers so that students can acquire self-learning and presentation skills.** **3. Take sudden exams.** **4. Conducting semester and final exams at the specified dates.** **5. Inform students about how grades are calculated for students during the semester**

9. Teaching and Learning Strategies

Strategy	**1. Broad education to understand the impact of engineering solutions globally a economically. 2. Ability to work in multidisciplinary teams.** **3. The possibility of applying cognitive sciences such as mathematics, pure scien and engineering.** **4. The ability to use the techniques, skills and tools of contemporary engineer in the engineering field.** **5. The ability to design systems to meet the required needs through realis determinants in terms of economics.**

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	2	Physics and Measurement	Learn the Unit	Explanation and exam	Daily Exam
2	2	Vectors	Learn the Unit	Explanation and examples	Daily Exam
3	2	The Force and Laws of Motion	Learn the Unit	Explanatio-n and examples	Daily Exam
4	2	Engineering Requirements of Materials	Learn the Unit	Explanation and examples	Daily Exam
5	2	Work Power Energy and its Conservation	Learn the Unit	Explanation and examples	Daily Exam
6	2	Fluid Mechanics	Learn the Unit	Explanation and examples	Daily Exam
7	2	Electricity	Learn the Unit	Explanation and examples	Daily Exam
8	2	Different examples mechanical propertie	Learn the Unit	Explanation and examples	Daily Exam
9	2	Types of Metal Alloys	Learn the Unit	Explanation and examples	Daily Exam
10	2	Metallic Bonding	Learn the Unit	Explanation and examples	Daily Exam
11	2	Atomic structure a interatomic bonding	Learn the Unit	Explanation and examples	Daily Exam
12	2	Nanomaterials	Learn the Unit	Explanation and examples	Daily Exam
13	2	Ferrous & Non ferr Metals	Learn the Unit	Explanation and examples	Daily Exam
14	2	Polymers	Learn the Unit	Explanation and examples	Daily Exam
15	2	Composite Materials	Learn the Unit	Explanation and examples	Daily Exam
16	2	Semiconductors	Learn the Unit	Explanation and examples	Daily Exam

11. Course Evaluation

Daily exam:20 Monthly Exam :20 Homework:10 Final Exam:50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	

Main references (sources)	Engineering Physics
Recommended books and references (scientific journals, reports…)	Introduction to physics John D. cutnell Kenneth W. Johnson
Electronic References, Websites	https://sites.google.com/site/hasanmaridi

Course Description Form

1. Course Name:
Petroleum Refinery
2. Course Code:
REF210
3. Semester / Year:
2024−2025
4. Description Preparation Date:
13/9/2024
5. Available Attendance Forms:
Mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
Number of Credit Hours (Total) /60 hr Number of Units (Total)/3
7. Course administrator's name (mention all, if more than one name)
Name: Asan Suad Mohammed Email: assen.suad84@ntu.edu.iq
8. Course Objectives

Course Objectives	- refinery is to produce gasoline, diesel or asph key objectives include improving return investment (ROI), net profitability and cash fl Great strides have been made in improving pl efficiency and productivity by implement online, interactive compute
9. Teaching and Learning Strategies	
Strategy	Explanation of the concept of petroleum refinery can be done using various relevant methods and strategies to make it easier for students to understand, for example through laboratory or practicum activities, using problem-based learning, or problems solving. In this case, the learning can be a combination of conceptual understanding, exercises, and problem teaching. Problems are an important feature of petroleum refinery as it helps in developing thinking and serves to expand the field of interest, so the selection of problem sequences is an important aspect of increasing deductive and inductive reasoning.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	.. 1-Using the latest teaching methods and allowing students to discuss	Chemical Composition of Petroleum	Explanation and exam	Daily exam
2	2	Expresses the role of petroleum refinery in engineering fields.	Physical properties of feedstock's and products	Explanation and examples	Daily exam
3	2	Ability to cope with ambiguity, positive interaction with others, common sense and good judgement	Pipe Still Heater:	Explanation and examples	Daily exam
4	2	Explainsthe fundamentalsof petroleum refinery	Emulsions	Explanation a examples	Daily exam
5	2	Introducing students to contemporary techniques, skills and equipment in the engineering field.	Atmospheric distillation:	Explanation and examples	Daily exam

6	2	Written and oral communication skills, initiative and sensitivity to the interests and views of others and ability to take directions	Fractional distillation	Explanation and examples	Daily exam
7	2	Introducing students to contemporary techniques	Upgrading Processes	Explanation and examples	Monthly exam
8	2	and evaluating the student's intellectual curiosity and imagination	Visberaking	Explanation and examples	Monthly exam
9	2	Written and oral communication skills,	Treating Processes	Explanation and examples	Monthly exam
10	2	Evaluating the student's intellectual curiosity and imagination	Manufacturing Lubricating Oils	Explanation and examples	Monthly exam
11	2	Providing the ability to design systems to meet the required needs in the field of fuel and energy engineering	Hydrotraeting	Explanation and examples	Daily exam
12	2	evaluating the student's intellectual curiosity and imagination	Solvent Extraction	Explanation and examples	Daily exam
13	2	Providing the ability to design systems to meet the required needs in the field	Product Blending	Explanation and examples	Daily exam

		of fuel and energy engineering			
14	2	Providing the ability to design systems to meet the required needs	Alkylation or Polymerization	Explanation and examples	Daily exam
15	2	Providing the ability to design systems to meet the required needs	Sulfur Removed	Exam	Finally exam

11. Course Evaluation

Theoretically 20 Practical 20 Works of tear 10 final exam 50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	W. L. Petroleum Refinery Engineering, T McGraw Hill Publishing Company Limit 1985.
Recommended books and references (scientific journals, reports…)	Oil refinery operation book
Electronic References, Websites	web

Course Description Form

Third Level

Course Description Form

1. Course Name:
Internal combustion engines
2. Course Code:
ICE350
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
2024
5. Available Attendance Forms:
Classroom attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
45 Hours / 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Isam Ezzulddin Yousif Email: isamizz@ntu.edu.iq
8. Course Objectives

Course Objectives	1. To know the IC engines and its classifications. 2. Analysis thermodynamic cycles of IC engines. 3. Teaching the parameters of IC engines. 4. Teaching the major working principles of IC engines.

9. Teaching and Learning Strategies	
Strategy	The primary approach that will be used to deliver this module is to prom student engagement in the exercises while also enhancing and broaden their ability to calculate answers to mathematical problems. This will accomplished through lectures, interactive tutorials, and the considerat of small experiments with various sampling tasks that the students will f fascinating.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	1.The ability to identify the operating principle of internal combustion engines and their types. 2. The ability to identify the thermodynamic cycles of internal combustion engines and calculate the parameters for evaluating the thermal performance of the cycles. 3. The ability to identify and calculate the performance parameters or parameters of internal combustion engines. 4. Determine the effect of combustion on air pollution.	Introduction – define internal combustion engines and its classifications.	Lectures and Presentations Subject Basics Identifying and classifying types of internal combustion engines. Thermal analysis of the theoretical cycle performance of internal combustion engines. Explanation of combustion in gasoline and diesel engines, and a comparison between them. Explanation of the supercharging device and its types, along with its mathematical calculations. Explanation of valve timing and analysis of the thermal balance of engines. Identification of types of emissions, their causes, their impact on the environment, and methods for reducing them. Identification of fuel chemistry and fuel types. Identification of the octane and cetane numbers of fuel.	Homework assignments for solving mathematical or explanatory problems. Participate in discussions on selected topics in automotive and engine engineering. Pose surprising intellectual questions in class about the previous week's topic before the start of the new lecture. Work on allocating specific time in class by forming groups to solve selected mathematical problems for each group and fostering a spirit of competition among students.
2	3		Thermodynamic cycles of IC engines		
3	3		Air standard assumptions and solving examples of Otto, Diesel, and Dual cycles.		
4	3		Performance parameters and its applications.		
5	3		Solving some examples of IC engine performance		
6	3		Combustion in SI engines.		
7	3		Mid-term Exam.		
8	3		Supercharger.		
9	3		Turbocharger.		
10	3		Two stroke IC engines.		
11	3		Valve timing and variable valve timings.		
12	3		Heat balance of IC engines.		
13	3		Emissions and air pollutions.		
14	3		Thermochemistry and fuels.		
15	3		Octane and Cetane numbers and engine knock.		

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

Academic Assignment	Weight	Note
Daily Preparation and Participation	%10	The student's grade is based on their preparation and attendance in the semester, as well as the assignments they submit. These assignments are considered yearly work, with a weight of 10% added to the monthly exam grade to qualify for the semester course in Internal Combustion Engines.
Daily Oral Questions/Quiz	%10	
Homework and Assignments	%10	
Mini-Reports/Projects	%20	
Monthly or Bi-Monthly Tests	%30	
Final Written Exam	%60	

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Engineering Fundamental of Internal Combustion Engine, by Willard W. Pulkrabek (1998).
Main references (sources)	1-Applied Thermodynamics for Engineering Technologists S.I. Units, Thomas D. Eastop, Allan McConkey, Longman, 1978. 2-Fundamentals of Engineering Thermodynamics, Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, Wiley, 2011.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Mathematics (3)
2. Course Code:
OECK 201
3. Semester / Year:
1st semester/ second year
4. Description Preparation Date:
9/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours / 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Saad Saleem Merie Email: saad.saleem@ntu.edu.iq

8. Course Objectives	
Course Objectives	• To equip students with the knowledge and understanding of mathematical concepts, notation and techniques relevant to mechanical engineering. • To develop skills and confidence in mathematical modelling and problem solving. • To support students in understanding mathematical aspects of other modules

9. Teaching and Learning Strategies	
Strategy	• Implementing active learning in a class room requires preparation and some changes to the lecture. However, the lecture content is not changed or replaced with new material. The same lecture content is delivered to the students in a better way and the lecture time is used more effectively. The following are some of the techniques of active learning and cooperative learning I personally use in

my engineering classes to enhance student's understanding and retention of the material:

- One Minute Paper: Students are asked to write a one minute note (about the previous lecture, the homework or the material in general) to the instructor on a piece of paper. This provides a fast way for the teacher to have a quick feedback on students understanding of what was covered previously.
- Muddiest Point: When there is a long lecture with multiple topics covered, the students are given the chance to discuss the material covered in the lecture and list the most difficult parts of the lecture.
- Clarification Pause: During the lecture, the students are given the time to go over the material written on the board, think about it and ask if they have any questions. Then, the lecturer answers the different questions raised before resuming the next part of the lecture.
- Questions and answers: Usually during the lecture, questions are raised about the new material presented and questions are solved on the board. A sample of the questions asked include "Why do you think this topic is important?" or "what is the relation between what we were talking about and this technique?" or "which technique is best?"
- Critical Thinking, Group Discussion: Students are given a handout with multiple problems and they are asked to apply what they learned in the lecture to solve the problems in groups. They are asked to discuss it together and come up with a single solution that all members agree on.
- Critical Thinking, Think-pair-share: Students are asked to work individually on a problem for a short time; then students pair up to compare their answers. Then they have to explain their answer and share it with the rest of the class.
- Peer Teaching: If one member of the team solves the problem correctly, He will explain it to the rest of the group and discuss with them why his/her answer is correct and their answer is not. This allows the students to find out what went wrong and the mistake they made in solving the problem. This technique will help the student to avoid these mistakes when doing the homework or the exams.

- Active Review Sessions: For each exam, students are given a practice test with a set of problems a week in advance. They are encouraged to work on the practice test individually first and then in groups to discuss the answers. During the review session, the students are asked questions about the problems in the practice test and they are given the choice to decide which problems they want the professor to concentrate on.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	The student understands the fundamental concepts of vectors in space.	Introduction of vectors	Presentation using the board	Solving questions on the board
2	3	The student distinguishes between planes, tangents, and perpendicular lines using vector principles. The student grasps the concept of vector functions and their applications	Vectors: general introduction to vectors in space – equation of straight line and an equation for a plane in space – plane, tangent and perpendicular line – vector function	Interactive explanation on the board	Written activity
3	3	The student becomes familiar with infinite sequences and series and their general behavior.	Infinite Sequences and Series	Presentation combined with board explanation	Online exam via Google Classroom
4	3	The student determines the convergence or divergence of sequences and series.	Convergence and Divergence	Interactive explanation on the board	Written activity
5	3	The student applies various convergence	Convergence tests	Presentation combined with board explanation	Board-based exam

		tests to analyze the behavior of series.			
6	3	The student understands power series and their practical uses.	Power series	Presentation combined with board explanation	Assignment submission via Google Classroom
7	3	The student identifies the maximum and minimum values of functions with two variables. The student interprets gradients and directional derivatives to understand the behavior of multivariable functions.	Chain rule for partial derivative – gradient and directional derivative – maximum and minimum values for tow variable functions	Presentation combined with board explanation	Group activity
8	3	exam	Mid-Term Exam	Exam	Written activity
9	3	The student practices computing higher-order partial derivatives.	Partial derivatives of higher order	Presentation combined with board explanation	Group activity
10	3	The student is able to formulate the equation of a straight line and a plane in three-dimensional space. .	The chain rule for function of three variables	Presentation combined with board explanation	Assignment submission via Google Classroom
11	3	The student calculates gradients and directional derivatives to analyze functions	Directional derivatives and gradient vectors	Presentation combined with board explanation	Group activity
12	3	. The student calculates Tangent planes and normal lines	Tangent planes and normal lines	Presentation combined with board explanation	Written activity

13	3	The student find Extreme values and saddle points of functions of two and three variables.	Extreme values and saddle points	Presentation combined with board explanation	Assignment submission via Google Classroom
14	3	Polar coordinates	Polar coordinates	Presentation combined with board explanation	Written activity
15	3	Final Exam	Preparing for the final Exam	Exam	Written activity

11.

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Calculus
Main references (sources)	Advanced Engineering Mathematics
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Natural Gas Processing
2. Course Code:
NGP316
3. Semester / Year:
2ND Semester/ Third Year 2024-2025
4. Description Preparation Date:
1/10/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
3
7. Course administrator's name (mention all, if more than one name)
Name: Ass. Lec Aya Aws Saad Email: Aya.aws@ntu.edu.iq

8. Course Objectives	
Course Objectives	• Develop a solid foundation in the principles and significance of natural • Gain essential knowledge of natural gas processing steps and Operations. • Explore the fundamentals of Gas-to-Liquids (GTL) technology and its Practical applications. • Strengthen critical thinking and collaborative problem-solving skills related to natural gas systems through team-based learning activities.

9. Teaching and Learning Strategies	
Strategy	• Interactive lectures and presentations to deliver core concepts Effectively. • Collaborative group work to encourage teamwork and collective problem-solving. • Student-led discussion sessions addressing challenges in natural gas processing. • Field visits to relevant facilities to deepen practical understanding of content. • Encouraging students to use digital tools to create presentations and mini-projects on gas processing

	operations. • Brainstorming sessions to promote active participation and idea exchange during lectures

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Understanding the fundamentals and role of natural gas in energy	Introduction: General look on importance of natural gas and reverse.	Theoretical lecture with PowerPoir	Oral questions assess students' understanding
2	3	Identifying types of natural gas and reservoir properties	Natural Gas : Natural Gas kinds gas reservoir characteristics.	Oral review previous lecture	Question via Google Classroom
3	3	Understanding phase behavior and chemical/physical properties	Natural Gas : Phase Behavior, Chemical and Physical Properties.	Interactive explanation using the board	Oral group -based questions to support collaborative thinking
4	3	Learning natural gas compression techniques	Gas Compression Compressions Natural Gas	Lecture supported by video	Assignment on Google Classroom
5	3	Distinguishing between types of gas compressors	Gas Compression : Types of compressors: Rotary, Jet.	PowerPoint with diagrams and board explanation	Oral review interactive questions evaluate comprehension
6	3	Explaining operation of reciprocating compressors	Gas Compression Reciprocating natural compressors.	Interactive group-led lecture compressor types, pros & cons	Divide students into groups, each with a unique question, to present a unified answer
7	3	Assessing understanding of the first half of the course	first: Mid-term Exam	Written test	Written exam
8	3	Learning separation techniques for gas impurities	Gas Physical Separation: Separators, removal of solid, water and condensates.	PowerPoint lecture with practical data show	Oral review with questions from previous lectures

9	3	Explaining the gas stabilization process	Gas Physical Separation: Stabilization process.	Lecture with case study	Oral question
10	3	Differentiating between adsorption and absorption	Gas Physical Separation: Drying gaseous fuel adsorption absorption	Group activity	Oral questions
11	3	Explaining removal of acidic components	Sweetening of Gaseous fuel: Sweetening adsorption absorption.	Interactive lecture brainstorming	Quick quiz
12	3	Understanding gas flaring reduction techniques	Sweetening of Gaseous fuel: Flaring Reduction	Video and discussion	Student-led presentation
13	3	Evaluating advanced concepts in second half	second: Mid-term Exam	Written test	Oral exam
14	3	Understanding separation light components	Natural Liquefaction(NGL) NGL fractionation: de-ethanizer.	Lecture with images	Oral exam
15	3	Completing explanation of distillation process	Natural Liquefaction(NGL) NGL fractionation: propanizer, butanizer.	Lecture	Interactive questions
16	3	Comprehensive material review	**Preparatory week before the final Exam**	Review session	Preparatory quiz / questions

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, pop quizes, monthly exams, or written exams, Field trip reports, and presentations.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Shreve's "Chemical Process Industries" 5th edition (2001)
Main references (sources)	handbook of natural gas transmission and processing saeid Mokhatab william a. poe james g. speight
Recommended books and references (scientific journals, reports…)	Fundamentals of Natural Gas Processing Third Edition Arthur J. Kidnay, William R. Parrish, and Daniel G. McCartney.

Electronic References, Websites	-

Course Description Form

1. Course Name: Renewable energy

2. Course Code: REN317

3. Semester / Year: 2024-2025

4. Description Preparation Date: 2024

5. Available Attendance Forms: Presence

6. Number of Credit Hours (Total) / Number of Units (Total)

   3*16 = 48 3

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

   Name: Dr. Ahmed Saadallah Salman
   Email: ahmed.saadallah@ntu.edu.iq

8. Course Objectives

Course Objectives	1. **Understand the Principles of Renewable Energy** Introduce the fundamental concepts of energy production and consumption. Explain the differences between renewable and non-renewable energy sources. **2. Identify Different Types of Renewable Energy** Explore solar, wind, hydro, geothermal, and biomass energy systems. Study the technologies and methods used in harnessing these energy sources. **3. Analyze the Environmental and Economic Impacts** Evaluate the environmental benefits of renewable energy compared to fossil fuels. Examine the economic feasibility and policy frameworks supporting renewable energy. **4. Design and Evaluate Renewable Energy Systems**

	Learn basic calculations for system sizing, energy output, and efficiency. Understand how to integrate renewable energy systems into existing grids. **5. Study Global and Local Renewable Energy Applications** Review real-world case studies from different regions. Discuss current trends and future developments in renewable energy technologies. **6. Develop Problem-Solving and Analytical Skills** Apply engineering and scientific methods to solve energy-related problems. Use simulation tools or software (e.g., PVsyst, HOMER, RETScreen) where applicable. **7. Encourage Sustainability and Innovation** Promote sustainable practices and innovation in energy use and development. Encourage critical thinking about energy challenges and solutions.

9. Teaching and Learning Strategies

Strategy	Learning and teaching strategies for a renewable energy module are designed to engage students with both theoretical concepts and practical applications. These strategies aim to foster critical thinking, problem-solving skills, and technical expertise. Below are common strategies that can be used in teaching a renewable energy module: 1. **Lectures and Presentations** 2. **Seminars and Group Discussions** 3. **Field Trips and Site Visits** 4. **Formative Assessments and Feedback** 5. **Independent Study and Research** These diverse teaching strategies ensure a holistic approac learning, combining theoretical understanding with prac application, and preparing students for future careers in renewable energy sector.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 **Week 2**	3 3	**Fundamentals of the curriculum**	Introduction Energy resources Solar Energy	**Lectures and Presentations**	Homework take-home assignments involving

Week 3 **Week 4** **Week 5** **Week 6** **Week 7** **Week 8** **Week 9** **Week 10** **Week 11** **Week 12** **Week 13** **Week 14** **Week 15** **Week 16**	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	**Identify and classify different types of energy resources (renewable and non-renewable).** **Analyze wind resource data (e.g., wind speed, direction) to determine site feasibility.** **Explain the working principles of dams, reservoirs, and turbines used in hydroelectric power generation.** **Compare and contrast the efficiency, cost, and environmental impact of sea and ocean energy technologies.** **Evaluate the feasibility of implementing ocean energy systems in different coastal regions.** **Apply fundamental equations and models to assess energy storage performance (e.g., efficiency, capacity, charge/discharge rates).**	Solar Energy Angles Solar Energy Collectors Wind Energy Wind Energy Turbines Mid-term Exam Heat Pump Theory Hydraulic Energy Geothermal Energy Sea Energy Ocean Energy Energy Storage Energy Storage Forms **Preparatory week before the final Exam**	**Seminars and Group Discussions** **Formative Assessments and Feedback** **Independent Study and Research**	problem-solv or research. Participation discussions, selected renewable energy topics Regular, personalized feedback will be provided to support individual progress and address misconcepti ons early. Constructive feedback will help foster critical thinking and communicati on skills

11. Course Evaluation

Component	Weight	Notes
Daily Preparation & Participation	10%	Includes class engagement, attendance, and preparedness.
Daily Oral Questions/Quizzes topics.	10%	Short oral assessments to test understanding of recent
Homework & Assignments calculations.	15%	Problem-solving tasks, case studies, or energy
Reports / Mini-Projects wind), written and/or presented.	15%	Focused on renewable systems (e.g., solar,
Monthly or Midterm Exams	20%	Written tests evaluating theoretical and practical knowledge.
Final Written Exam	30%	Comprehensive assessment of all course topics.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Renewable Energy Authors: Vaughn C.Nelson and Kenneth L.Starcher CRC Press, Taylor & Francis
Main references (sources)	Wind Power for the World: The Rise of Modern Wind Energy

	Editors: Wolfgang Palz, Preben Maegaard, and Anna Krenz Jenny Stanford Publishing
Recommended books and references (scientific journals, reports…)	https://www.sciencedirect.com/
Electronic References, Websites	https://eplibrary.libguides.com/CART/SF enewable-energy/e-books

Course Description Form

1. Course Name:
Numerical Analysis
2. Course Code:
OECK 302
3. Semester / Year:
Second Semester 2024–2025
4. Description Preparation Date:
01/09/2024
5. Available Attendance Forms:
Theoretical + Practical
6. Number of Credit Hours (Total) / Number of Units (Total)
(2 Theory + 2 Practical) / Units (3)
7. Course administrator's name (mention all, if more than one name)
Name: Asst. Lecturer Maha Adnan Dawood Email: maha.adnan@ntu.edu.iq
8. Course Objectives

Course Objectives	• Understand the fundamentals and importance of numerical analysis in solving engineering problems. • Become familiar with MATLAB and other numerical tools such as Microsoft Excel. • Develop simple programming skills to implement numerical algorithms. • Learn various numerical methods for solving mathematical problems relevant to chemical engineering. • Analyze and interpret different types of numerical errors and approximations. • Solve nonlinear equations and systems of linear equations numerically. • Apply methods of curve fitting and interpolation to experimental data. • Enhance problem-solving skills through computational techniques. • Prepare students to model and simulate real-world chemical engineering problems using numerical methods.

9. Teaching and Learning Strategies

Strategy	• Use a combination of lectures and hands-on sessions to explain numerical methods and their applications. • Incorporate problem-based learning to enhance analytical and critical thinking. • Integrate MATLAB and Excel in laboratory sessions for practical numerical problem-solving. • Provide real-world chemical engineering examples to apply numerical techniques. • Encourage student discussions and group work to improve collaborative learning. • Utilize visual aids and simulations to simplify complex concepts. • Assign regular homework and projects to reinforce theoretical understanding with practical skills. • Offer continuous assessment through quizzes, lab reports, and classroom activities. • Provide guidance and support through academic advising and feedback mechanisms.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week One	(2 th.+2p.)		•Round-off and Truncation Errors, Model Errors, and Data Uncertainly	Practical and theoretical evaluation	quizzes
Week Two			•Round-off and Truncation Errors, Model Errors, and Data Uncertainly	Practical and theoretical evaluation	
Week Three			•Matrix Operations, The Matrix inverse, Gaussian Elimination, Pivoting, Backward error analysis, and conditioning	Practical and theoretical evaluation	
Week Four			•Jacob's Method and Gauss-Seidel Methods	Practical and theoretical evaluation	

Week Five			•Graphical Methods, Bisection Method, False Position Method	Practical and theoretical evaluation	
Week Six			•Newton-Raphson Method	Practical and theoretical evaluation	quizzes
Week Seven			•Mid-term Exam		
Week Eight			•Polynomial Interpolation- Newton and Neville's Methods	Practical and theoretical evaluation	
Week Nine			•Linear Regressions, Fitting a Straight Line, Polynomial, Multiple linear, and non-linear Regressions	Practical and theoretical evaluation	
Week Ten			•Numerical Integration: Trapezoid Rule, Simpson's Rule	Practical and theoretical evaluation	quizzes
Week Eleven			•Euler's Method, Modified Euler's method, Runge-Kutta method, Milne's method	Practical and theoretical evaluation	
Week Twelve			•Finite element method	Practical and theoretical evaluation	
Week Thirteen			•Difference methods for the heat equation and hyperbolic equations	Practical and theoretical evaluation	
Week Fourteen			•Local methods for unconstrained optimization problems.	Practical and theoretical evaluation	quizzes

Week Fifteen Week Sixteen			•The simplex method, Gradient methods and Newton line • Second med term.	Practical a theoretical evaluation	

11. Course Evaluation

Component	Score
First Semester	
Practical	5
Theoretical	15
Second Semester	
Practical	5
Theoretical	15
Coursework	
Attendance	5
Quizzes & Daily Exams	5
Subtotal (During Semester)	50
Final Exam	50
Total Final Grade	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any	Numerical Methods for Engineers (2005). 5th Edition. McGraw-Hill. S.C. Chapra & R.P. Canale.
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Kreyszig, E. (2006). Advanced Engineering Mathematics. United Kingdom: John Wiley.
Electronic References, Websites	

Course Description Form

1. Course Name:
Thermodynamics 1&2
2. Course Code:
THMD314 &THMD315
3. Semester / Year:
Semester 1&2 2024/2025
4. Description Preparation Date:
15/09/2024
5. Available Attendance Forms:
Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
150 H. 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Asst. Prof. Ahmed A. Hussein Email: ahmedali@ntu.edu.iq
8. Course Objectives

Course Objectives	The course aims to provide third-year students with the basic knowledge of engineering thermodynamics. It covers everything related to energy and related concepts, such as the first law of thermodynamics and its applications. The course aims to enable students to access the science of thermodynamics by understanding correct engineering analysis and how to deal with laws, equations, illustrative drawings, and other data, linking data together to arrive at outputs, and enabling students to analyze, deduce, and conclude.

9. Teaching and Learning Strategies	
Strategy	1. General and transferable skills (other skills related to employability and personal development) 2. Ability to analyze, infer, and describe 3. Understanding and comprehending the laws of energy conversion and transfer 4. Providing scientific material related to their field of work and specialized in the Department of Fuel and Energy Technology Engineering

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2Lecture+2Practical	That the student understands the lesson	Introduction-Prescribed Books -Units. Important definitions - force - pressure and its types	Lecture+practical	Weekly exams, pre- and post-test questions, homework
2	2Lecture+2Practical	That the student understands the lesson	Temperature: its units, its conversions, and its measurement methods- Zero Law - Definition of energy –	Lecture+practical	Weekly exams, pre- and post-test questions, homework
3	2Lecture+2Practical	That the student understands the lesson	The first law of thermodynamics.	Lecture+practical	Weekly exams, pre- and post-test questions, homework
4	2Lecture+2Practical	That the student understands the lesson	Run Flow Chart Pressure - Enthalpy internal energy.	Lecture+practical	Weekly exams, pre- and post-test questions, homework
5	2Lecture+2Practical	That the student understands the lesson	Ideal gas Boyle's Law - Charles's law	Lecture+practical	Weekly exams, pre- and post-test questions, homework
6	2Lecture+2Practical	That the student understands the lesson	Characteristic Gas Equation, 4 specific volume, molecular weight, and Problems	Lecture+practical	Weekly exams, pre- and post-test questions, homework
7	2Lecture+2Practical	That the student understands the lesson	adiabatic temperature constant	Lecture+practical	Weekly exams, pre- and post-test questions, homework
8	2Lecture+2Practical	That the student understands the lesson	Polytropic process	Lecture+practical	Weekly exams, pre- and post-test questions, homework
9	2Lecture+2Practical	That the student understands the lesson	Open systems procedures	Lecture+practical	Weekly exams, pre- and post-test questions, homework
10	2Lecture+2Practical	That the student understands the lesson	Steam forms of matter when changing phase. Draw the phase change of a substance on a pressure-volume diagram.	Lecture+practical	Weekly exams, pre- and post-test questions, homework
11	2Lecture+2Practical	That the student understands the lesson	Dryness fraction- dry steam -saturated steam	Lecture+practical	Weekly exams, pre- and post-test questions, homework
12	2Lecture+2Practical	That the student understands the lesson	Steam calculation Steam Table	Lecture+practical	Weekly exams, pre- and post-test questions, homework
13	2Lecture+2Practical	That the student understands the lesson	superheated steam. table of superheated steam	Lecture+practical	Weekly exams, pre- and post-test questions, homework

14	2Lecture+2Practical	That the student understands the lesson	Steam procedures Plot it on the pressure and volume chart.	Lecture+practical	Weekly exams, pre- and post-test questions, homework
15	2Lecture+2Practical	That the student understands the lesson	Second Law Of Thermodynamic /Heat engine – heat pump	Lecture+practical	Weekly exams, pre- and post-test questions, homework
16	2Lecture+2Practical	That the student understands the lesson	The ideal heat engine-Carnot cycle	Lecture+practical	Weekly exams, pre- and post-test questions, homework
17	2Lecture+2Practical	That the student understands the lesson	Reversible and the Irreversible process	Lecture+practical	Weekly exams, pre- and post-test questions, homework
18	2Lecture+2Practical	That the student understands the lesson	Second law of thermodynamics: Clausius's inequality	Lecture+practical	Weekly exams, pre- and post-test questions, homework
19	2Lecture+2Practical	That the student understands the lesson	Entropy, mathematical statement of the second law	Lecture+practical	Weekly exams, pre- and post-test questions, homework
20	2Lecture+2Practical	That the student understands the lesson	Entropy calculation for vapors	Lecture+practical	Weekly exams, pre- and post-test questions, homework
21	2Lecture+2Practical	That the student understands the lesson	Calculating the entropy change of the surroundings	Lecture+practical	Weekly exams, pre- and post-test questions, homework
22	2Lecture+2Practical	That the student understands the lesson	adiabatic efficiency	Lecture+practical	Weekly exams, pre- and post-test questions, homework
23	2Lecture+2Practical	That the student understands the lesson	Standard air cycles Otto cycle	Lecture+practical	Weekly exams, pre- and post-test questions, homework
24	2Lecture+2Practical	That the student understands the lesson	diesel cycle- dual cycle	Lecture+practical	Weekly exams, pre- and post-test questions, homework
25	2Lecture+2Practical	That the student understands the lesson	Steam cycles- simple Rankine cycle	Lecture+practical	Weekly exams, pre- and post-test questions, homework
26	2Lecture+2Practical	That the student understands the lesson	Rankine cycle with super-heated steam	Lecture+practical	Weekly exams, pre- and post-test questions, homework
27	2Lecture+2Practical	That the student understands the lesson	plants, Reheat Rankine cycle, Regenerative Rankine cycle	Lecture+practical	Weekly exams, pre- and post-test questions, homework
28	2Lecture+2Practical	That the student understands the lesson	Concepts of vapor power cycles and their applications: Rankine cycle for vapor power	Lecture+practical	Weekly exams, pre- and post-test questions, homework

29	2Lecture+2Practical	That the student understands the lesson	Concepts of gas power cycles and their applications	Lecture+practical	Weekly exams, pre- and post-test questions, homework
30	2Lecture+2Practical	That the student understands the lesson	Brayton cycle, reheat , intercooling, regenerator	Lecture+practical	Weekly exams, pre- and post-test questions, homework

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Thermodynamics an engineering approach Yunus A cengel Michael A boles
Recommended books and references (scientific journals, reports…)	Fundamentals of classical Thermodynamics; Gordon John Van Wylen The Principles of Thermodynamics, (N. D. Hari Dass)
Electronic References, Websites	

Course Description Form

1. Course Name:
Occupational Health and Safety
2. Course Code:
OSH318
3. Semester / Year:
Second / Third 2024-2025
4. Description Preparation Date:
13/9/2024
5. Available Attendance Forms:
Lecture
6. Number of Credit Hours (Total) / Number of Units (Total)
2/2
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Lecturer Bayan H. Al-Jaleel Email: bayan.hikmat@ntu.edu.iq
8. Course Objectives

Course Objectives	**Course Objectives** By the end of this course, students will be able to: • Understand and apply general and specific industrial safety rules and procedures in various high-risk environments. • Identify potential hazards in workplaces including mechanical, electrical, chemical, thermal, and environmental risks. • Properly select, use, and maintain Personal Protective Equipment (PPE). • Execute safety protocols for hand tools, power tools, welding, woodworking, and compressed gas cylinders. • Apply safety measures related to Lockout/Tagout (LOTO) procedures, confined spaces, heavy equipment operation, and fall protection.

	• Analyze real-world industrial safety cases and propose effective prevention strategies.

9. Teaching and Learning Strategies

Strategy	• **Lectures** with multimedia presentations and real-life case studies. • **Demonstrations** of PPE, tools, and safety techniques. • **Group discussions** and problem-solving activities. • **Hands-on practice** in laboratory and field environments. • **Guest speakers** from the industrial safety sector. • **Simulated drills** on emergency response and hazard control. • **Self-assessments** and weekly quizzes for reinforcement.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduction to Industrial Safety	Understand general safety concepts and the importance of safety	Lecture, discussion	Quiz, participation
2	2	Personal Protective Equipment (PPE)	Identify and use appropriate PPE	Lecture, demo	Quiz, practice
3	2	Head, Eye & Face Protection	Differentiate types of protection and use effectively	Lecture, demo	Hands-on test
4	2	Hearing Protection	Recognize noise hazards and choose correct PPE	Case study, demo	Quiz
5	2	Hand & Foot Protection	Select correct gloves and shoes based on hazard	Lecture, practice	Practical test
6	2	Protective Clothing & Hygiene	Implement personal hygiene in hazardous settings	Lecture, discussion	Assignment

7	2	Torso Protection	Identify torso hazards and proper protective wear	Lecture	Quiz
8	2	Lockout/Tagout Procedures	Apply LOTO steps and regulations	Demo, simulation	Practical evaluation
9	2	Hand & Power Tools Safety	Operate tools safely and perform safety checks	Workshop	Hands-on assessment
10	2	Compressed Gas and Welding Safety	Handle cylinders and welding tools safely	Lecture, lab	Quiz, demo
11	2	Woodworking Safety	Apply safe practices in woodworking environments	Lab work	Observation
12	2	Grounds Maintenance & Gasoline Safety	Recognize and mitigate risks during outdoor work	Lecture	Written test
13	2	Heavy Equipment and Confined Space Safety	Operate equipment safely and assess confined space risks	Field demo	Practical report
14	2	Fall Protection and Safety Systems	Apply fall protection strategies in elevated work	Lecture, lab	Performance test
15	3	Course Review & Final Assessment	Integrate all knowledge into a safety plan	Group work, review	Final exam

11. Course Evaluation

Quizzes and Short Tests 20%

Practical Evaluations (PPE, Tools, LOTO, etc.) 30%

Assignments & Case Studies 15%

Participation & Attendance 10%

Final Exam 25%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Goetsch, David L. (2020). Occupational Safety and Health for Technologists, Engineers, and Managers (9th Edition). Pearson Education.

	➤ A comprehensive text covering industrial safety principles, PPE, OSHA regulations, hazard control, and safety programs.
Main references (sources)	OSHA (Occupational Safety and Health Administration). 29 CFR Part 1910 – General Industry Regulations. ➤ Official safety standards used in industry and education. UL Lafayette Environmental Health & Safety Department Manuals. ➤ Internal safety protocols and training guides, specific to the university context (as seen in the uploaded materials).
Recommended books and references (scientific journals, reports…)	Ridley, J., & Channing, J. (2015). Safety at Work (Edition). CRC Press. Bahr, Nicholas J. (2014). System Safety Engineer and Risk Assessment: A Practical Approach. CR(Press. Journal of Safety Research – Published by the National Safety Council. Safety Science – Elsevier scientific journal focus on safety-related issues in engineering, operatic and health. NIOSH (National Institute for Occupational Sa and Health) Reports and Guidelines.
Electronic References, Websites	https://www.osha.gov ➤ U.S. Occupational Safety and Health Administration – regulations, guides, and traini tools. https://www.cdc.gov/niosh ➤ National Institute for Occupational Safety an Health – research-based recommendations. https://www.ansi.org ➤ American National Standards Institute – PPE and industrial equipment standards. https://www.hse.gov.uk ➤ UK Health and Safety Executive – internation perspective on workplace safety. https://ehs.louisiana.edu ➤ UL Lafayette Environmental Health & Sa Office – institutional safety policies and updates

Course Description Form

1. Course Name:
Engineering Analysis
2. Course Code:
OECK 301
3. Semester / Year:
2024−2025
4. Description Preparation Date:
17/9/2024
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
6 hour
7. Course administrator's name (mention all, if more than one name)
Name: Gulan Aziz Bakr Email: gulan.aziz@ntu.edu.iq
8. Course Objectives

Course Objectives	This module aims to introduce the students to the theory and application methods that are used in solving Ordinary Differential Equatio Separable, Homogenous, exact and Fourier transform and others. On completion of the module the student is expected to be able to: **1.** Solve ordinary differential equations for forced oscillations and approximate periodic functions by Fourier series and other methods. **2**. Applications on First Order Ordinary Differential Equations. **3**. Solve Second and Higher Order Ordinary Differential Equation and applications. **4**. Solve Partial Differential Equations.. Indicative content includes the following. **Part A- First Order Ordinary Differential Equations.** Introducti Separable variables, Homogeneous differential equations, Reducible homogeneous DE, Exact DE , Reducible to exact DE , Linear DI Reducible to linear DE , Second order DE reduced to first order DI Applications on First-Order ODE. **Part B- Second and Higher Order Ordinary Differential Equatio** Introduction, Solution of homogeneous linear DE with const coefficients, Solution of non-homogeneous linear DE with const coefficients, Solution of some linear DE with variable coefficient Applications on Second and Higher Order Linear ODE.

	Part C – Fourier Series Fourier series for periodic functions of period Fourier series for a non-periodic function over range 2π. Even o functions and half-range Fourier series. Fourier series over any range numerical method of harmonic analysis. The complex or exponential fo of a Fourier series. **Part D - Partial DE** , Simultaneous Linear Ordinary Differential Equatio

9. Teaching and Learning Strategies

Strategy	Explanation of Engineering analysis can be done using various relevant methods and Strategies to make it easier for students to understand. The most important strategies may be represented by: Transferring knowledge through theoretical classroom and network resources, adopting methods for inspiring students such as questioning, solving practical problems through engineering cases and awareness, And developing experimental modules and project training.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Summary engineering analysis	Introduction.	Explanation a examples	Daily exar
2	3	Explanation and clarification of differenti equations and solving examples	First Order Ordinary Differential Equatio	Explanation a examples	Daily exar
3	3	Solve examples	First Order Ordinary Differential Equatio	Explanation a examples	Daily exar
4	3	Explain the mathematica formulation of physical problems involving continuously changing quantities.	Applications on Firs Order Ordinary Differential Equatio	Explanation a examples	Daily exar
5	3	Solve example	Applications on Firs Order Ordinary Differential Equatio	Explanation a examples	Daily exar

6	3	Explanation a examples	Second and Higher Order Ordinary Differential Equatio	Explanation a examples	Daily exar
7	3	Explanation a examples	Second and Higher Order Ordinary Differential Equations.	Explanation a examples	Daily exar
8	3	Explanation a examples	Applications on Second and Higher Order Ordinary Differential Equatio	Explanation a examples	Daily exar
9	3	Explanation and examples	Applications on Second and Higher Order Ordinary Differential Equatio	Explanation a examples	Daily exar
10	3	Explanation a examples	Inverse Laplace transform, Inverse Laplace transform using Partial Fractio	Explanation a examples	Daily exar
11	3	Explanation a examples	Inverse Laplace transform, Inverse Laplace transform using Partial Fractio	Explanation a examples	Daily exar
12	3	Explanation a examples	Simultaneous Lin Ordinary Differen Equations.	Explanation a examples	Daily exar
13	3	Explanation a examples	Simultaneous Lin Ordinary Differen Equations.	Explanation a examples	Daily exar
14	3	Explanation a examples	Fourier Series.	Explanation a examples	Daily exar
15	3	Explanation a examples	Partial Differen Equations.	Explanation a examples	Daily exar
16	3		Preparatory we before the final Exa	review	Daily exar

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	- Advanced Engineering Mathematics, by C. R. Wylie. - Advanced Engineering Mathematics, by E. Kreyszig - Advanced Engineering Mathematics, by O'Neil. - Advanced Mathematics for Engineers and Scientists, by R. Spiegel.

	- Differential Equations, by F. Ayres.
Main references (sources)	Kreyszig, E. (2006). Advanced Engineering Mathema United Kingdom: John Wiley.
Recommended books and references (scientific journals, reports…)	Kreyszig, E. (2006). Advanced Engineering Mathema United Kingdom: John Wiley.
Electronic References, Websites	

Course Description Form

1. Course Name:
English 3
2. Course Code:
NTU 300
3. Semester / Year:
First / Third
4. Description Preparation Date:
13/9/2024
5. Available Attendance Forms:
Lecture
6. Number of Credit Hours (Total) / Number of Units (Total)
2
7. Course administrator's name (mention all, if more than one name)
Name: Hasnaa Saleh Khalaf Email: hasnaa_hwj@ntu.edu.iq
8. Course Objectives

Course Objectives	By the end of the course, students will be able to: 1. Communicate effectively in familiar everyday situations using appropriate vocabulary and grammar. 2. Read and understand intermediate-level texts on various topics. 3. Write paragraphs and short texts (emails, messages, short essays) with proper structure. 4. Understand spoken English in a variety of standard situations. 5. Speak with improved fluency, accuracy, and confidence. 6. Use grammar structures like past tenses, future forms, conditionals, modals, and comparatives correctly.

9. Teaching and Learning Strategies	
Strategy	• Communicative approach • Pair and group work • Role-plays and interviews • Listening and video tasks

	• Grammar in context • Writing workshops • Feedback and correction

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduce self and others, use present simple/present continuous	Unit 1: Getting to know you	Role-play, grammar task	Speaking Task
2	2	Use past tenses, narrate personal stories	Unit 2: Living life	Reading + Grammar	Quiz
3	2	Talk about free time and preferences	Unit 3: Time out	Listening + Speaking	Group Activity
4	2	Use modals for advice/necessity	Unit 4: Great minds	Problem-solving + Dialogue	Oral Task
5	2	Descriptive paragraph	Writing Workshop I	Brainstorm + Writing	Written Assignment
6	2	Discuss habits and routines	Unit 5: No time for anything	Time management task	Quiz
7	2	Talk about changes and use comparatives/superlatives	Unit 6: A change for the better	Interactive Speaking	Pair Work
8	2	Integrated skills (Units 1–6)	Midterm Exam	Test Review + Exam	Midterm Exam
9	2	Use conditionals and expressions of probability	Unit 7: Life’s like that!	Discussion + Writing	Conditional Practice
10	2	Express hypothetical situations	Unit 8: What if?	Role-play	Mini-Project

11	2	Talk about money and shopping	Unit 9: Buying and selling	Listening + Real-life Situations	Quiz
12	2	Argument paragraph	Writing Workshop II	Planning + Peer Review	Writing Rubric
13	2	Use future forms, talk about plans and predictions	Unit 10: Life on the edge	Grammar games	Speaking Test
14	2	All skills integrated	Review	Game-based revision	Group Review
15	2	CEFR-based assessment	Final Exam	Written + Oral	Final Exam

11. Course Evaluation

Class Participation & Homework 5%
Speaking & Listening Tasks & Writing Assignments 5%
Midterm Exam 30%
Final Exam 60%
Total 100%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• *New Headway: Upper-Intermediate Student's Book* – Liz & John Soars (Oxford University Press)
Recommended books and references (scientific journals, reports…)	• *English Grammar in Use – Raymond Murphy (Cambridge University Press)* • *Practical English Usage – Michael Swan* • *Oxford Word Skills: Intermediate – Ruth Gairns and Stuart Redman*
Electronic References, Websites	https://www.oxfordlearnersdictionaries.com https://learnenglish.britishcouncil.org https://www.esl-lab.com https://www.englishpage.com

Course Description Form

1. Course Name:
Heat Transfer
2. Course Code:
HEAT310
3. Semester / Year:
2024−2025
4. Description Preparation Date:
13/9/2024
5. Available Attendance Forms:
Mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
Number of Credit Hours (Total) /120 hr Number of Units (Total)/3
7. Course administrator's name (mention all, if more than one name)
Name: Asan Suad Mohammed Email: assen.suad84@ntu.edu.iq
8. Course Objectives

Course Objectives	1-Heat is a form of energy that can be used in many forms to perform industry scale operations. 2-Electricity and steam are two main sources of the energy that are used in industries. 3-Knowledge of heat transfer is essential in orde avoid heat loss.

9. Teaching and Learning Strategies	
Strategy	Explanation of the concept of heat transfer can be done using various relevant methods and strategies to make it easier for students to understand, for example through laboratory or practicum activities, using problem-based learning, or problems solving. In this case, the learning can be a combination of conceptual understanding, exercises, and problem teaching. Problems are an important feature of heat transfer as it helps in developing thinking and serves to expand the field of interest, so the selection of problem sequences is an important aspect of increasing deductive and inductive reasoning.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	.. 1-Using the latest teaching methods and allowing students to discuss	Introduction heat transfer – Units. Types of heat transfer-	Explanation and exam	Daily exam
2	2	Expresses the role of heat transfer in engineering fields.	Thermal conductivity	Explanation and examples	Daily exam
3	2	Ability to cope with ambiguity, positive interaction with others, common sense and good judgement	Conduction Heat Transfer Definitions, thermal resistance,	Explanation and examples	Daily exam
4	2	Explainsthe fundamentalsof heat transfer.	Electric analog, Heat conduction through the plane	Explanation a examples	Daily exam
5	2	Introducing students to contemporary techniques, skills and equipment in the engineering field.	Cylinder and spherical walls.	Explanation and examples	Daily exam

6	2	Written and oral communication skills, initiative and sensitivity to the interests and views of others and ability to take directions	Temperature distribution, temperature distribution through plane wall, Critical thickness of insulat	Explanation and examples	Daily exam
7	2	Introducing students to contemporary techniques	cylindrical, and spherical wall Composite wall ,heat transfer coefficient,	Explanation and examples	Monthly exam
8	2	and evaluating the student's intellectual curiosity and imagination	The overall of heat transfer coefficient. Insulations,	Explanation and examples	Monthly exam
9	2	Written and oral communication skills,	Fins Types, Types of Temperature distribution along fins,	Explanation and examples	Monthly exam
10	2	Evaluating the student's intellectual curiosity and imagination	Annular fine calculation	Explanation and examples	Monthly exam
11	2	Providing the ability to design systems to meet the required needs in the field of fuel and energy engineering	Convection Heat Transfer //Forced convection, flow over flat plat, pipe laminar and turbulent flows	Explanation and examples	Daily exam
12	2	evaluating the student's intellectual curiosity and imagination	Application of forced convection,dimensionless numbers. Thermal and velocity boundary layers.	Explanation and examples	Daily exam
13	2	Providing the ability to design systems to meet the required needs in the field	Free convection thermal and velocity boundary layers	Explanation and examples	Daily exam

		of fuel and energy engineering			
14	2	Providing the ability to design systems to meet the required needs	Heat exchangers types of heat exchangers. Logarithm mean temperature difference (LMTD).	Explanation and examples	Daily exam
15	2	Providing the ability to design systems to meet the required needs	Single pass and multipacks heat exchangers;	Exam	Finally exam

11. Course Evaluation

Theoretically 20 Practical 20 Works of tear 10 final exam 50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Hollman J.P., Heat Transfer, McGraw Hill
Recommended books and references (scientific journals, reports…)	Kern D.Q., Process Heat Transfer, McGı Hill.
Electronic References, Websites	web

Course Description Form

1. Course Name:

Mass Transfer

2. Course Code:

MASS312

3. Semester / Year:

2024–2025

4. Description Preparation Date:

13/9/2024

5. Available Attendance Forms:

Mandatory attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

Number of credit hours =60
Number of unit (Total)=3

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

Name: Mohammed Qader Abdulrahman
Email: Mohammed83@ntu.edu.iq

8. Course Objectives

Course Objective	To introduce the basic principles of chemical engineering separation processes and r transfer and then proceed to study the diffusion of components and also design and opera of separation processes units operation such as distillation, gas-liquid absorption, and stripp adsorption, liquid-liquid extraction.

9. Teaching and Learning Strategies

Strategy	1. Explain The term diffusion (mass transfer), the physical phenomena, theoretical concepts, and design aspects of mass transfer in separation processes, including distillation, gas-liquid absorption, gas-solid adsorption, liquid-liquid extraction. 2. Analyse the important separation processes of distillation, gas absorption, adsorption, liquid-liquid extraction and carry out design calculations appropriately of the above processes. 3. Apply simplifying assumptions to complex problems in order to gain useful design information individually and in a team 4. Communicate (written and verbal) outcome of practical work. 5. Learning outcomes will be achieved through interactive lectures, tutorials and laboratory sessions. The lectures will be organized so that the students participate by organizing them in groups in the class and assigning to them points of discussion throughout the lecture. The tutorials will be organized so that the students work in groups discussing the problem at hands and its solution. Each group will be asked to raise and

	share questions with the rest of the class. All lecture notes and tutorial questions and their solutions will be posted on the VLE. The laboratory sessions will be conducted with students working in groups. During the sessions, the students will be challenged to explain the objectives of the experiments, the operation of the experiment, health safety precautions and error analysis of the data collected and present them in their report. The Learning outcomes covered by the examinations include an understanding of the fundamental principles of mass transfer operations and application of these principles to the design of operations such as distillation, gas absorption, liquid-liquid extraction and crystallization.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Diffusion , flick's law, modes of diffusion	Introduction: General look on modes of diffusion	Theoretical lecture with PowerPoint	Oral questions to as students' understandin g
2	4	Diffusivity coefficient in liquid and gas	Study of the diffusion coefficient of different liquids and gases depending on the temperature and pressure of the components	Oral review of previous lecture	Question via Google Classroom
3	4	Absorption, equilibrium of gas and liquid	Introduction to study the design and calculation of different types of absorption	Interactive explanation using the board	Oral group -based questions to support collaborative thinking
4	4	Packed tower	Packed Tower – Working Principle and Advantages in Industrial Filtering	Lecture supported by video	Assignment o Google Classroom
5	4	Tray tower	Tray tower – Working Principle and Advantages in Industrial Filtering	PowerPoint with diagrams and board explanation	Oral review interactive questions evaluate comprehensio
6	4	Calculation of tower diameter, stripping	Calculation of Tower Height	Interactive group-led lecture compressor types, pros & cons	Divide student into groups, each with a unique question, to present a unified answer
7	4	Extraction, differential type	A technique used to separate and extract solute from different types	Written test	Written exam

			of solution by extraction		
8	4	Completely immiscible	The study of completely immiscible solvents is essential for effective separation.	PowerPoint lecture with practical data show	Oral review with questions from previous lectures
9	4	Party miscible	The study of partially miscible solvents is essential for effective separation.	Lecture with case study	Oral question
10	4	Distillation , vapor-liquid equilibrium	Study of different types of distillation, where the components of a liquid mixture are separated according to their boiling point.	Group activity	Oral questions
11	4	Continuous distillation	Study of the design of continuous distillation types according to the entering feed	Interactive lecture and brainstormin g	Quick quiz
12	4	Flash distillation	What Is Flash Distillation & How To Design One Easily	Video and discussion	Student-led presentation
13	4	Adsorption	What is adsorption and what is the main method of adsorption?	Written test	Oral exam
14	4	Physical adsorption and Chemisorption	Study the types of physical adsorption	Lecture	Oral exam
15	4	Exam			

11. Course Evaluation

Theoretically 20 Practical 20 Works of tear 10 Final exam 50

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Treybal R.E., Mass Transfer Operations, McGraw Hill • McCabe W.L., Smith J.C. & Harriott P., Unit Operations in Chemical Engineering, McGraw Hill.
Main references (sources)	David Basic principles and calculation in chemical engineering
Recommended books and references (scientific journals, reports...)	• Seader J.D.& Henley E.J., Separation Proce Principles. • Rousseau R.W., Handbook of Separation Process Technology, John Wiley • Foust A.S. et al, Principles of Unit Operatio John Wiley
Electronic References, Websites	https://www.comsol.com/multiphysics/what-is-mass-transfer?parent=fluid-flow-heat-transfer-and-mass-transport-0402-372

Course Description Form

Fourth Level

Course Description Form

1. Course Name:
Combustion Technology
2. Course Code:
COB414
3. Semester / Year:
First semester / 2024–2025 / Fourth Year
4. Description Preparation Date:
2024
5. Available Attendance Forms:
Classroom attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
45 Hours / 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Isam Ezzulddin Yousif Email: isamizz@ntu.edu.iq
8. Course Objectives

Course Objectives	1. To know the fuel and types of it. 2. To recognize the advantages and dis advantage of all fuel types. 3. Teaching the steps of calculating air to fuel ratio. 4. Teaching the major points of air to fuel ratio effect on combustion mode. To teach the relations of thermodynamics laws with combustion of fuels.
9. Teaching and Learning Strategies	
Strategy	The primary approach that will be used to deliver this module is to promote stud engagement in the exercises while also enhancing and broadening their ability calculate answers to mathematical problems. This will be accomplished throu lectures, interactive tutorials, and the consideration of small experiments with vari sampling tasks that the students will find fascinating.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Classify fuel types. Calculating the air to fuel ratio with variable air or fuel content conditions. Specify the rank and grade of coal. Determine the types of exhaust gases of fuel combustion using Orsat Apparatus. Determine the boiler burner efficiency. Calculating the entropy of combustion. Determine the effect of combustion on air pollution.	Introduction – Fuel and classification of fuel types.	Indicative content includes the following. <u>Part A -</u> Introduction and definitions. Doing some practice and quizzes. Calculating air to fuel ratios and defining some of combustion parameters. Dissociation phenomenon of combustion. Revision problem classes. [6 hrs] <u>Part B -</u> Working principle and components of Orsat device, and solving some problems dealing with actual combustion and orsat analysis. Heating values and experimental devices of bomb and Boy's calorimeter devices. Combustion thermodynamics, first and second law applications for combustion of fuels, and solving some problems of it.	Homework assignments for solving mathematical or explanatory problems. Participate in discussions on selected topics in automotive and engine engineering. Pose surprising intellectual questions in class about the previous week's topic before the start of the new lecture. Work on allocating specific time in class by forming groups to solve selected mathematical problems for each group and fostering a spirit of competition among students.
2	3		Calculation calorific vales of fuels.		
3	3		Calculation of air to fuel ratio – using tabulation and chemical formula methods.		
4	3		Defining the combustion principles – write advantages and dis advantages of fuel types.		
5	3		Define the dissociation and calculating the chemical equilibrium constant.		
6	3		Calculating the physiochemical properties of fuel blends		
7	3		Mid-term Exam.		
8	3		Boiler burner efficiency calculations.		
9	3		Orsat apparatus and flue gases analysis.		
10	3		Working principles of bomb and boy's calorimeters.		
11	3		Combustion thermodynamics.		
12	3		Constant volume combustion reactor.		
13	3		Constant pressure combustion reactor.		
14	3		Combustion entropy and analysis of second law of thermodynamics.		
15	3		Irreversibility and Gibbs function of combustion.		

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

Academic Assignment	Weight	Note
Daily Preparation and Participation	%10	The student's grade is based on their preparation and attendance in the semester, as well as the assignments they submit. These assignments are considered yearly work, with a weight of 10% added to the monthly exam grade to qualify for the semester course in combustion.
Daily Oral Questions/Quiz	%10	
Homework and Assignments	%10	
Mini-Reports/Projects	%20	
Monthly or Bi-Monthly Tests	%30	
Final Written Exam	%60	

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Applied Thermodynamics for Engineering Technologists S.I. Units, Thomas D. Eastop, Allan McConkey, Longman, 1978.
Main references (sources)	Fundamentals of Engineering Thermodynamics, Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey, Wiley, 2011.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Control and Measuring Engineering
2. Course Code:
Ctrl415
3. Semester / Year:
1ND Semester/ Fourth Year
4. Description Preparation Date:
01/09/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
4 hours 3 credit
7. Course administrator's name (mention all, if more than one name)
Name: Dr Sami Ridha Aslan Email: aslan.sami@ntu.edu.iq
8. Course Objectives

Course Objectives	1. Analyze responses of systems with different orders. 2. Analyze closed loop block diagrams. 3. Design controllers for closed loop systems. 4. Tune controllers that has been designed using various methods such as Bode stability criteria and dynamic error criteria. 5. Analyze the stability of closed loop systems that has been designed..
9. Teaching and Learning Strategies	
Strategy	• Interactive lectures and presentations to deliver core concepts Effectively. • Collaborative group work to encourage teamwork and collective problem-solving. • Student-led discussion sessions addressing challenges in cont engineering • Field visits to relevant facilities to deepen practical understanding of content. • Encouraging students to use digital tools to create presentations and mini-projects on control engineering operations. • Brainstorming sessions to promote active participation and idea exchange during lectures

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Why Process Control, Control Systems, Proce dynamics	Introduction to process control	Theoretical lecture with PowerPoi	Oral questions assess students' understanding
2	5	Transfer Function (Mercury Thermometer Transient Response , Forcing Functions, Step Response	Linear Open-Loop Systems: Response of First-Order Systems ,	Theoretical lecture with PowerPoi	Question via Google Classroom
3	5	Impulse Response , Ra Response , Sinusoidal Response	Linear Open-Loop Systems: Response of First-Order Systems	Theoretical lecture with PowerPoi	Oral group -based questions to support collaborative thinking
4	5	Examples of First-Orde Systems , Liquid Level Mixing Process, Heatin Process , Linearization	Linear Open-Loop Systems	Theoretical lecture with PowerPoi	Assignment on Google Classroom
5	5	Non-interacting System Interacting System	Response of First-Order Systems in Series	PowerPoint with diagrams and board explanation	Oral review interactive questions evaluate comprehension
6	5	Second-Order System , Transportation Lag	Higher-Order Systems: Second-Order and Transportation Lag	Interactive group-led lecture compressor types, pros & cons	Divide students into groups, each with a unique question, to present a unified answer
7	5	Components of a control system , Block diagram , Development of block diagram	Linear closed-loop systems: the control system	Written test	Written exam
8	5	Description of System, Reactor Transfer FunctionS Control Valv Measuring Element, Controller, Controller	Block Diagram of a Reactor Control System ,	PowerPoint lecture with practical data show	Oral review with questions from previous lectures

		Transducer, Transportation Lag			
9-10	10	Concept of Stability , Definition of Stability (Linear Systems), Stability Criterion , Rou Test for Stability	Stability	Lecture with case study	Oral question
11	5	concept of root locus	Root Locus	Group activity	Oral questions
12	5	Substitution Rule , Bod Diagrams	Frequency Response	Interactive lecture brainstorming	Quick quiz
13	3	Tank Temperature Control System, The Bo Stability Criterion , Gai and Phase Margins , Ziegler-Nichols Contro Settings	Control System Design by Frequency Response	Video and discussion	Student-led presentation
14-15	10	Control valve construct , Valve sizing , Valve characteristics , Valve positioner	Control valves	Written test	Oral exam
16	5	Comprehensive material review	Preparatory week before the final Exam	Review session	Preparatory quiz / questions

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, pop quizes, monthly exams, or written exams, Field trip reports, and presentations.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Modern Control Engineering , Katsuhiko Ogata
Main references (sources)	Advanced Control Engineering , Roland S. Bu
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	-

Course Description Form

1. Course Name:
Control and Measuring Engineering
2. Course Code:
FEK403
3. Semester / Year:
1ND Semester/ Fourth Year
4. Description Preparation Date:
13/09/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
5 hours 3 credit
7. Course administrator's name (mention all, if more than one name)
Name: Dr Sami Ridha Aslan Email: aslan.sami@ntu.edu.iq

8. Course Objectives	
Course Objectives	1. Analyze responses of systems with different orders. 2. Analyze closed loop block diagrams. 3. Design controllers for closed loop systems. 4. Tune controllers that has been designed using various methods such as Bode stability criteria and dynamic error criteria. 5. Analyze the stability of closed loop systems that has been designed..

9. Teaching and Learning Strategies	
Strategy	• Interactive lectures and presentations to deliver core concepts Effectively. • Collaborative group work to encourage teamwork and collective problem-solving. • Student-led discussion sessions addressing challenges in control engineering • Field visits to relevant facilities to deepen practical understanding of content. • Encouraging students to use digital tools to create presentations and mini-projects on control engineering operations. • Brainstorming sessions to promote active participation and idea exchange during lectures

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Why Process Control, Control Systems, Process dynamics	Introduction to process control	Theoretical lecture with PowerPoi	Oral questions to asse students' understandi
2	5	Transfer Function (Mercu Thermometer), Transient Response , Forcing Functions, Step Response	Linear Open-Loop Systems: Response of First-Order Systems ,	Theoretical lecture with PowerPoi	Question via Google Classroom
3	5	Impulse Response , Ramp Response , Sinusoidal Response	Linear Open-Loop Systems: Response of First-Order Systems	Theoretical lecture with PowerPoi	Oral group -based questions to support collabora thinking
4	5	Examples of First-Order Systems , Liquid Level, Mixing Process, Heating Process , Linearization	Linear Open-Loop Systems	Theoretical lecture with PowerPoi	Assignment on Google Classroom
5	5	Non-interacting System , Interacting System	Response of First-Order Systems in Series	PowerPoint with diagrams and board explanation	Oral review interactive questions to evalu comprehension
6	5	Second-Order System , Transportation Lag	Higher-Order Systems: Second-Order and Transportation Lag	Interactive group-led lecture compressor types, pros & cons	Divide students into groups, each with a unique question, to present a unified answer
7	5	Components of a control system , Block diagram , Development of block diagram	Linear closed-loop systems: the control system	Written test	Written exam
8	5	Description of System, Reactor Transfer Functio Control Valve, Measuring Element, Controller, Controller Transducer, Transportation Lag	Block Diagram of a Reactor Control System ,	PowerPoint lecture with practical data show	Oral review with questions from previous lectures
9-10	10	Concept of Stability , Definition of Stability	Stability	Lecture with case	Oral question

		(Linear Systems), Stabilit Criterion , Routh Test for Stability		study	
11	5	concept of root locus	Root Locus	Group activity	Oral questions
12	5	Substitution Rule , Bode Diagrams	Frequency Response	Interactive lecture brainstorming	Quick quiz
13	3	Tank Temperature Contro System, The Bode Stabili Criterion , Gain and Phas Margins , Ziegler-Nichols Controller Settings	Control System Design by Frequency Response	Video and discussion	Student-led presentati
14-15	10	Control valve constructio Valve sizing , Valve characteristics , Valve positioner	Control valves	Written test	Oral exam
16	5	Comprehensive material review	Preparatory week before the final Exam	Review session	Preparatory quiz / questions

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, pop quizes, monthly exams, or written exams, Field trip reports, and presentations.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Modern Control Engineering , Katsuhiko Ogata
Main references (sources)	Advanced Control Engineering , Roland S. Burns
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	-

Course Description Form

1. Course Name:
Engineering Project Management
2. Course Code:
OECK400
3. Semester / Year:
1st Semester/ Fourth Year
4. Description Preparation Date:
01/09/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hrs theoretical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Ass. Lec Aya Aws Saad Email: Aya.aws@ntu.edu.iq
8. Course Objectives

Course Objectives	• Introducing students to different management approaches and understanding their suitability across various professional fields. • Enabling students to apply diverse management techniques within sn groups to enhance their leadership and organizational skills. • Developing problem-solving abilities and building a solid understandi of engineering project management. • Equipping students with essential knowledge related to managing engineering projects and industrial operations. • Training students to evaluate optimal solutions using well-established methods from operations research.

	• Providing students with a foundation in the principles of statistics.

9. Teaching and Learning Strategies

Strategy	• Encouraging student participation in exercises while strengthening their critical thinking skills. • Delivering course material through classroom lectures and interactive lessons, using simple examples and sampling activities relevant to students' interests. • Enhancing students' problem-solving abilities and deepening their understanding of engineering project management concepts. • Building knowledge of site selection principles and understanding th key factors that influence the choice of industrial locations. • Introducing students to core topics such as work-study methods, feasibility studies, operations research, and basic concepts of maintenance, including its types and replacement processes.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Students will understand the principles of engineering project management, including planning, execution, monitoring, and closure, and recognize its role in enhancing efficiency, managing time, and controlling costs, while acquiring the essential skills and tools for successful project management.	Introduction and general definition engineering project management.	Teaching Methods and Tools	Oral questions to assess students' knowledge and understanding of the subject
2	3	Students will explore the concept, objectives, and functions of industrial engineering, become familiar with its key technologies, and learn about the pioneers in the field and their contributions to improving work methods.	Introduction and general definition of industrial engineeri	PowerPoint presentation, Interactive whiteboard	Oral questions
3	3	Students will understand the concept of plant location selection, analyze the factors that influence the choice of the optimal site—such as proximity to raw materials, markets,	Plant Location definition, types and selection.	Interactive whiteboard explanatory videos	Group activity

		transportation, labor, and facilities—while recognizing the importance of minimizing costs and maximizing benefits in the decision-making process.			
4	3	Students will differentiate between production layouts (Product Layout and Process Layout), identify the characteristics, advantages, disadvantages of each, and evaluate their suitability for different types of production.	Project Planning (Plant Layout).	PowerPoint presentation, Interactive whiteboard	Assignment on Google Classroom
5	3	Students will explore fixed-position and combination layouts, analyze the appropriate conditions for using each type, and understand the pros and cons of these systems in large or complex production environments.	Project Planning (Plant Layout).	PowerPoint explanation	Verbal review with interactive questions to evaluate students' understanding
6	3	Students will understand the concept of work-study, focusing on method study to simplify and enhance performance steps, and effectively determine and sequence processes using tools such as process charts and flow diagrams.	Work Study.	PowerPoint explanation	Group activity
7	3	Students will determine the standard time for task performance using work measurement techniques, such as time studies and sampling, and will understand motion study principles to enhance performance efficiency and minimize waste.	Work Study.	Interactive explanation	Quiz on Google Classroom
8	3	Students will grasp the concept of feasibility studies, distinguish between its types (market, technical, and financial), and identify the essential components of each to assess project viability and profitability.	Introduction to feasibility Study.	PowerPoint explanation	Verbal review with questions about previous lectures
9	3	Students will apply economic feasibility concepts by calculating	Feasibility Study methods and applications.	PowerPoint	Oral question

		costs, profits, break-even points, payback periods, and profitability ratios to evaluate the financial soundness of projects.		lecture practical demonstration using data show	
10	3	Students will understand the concept of operations research, apply linear programming techniques to solve decision-making problems related to resource allocation, and formulate mathematical models with constraints and objective functions.	Introduction to operation research.	Lecture with study analysis	Interactive questions
11	3	Students will apply the simplex method to solve multi-variable linear programming models and interpret optimal solution results to achieve maximum profit or minimum cost within specified constraints.	Operation research methods and applications.	Group activity	Assignment on Google Classroom
12	3	Students will understand the concept of maintenance, distinguish between its types (preventive and breakdown maintenance), and analyze the relationship between maintenance costs and failure rates to determine the optimal maintenance level.	Introduction and definition of maintenance replacement.	Interactive lecture brainstorming session	Student presentations
13	3	Students will analyze replacement problems for assets that deteriorate over time or face sudden failure, and calculate the economic life of equipment to determine the best replacement timing with the lowest total cost.	Maintenance replacement methods.	Problem-solving explanation on board	Oral test
14	3	Students will understand the concept of materials management, its objectives in regulating material flow, optimizing resource utilization, improving service levels, and reducing waste.	Introduction to material Management.	Interactive explanation engagement	Oral test
15	3	Students will analyze how materials management affects profitability by understanding its relationship with costs,	Material management importance and methods.	Lecture supported by images	Interactive questions

		production, and inventory within the income statement of industrial companies.			
16	3	Comprehensive review of course content.	Final Exam	Lecture explanatory video	Review session with discussion questions for students

11. Course Evaluation

Grade distribution out of 100 based on short quizzes, assignments, reports, and final evaluations (midterm and final exams) to assess the extent to which students have achieved the intended learning outcomes within the specified weeks.

12. Learning and Teaching Resources

Required textbooks (curricular books, if an	PROJECT MANAGEMENT FOR ENGINEERING AND TECHNOLOGY" by David L. Goetsch.
Main references (sources)	"ESSENTIALS OF PROJECT AND SYSTEMS ENGINEERING MANAGEMENT " by HOWARD EISNER
Recommended books and references (scientific journals, reports…)	-
Electronic References, Websites	https://www.investopedia.com/terms/q/quality-control.asp

Course Description Form

1. Course Name:
Power Plants
2. Course Code:
PPE410
3. Semester / Year:
1ST semester / Fourth year
4. Description Preparation Date:
1/9/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
4 theoretical / 4 units
7. Course administrator's name (mention all, if more than one name)
Name: Qays Adnan Ali Email: alnajarqays@ntu.edu.iq
8. Course Objectives

Course Objectives	1. To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of Power Generation and Power Station Management. 2. To enable the students to develop managerial skills to assess feasibility of alternative approaches and drive strategies in the field of Power Generation and Power Station Management. 3. To understand, discuss and evaluate the maintenance operations of power plant components..
9. Teaching and Learning Strategies	
Strategy	Power (Electricity) is critical to the socio-economic development of any society. The demand and supply of electricity are dynamic in nature as they vary due to its dependence on various factors. Additionally, power can't be stored at large scale and thus there is imminent need to ensure balance between its demand and supply to ensure commercial viability. Moreover, due to climate change and pollution concerns, nations worldwide are integrating more and more renewable energy options for power generation. In this course: a) Students will be engaged to help them acquire technical and commercial knowledge and skills associated with power generation and power station management. b) Classroom activities will be designed to encourage students to play an active role in the construction of their own knowledge and in the design of their own learning strategies.

	c) We will combine traditional lectures with other active teaching methodologies, such as group discussions, cooperative group solving problems, quizzes, presentations, etc. d) Class participation is a fundamental aspect of this course. Students will be encouraged to actively take part in all group activities and to give an oral group presentation. e) Students will be expected to interact with media resources, such as, web sites, YouTube videos, blogs, and newspapers articles.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Knowledge and practical application	Introduction; Need for Power	Practical + Theoretical+ PowerPoint	Exams and reports
2	4	Knowledge and practical application	Faraday's Law of Electromagnetic Induction; Understanding Power Sector Current Issues in Power Sector	Practical + Theoretical+ PowerPoint	Exams and reports
3-5	4	Knowledge and practical application	Introduction; Terminologies: Load Factor, Capacity Factor, Reserve Factor, Demand Factor, Diversity Factor, Plant Use Factor; Load Curve and Load Duration Curve; Base Load, Intermediate Load and Peak Load; Impact of Load Factor on Power Plant Economics; Thermal Efficiency and Heat Rate and its impact on Power Plant Economics; Cost Comparison of Power Generation from various technologies.	Practical + Theoretical+ PowerPoint	Exams and reports
6-8	4	Knowledge and practical application	Working Principles of Coal Fired TPP; Hydro Electric Power Plant; Wind Farm; Solar Photovoltaics; Solar Thermal Power Plant; Biomass Fired Power Plant; Tidal Power Plant;	Practical + Theoretical+ PowerPoint	Exams and reports

			Geothermal Power Plant; Ocean Thermal Energy Conversion		
9-10	4	Knowledge and practical application	Rankine Cycle; Concept of Mean Temperature of Heat Addition; Effect of the following on the Thermal Efficiency of Steam Power Plant: Variation in Steam Condition, Reheating, Regeneration; Feed water Heaters.	Practical + Theoretical+ PowerPoint	Exams and reports
11-13	4	Knowledge and practical application	Fire-Tube and Water-Tube Boilers; Schematic Layout of a Boiler; Coal Handling, Ash Handling, Power Generation and Control in a Coal Fired TPP	Practical + Theoretical+ PowerPoint	Exams and reports
14-15	4	Knowledge and practical application	Technical, Commercial and Regulatory Issues associated with Hydroelectric Power Plant, Nuclear Power Plant, Solar (PV and Thermal) Power Plant, Wind Power Plant, Biomass Power Plant; Integration of Various Power Generation Options to the Grid; Future of Indian Power Sector	Practical + Theoretical+ PowerPoint	Exams and reports

11.

Grade Distribution out of 100 Based on Student Tasks such as: Daily Preparation, Presentations, Daily Quizzes (5 Quizzes), Monthly and Written Exams, Laboratory Reports, In-Lab Activities, or Scientific Activities.

12. Learning and Teaching Resources

Required textbooks (curricular books any)	
Main references (sources)	Yadav R. (2004). Steam & Gas Turbines and Power P Engineering [7 ed.]. Central Publishing House.
Recommended books and references (scientific journals, reports...)	Nag P.K. (2014). Power Plant Engineering (4th Editi McGraw Hill. ISBN (13): 978-93-3920-404-4 ISBN (10): 93-3920-404-2
Electronic References, Websites	https://www.amazon.com/Power-Plant-Engineering-P-Nag/dp/9339204042

Course Description Form

1. Course Name:
Research Methodology
2. Course Code:
NTU 401
3. Semester / Year:
1st Semester/ Fourth Year
4. Description Preparation Date:
01/09/2024
5. Available Attendance Forms:
In class
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hrs theoretical – 2 Units
7. Course administrator's name (mention all, if more than one name)
Name: Ass. Lec Aya Aws Saad Email: Aya.aws@ntu.edu.iq
8. Course Objectives

Course Objectives	• Understanding the importance of scientific researc and its role in advancing knowledge. • Identifying the key characteristics that define quali research. • Gaining familiarity with essential concepts for formulating research questions and objectives. • Recognizing the ethical foundations that guide responsible scientific research. • Appreciating the significance of conducting a literature review as part of the research process.

	• Exploring various methods for collecting both quantitative and qualitative data. • Building an understanding of the principles beh designing scientific experiments.

9. Teaching and Learning Strategies

Strategy	• Regularly reviewing course materials to build a solid understanding of key concepts. • Actively participating in class discussions and interactive group activities to develop critical thinking skills. • Taking detailed notes during lectures to support effective revision later on. • Practicing applied examples to gain hands-on experience with research processes. • Periodically summarizing and reviewing course content to reinforce learning. • Utilizing visual tools such as mind maps and illustrativ charts to organize information clearly. • Completing exercises and assignments to strengthen practical research skills.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Students will understand the concept, objectives, and types of scientific research, and its role in generating knowledge through description, prediction, explanation, and improvement, while distinguishing between inductive and deductive research approaches.	Introduction Scientific Research	PowerPoint presentation with interactive whiteboard	Oral questions to assess students' understanding of the subject
2	2	Students will grasp the importance of research design, differentiate between its types, identify its essential	Research Design	PowerPoint explanation with demonstration of a scientific	Pre-lecture questions to gauge prior knowledge

		components, and follow systematic steps to create an effective and objective research plan.		research model	
3	2	Students will critically analyze previous studies, evaluate different methodologies, and connect published findings to their own research objectives, identifying knowledge gaps and justifying the need for their study.	Literature Review	PowerPoint presentation with interactive whiteboard	Assignment on Google Classroom
4	2	Students will understand data collection methods, distinguish between quantitative and qualitative approaches, and select suitable techniques based on the research type and objectives, while adhering to ethical principles in gathering information.	Data Collection Methods	PowerPoint explanation	Oral questions
5	2	Students will explore various research tools, assess their validity and reliability, and either develop or select appropriate instruments for data collection aligned with research questions or hypotheses, preparing for accurate analysis.	Data Analysis	PowerPoint explanation	Surprise quiz requiring students to write a one-page mini literature review
6	2	Students will learn the steps of experimental design, differentiate between independent and dependent variables, formulate testable hypotheses, and select appropriate treatment methods, sampling techniques, and measurement tools to ensure reliable results.	Experimental Design	Interactive explanation	Group activity
7	2	Students will explore survey methodology as a research tool, differentiate between measurement scales (nominal, ordinal), and apply classification and	Survey Design Sampling	PowerPoint explanation	Activity on Google Classroom

		coding techniques for precise measurement of variables based on data characteristics.			
8	2	Students will understand sampling methods, recognize the concept of intellectual property rights, and appreciate their role in protecting creativity and fostering innovation in academic and commercial settings.	Qualitative Research Methods	PowerPoint lecture with practical demonstration using data show	Verbal review with questions about previous lectures
9	2	Students will recognize the importance of adhering to ethical principles in research, including informed consent, privacy, confidentiality, and harm prevention, ensuring participant rights and research integrity.	Ethics in Scientific Research	Lecture with case study analysis	Oral question
10	2	Students will interpret quantitative and qualitative data using statistical and methodological techniques, extract meaningful insights, and present findings clearly using measures such as averages, frequencies, and standard deviation.	Data Interpretation Presentation	Group activity	Interactive questions
11	2	Students will understand the peer review process in academic research, recognize the steps of scholarly publication, and apply principles of research integrity when preparing work for publication.	Peer Review Publication Process	Interactive lecture with brainstorming session	Assignment on Google Classroom with data interpretation tasks and related questions
12	2	Students will master writing research proposals and scientific reports, including essential components such as abstract, introduction, discussion, conclusions, and recommendations, while structuring content in a clear academic format.	Research Proposal Writing	Interactive session	Pre-lecture questions to assess initial understanding

13	2	Students will apply time management and effective planning techniques to accomplish research tasks, set priorities, and organize activities to achieve research objectives efficiently.	Project Management Time Planning	Explanation with interactive engagement	Assessment on writing a research proposal
14	2	Students will develop and confidently deliver academic research presentations, understand the requirements for participating in scientific conferences, and engage with academic audiences professionally.	Presentations Research Conferences	Interactive PowerPoint session	Oral test
15	2	Comprehensive review of course content.	Final Exam	Review session	Review session with student discussions and questions
16	2	Students will understand the concept, objectives, and types of scientific research, and its role in generating knowledge through description, prediction, explanation, and improvement, while distinguishing between inductive and deductive research approaches.	Introduction Scientific Research	PowerPoint presentation with interactive whiteboard	Oral questions to assess students' understanding of the subject

11. Course Evaluation

The grade will be distributed out of 100 using a variety of assessment methods, including short quizzes, assignments, projects, reports, as well as midterm and final exams. The purpose is to evaluate the extent to which students have achieved the intended learning outcomes at different stages of the course throughout the semester.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	*Research Methodology: A Step-by-Step Guide for Beginners* by Ranjit Kumar
Main references (sources)	"Research Design: Qualitative, Quantitative, and Mixed Methods Approaches" by John W. Creswell and J. David Creswell
Recommended books and references (scientific journals, reports…)	Vinayak Bairagi, and Mousami V. Munot, "Research methodology: a practical and scientific approach," CRC Press, Taylor & Francis Group, LLC, 2019.

Electronic References, Websites	(www.socialresearchmethods.net) (www.researchmethodology.org) (www.qualres.org)

Course Description Form

1. Course Name:	
Solar PV Systems	
2. Course Code:	
SOL452	
3. Semester / Year:	
Second semester / 2024-2025 / Fourth Year	
4. Description Preparation Date:	
1-9-2024	
5. Available Attendance Forms:	
Weekly attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 Hours / 2 Units	
7. Course administrator's name (mention all, if more than one name)	
Name: Isam Ezzulddin Yousif Email: isamizz@ntu.edu.iq	
8. Course Objectives	
Course Objectives	1. Develop students' awareness by learning the basics of solar energy. 2. Develop students' engineering skills to understand how solar energy is harvested. 3. Learn about the stages of solar energy system development and related data and statistics. 4. Learn about mathematical models for solar energy systems. 5. Learn about the types of solar energy harvesting systems. 6. Learn how to calculate the efficiency and performance of solar energy systems. 7. Learn about solar thermal plants.
9. Teaching and Learning Strategies	
Strategy	The primary approach that will be used to deliver this module is to promote stud engagement in the exercises while also enhancing and broadening their ability calculate answers to mathematical problems. This will be accomplished throu lectures, interactive tutorials, and the consideration of small experiments with vari sampling tasks that the students will find fascinating.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	A general introduction to solar energy and solar angles	Solar Radiation	Lecture/Discussion/ Solving problems on solar energy systems/Video and laboratory learning.	Conducting daily and monthly theoretical and practical tests, ensuring students' attendance and interaction during lectures, and monitoring their submission of required reports. Solving practical problems related to solar energy systems. Directing students to specific websites to follow the latest developments in these systems. Requiring students to write reports on specific topics related to solar energy systems
2	2	Understand the amount of solar radiation on horizontal, vertical, and inclined surfaces	Solar Radiation		
3	2	A general introduction to the types of flat-panel and concentrated solar collectors and their components	Solar Collectors		
4	2	Understand flat-panel solar collectors and the incident radiation	Solar Collectors		
5	2	Understand the energy absorbed by flat-panel solar collectors	Solar Collectors		
6	2	Understand the losses in flat-panel solar collectors	Solar Collectors		
7	2	Understand the net power of flat-panel solar collectors	Solar Collectors		
8	2	How to calculate the efficiency of flat-panel solar collectors	Solar Collectors		
9	2	Understand concentrating solar collectors and the incident radiation and losses in them	Solar Collectors		
10	2	Understand the net power of concentrated solar collectors	Solar Collectors		
11	2	How to calculate the efficiency of concentrated solar collectors	Solar Collectors		
12	2	Understand photovoltaic cells and their types	Solar Collectors		
13	2	The mathematical model for calculating the efficiency and output power of photovoltaic cells	Solar Collectors		
14	2	How to improve the performance of photovoltaic cells	Solar Collectors		
15	2	Understand the types of solar thermal plants, their cycle types, and how to calculate efficiency	Solar Thermal Power Plants		

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

Academic Assignment	Weight	Note
Daily Preparation and Participation	%10	The student's grade is based on their preparation and attendance in the semester, as well as the assignments they submit. These assignments are considered yearly work, with a weight of 10% added to the monthly exam grade to qualify for the semester course in combustion.
Daily Oral Questions/Quiz	%10	
Homework and Assignments	%10	
Mini-Reports/Projects	%20	
Monthly or Bi-Monthly Tests	%30	
Final Written Exam	%60	

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Solar Energy Engineering, Processes and Systems by (Soteris A. Kalogirou) (2009).
Main references (sources)	Wind and Solar Power Systems, 2nd ed, by Mukund R. Patel, (2006).
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
English 4
2. Course Code:
NTU 400
3. Semester / Year:
First / Fourth2025-2024
4. Description Preparation Date:
13/9/2024
5. Available Attendance Forms:
Lecture
6. Number of Credit Hours (Total) / Number of Units (Total)
2
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Lecturer Bayan H. Al-Jaleel Email: bayan.hikmat@ntu.edu.iq
8. Course Objectives

Course Objectives	By the end of this course, students will be able to: 1. Understand and use a wide range of vocabulary in spoken and written communication. 2. Apply complex grammatical structures accurately in context. 3. Comprehend a variety of spoken and written texts including narratives, arguments, and descriptions. 4. Engage in extended speaking tasks such as discussions, presentations, and debates. 5. Write structured and coherent essays, letters, and reports using appropriate language. 6. Develop listening, reading, speaking, and writing skills aligned with B2 level of CEFR.

9. Teaching and Learning Strategies	
Strategy	• Communicative, student-centered approach • Pair and group work

	• Listening and speaking tasks • Role-playing and simulations • Grammar and vocabulary integration • Writing workshops and peer feedback

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Grammar Review	Unit 1: Tenses and Time	Lecture + Practice	Diagnostic Quiz
2	2	Reading & Vocabulary	Unit 2: Relationships	Reading Task + Discussion	Assignment
3	2	Listening + Grammar	Unit 3: Media & News	Listening Activity	Listening Quiz
4	2	Speaking Practice	Unit 4: Expressing Opinions	Debate + Pair Work	Speaking Rubric
5	2	Formal Letters	Writing Workshop I	Writing + Feedback	Written Task
6	2	Vocabulary + Grammar	Unit 5: Work and Ambition	Text Analysis	Quiz
7	2	Review & Practice	Midterm Review	Group Tasks	Participation
8	2	Listening, Reading, Writing	Midterm Exam	Test	Midterm
9	2	Reading + Discussion	Unit 6: Risk and Adventure	Group Reading	Reflection Sheet
10	2	Grammar (Future Forms)	Unit 7: Future Trends	Prediction Tasks	Grammar Test

11	2	Vocabulary & Speaking	Unit 8: Culture & Identity	Interactive Speaking	Role-play
12	2	Argumentative Essay	Writing Workshop II	Planning + Drafting	Writing Rubric
13	2	Listening + Vocabulary	Unit 9: Health and Ethics	Listening for Details	Quiz
14	2	All Skills	Final Review	Integrated Practice	Mock Exam
15	2	CEFR-Aligned Skills	Final Exam	Formal Assessment	Final Exam

11. Course Evaluation

Class Participation & Homework 10%
Speaking & Listening Tasks 15%
Writing Assignments 20%
Midterm Exam 20%
Final Exam 35%
Total 100%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• *New Headway: Upper-Intermediate Student's Book* – Liz & John Soars (Oxford University Press)
Recommended books and references (scientific journals, reports…)	• *New Headway Workbook and Teacher's Guide* – OUP
Electronic References, Websites	• https://www.oxfordlearnersdictionaries.com • https://learnenglish.britishcouncil.org • https://breakingnewsenglish.com – For listening & vocabulary • https://www.englishpage.com – Grammar and exercises

Course Description Form

1. Course Name:
Equipment and Plant Design
2. Course Code:
PED413
3. Semester / Year:
Semester
4. Description Preparation Date:
14/09/2024
5. Available Attendance Forms:
Theoretical + Practical
6. Number of Credit Hours (Total) / Number of Units (Total)
(4 Theory + 2 Practical) / Units (5)
7. Course administrator's name (mention all, if more than one name)
Name: Asst. Lecturer Maha Adnan Dawood Email: mailto:maha.adnan@ntu.edu.iq
8. Course Objectives

Course Objectives	• **Understand the principles of engineering design.** • **Analyze and design basic equipment.** • **Estimate sizes and geometric dimensions of equipment.** • **Design control and monitoring systems.** • **Consider industrial safety and environmental factors.** **Estimate costs and perform economic planning.** • **Use engineering software.** • **Develop teamwork skills.** • **Execute an integrated design project.**

9. Teaching and Learning Strategies

Strategy	• Regular theoretical lectures • Interactive presentations • Solving application problems and designs in class • Implementing individual or group design projects • Using engineering software in practical applications • Field or virtual visits to industrial plants (if available) • In-class discussions and motivational questions • Homework assignments to reinforce understanding • Quizzes and midterm exams to assess progress • Use of diverse educational resources (books, papers, educational videos)

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week One	(2p.+4 th)		1. Introduction		
Week Two			2. Distillation column design (column design, degrees of freedom analysis)	Practical and theoretical evaluation	
Week Three			3. Distillation columns (various design methods, multicomponent distillation considerations)	Practical and theoretical evaluation	quizzes
Week Four			4. Distillation columns (tray efficiency, hydraulics of perforated and valve trays)	Practical and theoretical evaluation Practical and theoretical evaluation	

Week Five			5. Distillation columns (pressure drop, packed columns – types of packing)	Practical and theoretical evaluation	
Week Six			6. Distillation columns (packing height, column diameter, internals, design methods)	Practical and theoretical evaluation	quizzes
Week Seven			7. Midterm Exam		
Week Eight			8. Vessels and tanks (types, flash tanks for LPG, design principles, stress considerations, pressure vessel codes)	Practical and theoretical evaluation	
Week Nine			9. Tanks (design of cylindrical and spherical shells under internal/external pressure, closure and gasket selection)	Practical and theoretical evaluation	
Week Ten			10. Flange design (standard flange selection, bolts, lug and saddle supports, bearing plates, anchor bolts)	Practical and theoretical evaluation	quizzes
Week Eleven			11. Separators (principles, types, vertical separators)	Practical and theoretical evaluation	

Week Twelve			12. Horizontal separators (gas-liquid dimensions, vapor handling capacity, without mist extractor)	Practical and theoretical evaluation	
Week Thirteen			13. Separators with mist extractors, liquid handling capacity	Practical and theoretical evaluation	
Week Fourteen			14. Cost (Intro to cost diagrams, case study on lumped parameter diagrams, cost distribution, evaluating alternatives)	Practical and theoretical evaluation	quizzes
Week Fifteen			15. Project Cost Estimation (Time value of money, interest and depreciation, case study; project finance and profitability analysis)	Practical and theoretical evaluation	
Week Sixteen			16. Final Exam		

11. Course Evaluation

Component	Score
First Semester	
Practical	5
Theoretical	15
Second Semester	
Practical	5
Theoretical	15
Coursework	
Attendance	5
Quizzes & Daily Exams	5
Subtotal (During Semester)	50
Final Exam	50
Total Final Grade	100

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Coulson, J. M., Richardson, and Sinnott, R.K., 'Chemical Engineering Design. Vol 6', 4th Edition, Butterworth-Heinemann, 2006
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Peters, M.S. and Timmerhaus, K.D., 'Plant Design and Economics for Chemical Engineers', 5th Edition, New York, McGraw-Hill, 2003
Electronic References, Websites	

Course Description Form

1. Course Name:
Modeling and Simulation
2. Course Code:
MS455
3. Semester / Year:
Semester
4. Description Preparation Date:
2024/9/14
5. Available Attendance Forms:
Theoretical + Practical
6. Number of Credit Hours (Total) / Number of Units (Total)
(2 Theory + 2 Practical) / Units (3)
7. Course administrator's name (mention all, if more than one name)
Name: Asst. Lecturer Maha Adnan Dawood Email: maha.adnan@ntu.edu.iq
8. Course Objectives

Course Objectives	• Introduce students to the concepts of mathematical modeling of chemical and physical processes. • Enable students to develop mathematical models for various operations such as chemical reactions, heat transfer, and mass transfer. • Enhance students' ability to simplify complex systems into analyzable mathematical models. • Teach students how to use computer software (such as MATLAB or Aspen) to solve and simulate models. • Strengthen skills in analyzing and interpreting results to support

	engineering decision-making based on modeling. • Develop students' critical and logical thinking by comparing simulation results with real-world data. • Prepare students to apply modeling and simulation techniques in the design, operation, and optimization of industrial units.

9. Teaching and Learning Strategies

Strategy	• Explain fundamental concepts of mathematical modeling and their applications in chemical engineering processes. • Formulate differential and algebraic equations representing physical and chemical systems. • Apply appropriate assumptions and simplifications to develop solvable models. • Use software tools such as MATLAB, Simulink, or Aspen Plus to simulate chemical processes. • Analyze and interpret simulation results to evaluate process performance and behavior. • Validate models by comparing simulation outputs with experimental or industrial data. • Communicate technical findings effectively through reports and presentations. • Demonstrate critical thinking and problem-solving skills in modeling complex engineering systems. • Work effectively as part of a team during simulation-based projects and assignments. • Understand the limitations of models and the importance of sensitivity analysis in engineering design and decision-making.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
Week One		Module1: 1: Introduction. to process modeling. Type of modeling.		Practical and theoretical evaluation	
Week Two		Module 2: Parameter Estimation: Parameter estimation techniques in theoretical as well as numerical models.		Practical and theoretical evaluation	
Week Three		Module 3: Numerical Methods: Classification of partial differential equations (PDE's), solution of PDEs by Finitedifference techniques, method of weighted residuals		Practical and theoretical evaluation	quizzes
Week Four		Module 4: Orthogonal collocation to solve PDEs with their application to chemical engineering systems models. Nonlinearity and Linearization of Models		Practical and theoretical evaluation	
Week Five		Module 5: Simulation Introduction to process simulation		Practical and theoretical evaluation	
Week Six		Module 6: tools of simulation, approaches of		Practical and theoretical evaluation	quizzes

Week Seven		simulation, planning of calculation in a plant simulation			
Week Eight		Midterm Exam		Practical and theoretical evaluation	
Week Nine		Module 7: Simulation of holding tank using aspen HYSYS		Practical and theoretical evaluation	
Week Ten		Module 8: Simulation of Distillation column using aspen HYSYS		Practical and theoretical evaluation	quizzes
Week Eleven		Module 9: Simulation of Distillation column using aspen HYSYS		Practical and theoretical evaluation	
Week Twelve		Module 10: Simulation of Distillation column using aspen HYSYS		Practical and theoretical evaluation	
Week Thirteen		Module 11: Simulation of Separator column using aspen HYSYS		Practical and theoretical evaluation	
Week Fourteen		Module 12: Simulation of Absorber column using aspen HYSYS		Practical and theoretical evaluation	quizzes
Week Fifteen		Module 13: Simulation of condenser absorber column using aspen HYSYS		Practical and theoretical evaluation	
Week Sixteen		Module 14: Simulation of Reboiler absorber column using aspen HYSYS.			
		Final Exam			

11. Course Evaluation

Component	Score
First Semester	
Practical	5
Theoretical	15
Second Semester	
Practical	5
Theoretical	15
Coursework	
Attendance	5
Quizzes & Daily Exams	5
Subtotal (During Semester)	50
Final Exam	50
Total Final Grade	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Luyben, William L. "Process modeling, simulation and control for chemical engineers". McGrawHill Higher Education.
Main references (sources)	Jana, Amiya K. "Chemical process modelling and computer simulation". PHI Learning Pvt.
Recommended books and references (scientific journals, reports…)	Aris R., "Mathematical Modeling Vol. 1: A Chemical Engineering Perspective (Process System Engineering)", Academic Press, 1999
Electronic References, Websites	Najim K., "Process Modeling and Control in Chemical Engineering", CRC, 1990.

Course Description Form

1. Course Name:
Engineering Economy
2. Course Code:
OECK402
3. Semester / Year:
Second Semester / 2025
4. Description Preparation Date:
2024/9/1
5. Available Attendance Forms:
Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
32 =16*2
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Waleed Ali Hussein Al-Zaidi Email: dr.waleedah199@ntu.edu.iq

8. Course Objectives	
Course Objectives	• Developing the ability to make engineering economic decisions • Analyzing the total costs of projects • Applying methods for comparing alternatives • Conducting economic feasibility analysis for energy projects • Promoting ethical and sustainable decision-making

9. Teaching and Learning Strategies	
Strategy	Learning and teaching strategies are designed to engage students in both theoretical concepts and practical applications. These strategies aim to enhance critical thinking and problem-solving skills. The following are common strategies that can be used in teaching: 1. Lectures and presentations 2. Seminars and group discussions 3. Independent reports Within these diverse educational strategies, a holistic approach to learning is adopted, combining theoretical understanding with practical application.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	• Understanding the role of engineering economics in decision-making • Calculating the present and future value of money • Comparing alternatives using the annual cost method • Comparing alternatives using the present and future worth methods • Analyzing project cash flows • Evaluating the impact of changes on investment decisions • Determining the rate of return for projects • Conducting project feasibility analysis using Net Present Value (NPV) • Estimating the payback period of capital investments • Incorporating the effect of inflation in economic calculations • Understanding the impact of taxes on investment decisions • Calculating depreciation using various methods • Making replacement decisions between	• Introduction to Engineering Economics • Time Value of Money • Economic Comparison Methods – Part I • Economic Comparison Methods – Part II • Cash Flow Analysis • Sensitivity and Risk Analysis • Internal Rate of Return (IRR) • Net Present Value (NPV) • Payback Period and Financial Evaluation • Inflation and Its Impact on Economic Decisions • Taxes and Capital Investments • Depreciation and Its Types • Equipment Replacement Analysis • Energy Economics • Applied Case Study • Comprehensive Review and Final Exam Preparation	Lecture and discussion	1. Short Quiz + Participation 2. Solving Numerica Problems 3. Homework 4. In-Class Exercise 5. Case Study Analy 6. Group Discussion 7. Analytical Test 8. Mini Project 9.Presentation 10. Exercises with C Study 11. Problem Solving with Taxes 12. Applied Problem 13. Economic Feasibility Compari 14. Open Discussion 15. Final Project Presentation 16. Final Exam

		old and new equipment • Performing economic feasibility analysis for energy projects • Applying knowledge in a real-world project • Comprehensive preparation for the final exam			

11. Course Evaluation

Daily Preparation and Participation – 5%
Reports / Mini Projects – 5%
Monthly or Bi-monthly Quizzes – 30%
Final Written Exam – 60%

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Sullivan, W. G., Wicks, E. M., & Koelling, P. (2015). Engineering economy (16th ed.). Pearson
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Unit Operations
2. Course Code:
Unit412
3. Semester / Year:
Semester
4. Description Preparation Date:
15/9/2024
5. Available Attendance Forms:
Theoretical + Practical
6. Number of Credit Hours (Total) / Number of Units (Total)
Theoretical 2+ Practical2 / Units (3)
7. Course administrator's name (mention all, if more than one name)
Name:noor ahmed awad Email: noor.ahme23@ntu.edu.iq
8. Course Objectives

Course Objectives	• Understand the fundamental principles of transport processes (heat, mass, and momentum). • Study key industrial separation processes such as distillation, extraction, and drying. • Analyze and operate industrial equipment related to each unit operation. • Apply material and energy balances to real industrial processes. • Develop calculation and design skills for unit operation equipment. • Connect theoretical knowledge with practical industrial applications.

	• Enhance teamwork and engineering problem-solving abilities

9. Teaching and Learning Strategies	
Strategy	• Deliver theoretical lectures supported by practical examples. • Solve exercises and problems covering various unit operations • Use simulation tools or engineering software (e.g., Asp HYSYS). • Include factory tours or video demonstrations for real-wo context. • Assign group mini-projects to design parts of industrial units. • Conduct regular quizzes and exams to assess understanding. • Encourage class discussions and real-world application concepts

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 Week2 Week3 Week4 Week5 Week6 Week7 Week8 Week9 Week10 Week11	(2p.+2 th)	1.Humidification and Air Conditioning Adiabatic saturation temperature. humidity data for air-water system, psychometric chart 2.Humidification and Air Conditioning temperature-humidity and enthalpy-humidity charts , Determination of humidity, methods of increasing humidity, 3.Humidification and Air Conditioning Cooling towers 4.Humidification and Air Conditioning Design of natural-draught towers. Evaporation loss of water in cooling tower	3	Practical a theoretical evaluation	Quizzes Quizzes

Week12 Week13 Week14 Week15 Week16		5.Drying Steps of drying, rate of drying, time of drying. Heat and mass transfer in dryers. 6.Drying Solids handling, adiabatic and non-adiabatic dryers, temperature patterns in dryers, Drying equipment, 7.Drying Drying characteristics of materials. 8.Evaporation energy balances in the evaporators, Types of evaporators 9.Evaporation Single and multiple effect evaporators, Performance of evaporators 10.Sedimentation Separation Stokes Law, Gravitational Sedimentation 11.Sedimentation equipment 12.Membranes Separation Theory and Classification of Membranes Separation Concentration or partial pressure driven processes, 13.Membranes Separation Porous membranes, pressure driven processes,			

		14.Membranes Separation dense membranes, Reverse Osmosis. 15.Centrifugal Separation Centrifugal pressure, Separation of immiscible liquids of Different densities, Centrifugal equipment 16.Filtration Theory and Classificati of Filtration, Constant r Filtration Const Pressure Filtrati Filtration equipment: Pl and frame filter press a Rotary filte			

11.Course Evaluation	
Component	Score
First Semester	
Practical	5
Theoretical	15
Second Semester	
Practical	5
Theoretical	15
Coursework	
Attendance	5
Quizzes & Daily Exams	5
Subtotal (During Semester)	50
Final Exam	50
Total Final Grade	100

12.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1] Geankoplis C J, 1995, 'Transport Proc and Unit Operations', Prentice-Hall. Mc.Cabe W L, Smith J C, 1993, 'U Operations of Chemical Engineerin McGraw-Hill. [3] Seader & Henley, 20

	'Separation Process Principles', John Wi & Son.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	[4] Coulson J M, Richardson J F, 'Chemi Engineering Vol 2, Butterwor Heinemann. [5] Pabby, A.K., Rizwi, S. a Sastre, A.M., 2009 Handbook of Membra Separations
Electronic References, Websites	

Course Description Form

1. Course Name:	
Chemical Reactors Engineering	
2. Course Code:	
CHRE411	
3. Semester / Year:	
2nd semester 2024−2024	
4. Description Preparation Date:	
1/9/2024	
5. Available Attendance Forms:	
Theoretical	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(4 Theory) / Units (4)	
7. Course administrator's name (mention all, if more than one name)	
Name:noor ahmed awad Email: noor.ahme23@ntu.edu.iq	
8. Course Objectives	
Course Objectives	• Understand the fundamentals and classifications of chemical reactions (homogeneous and heterogeneous). • Analyze the behavior of different types of chemical reactors (Batch, CSTR, PFR). • Design and select the optimal reactor type based on reaction characteristics and operating conditions. • Calculate reaction rates and evaluate performance using kinetics equations. • Study the influence of operating variables (temperature, concentration, pressure) on reaction efficiency. • Apply mass and energy balance principles in reactor analysis and design.

	• Integrate heat and mass transfer concepts into chemical reaction engineering. • Develop problem-solving skills using mathematical modeling and numerical analysis

9. Teaching and Learning Strategies

Strategy	• Deliver theoretical concepts supported by practi examples. • Use software tools or charts to compare the performar of different reactors. • Provide varied exercises and problems to practice analy and design skills. • Assign mini-projects focused on reactor design for speci reactions. • Incorporate case studies from real industrial proces (e.g., petrochemical or pharmaceutical). • Promote teamwork in solving complex problems a comparing different solutions. • Conduct periodic quizzes and exams to asse understanding of both theory and application. • Link the course content with modern technologies such industrial catalysis and multiphase reactions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 **Week2** **Week3** **Week4**	4	1.RevisionIntroduction the course 2.kinetics of chemi reaction \ rate law 3.Kinetics of Chemical Reaction \ order and rat of chemical reactions	4	theoretical evaluation	Quizzes Quizzes

Week5 **Week6** **Week7** **Week8** **Week9** **Week10** **Week11** **Week12** **Week13** **Week14** **Week15** **Week16**		Kinetics of Chemi Reaction 4.stoichiometry, type reactions, and conversio 5.introduction to react design, General m balance equation. 6.Industrial reacto Design equation of bat reactor 7.Design equation for fl systems (PFR and CSTR) 8.Design equation for fl systems (PFR and CSTR) 9.Reversible reaction a equilibrium conversion 10.Reversible reaction batch reactor, a equilibrium conversion batch reactor - isotherm operation 11.Design Equation tubular reactor (PF volume of reactor, spa time, and space velocity 12.Multiple reactions Connecting CSTR and P in series and parallel 13.Multiple reactions Connecting CSTR and P in s 14.Pressure drops reactors, flow through packed- bed (gas-pha variable density) 15.Graphical methods fo n-stage CSTR Comparison betwe reactors 16.Preparatory we before the final Exam			

11. Course Evaluation

Component	Score
First Semester	
Theoretical	15
Second Semester	
Theoretical	15
Coursework	
Attendance	5
Quizzes & Daily Exams	5
Subtotal (During Semester)	40
Final Exam	60
Total Final Grade	100

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	J.B. Rawlings and J.G. Ekerdt, Chemi Reactor Analysis and Desi Fundamentals, Second Printing, N Hill Publishing, 2004.
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Additional textbooks of interest ha been placed on reserve at the Libra These include **Elements of Chemical Reacti Engineering** by Fogler, **Chemi Reaction Engineering** by Levensp and **Chemical Reactor Analysis a Design** by Froment and Bischoff.
Electronic References, Websites	