Academic Program Description Form

University Name: .Tikrit University

Faculty/Institute: College of Engineering.

Scientific Department: Chemical Engineering Department

Academic or Professional Program Name: BSc Chemical Engineering

Final Certificate Name: Bachelor of Science in Chemical Engineering (B.Sc. Chemical Engineering)

Academic System: Semesters

Description Preparation Date: 12-10-2025

File Completion Date: 15-10-2025

Signature:

Head of Department Name:
Maha N. Ismaeel
Date:15-10-2025

Signature:
Scientific Associate Name:
Prof. Dr. Saad M. Raoof
Date: 15-10-2025

The file is checked by: Dr.Ahmed Y. Radeef

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:15-10-

Signature:

Approval of the Dean

Ass.Prof.Dr.Saad R.Ahmed

Academic Program and Course Description Guide

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

College of Engineering-Tikrit University
Chemical Engineering Department

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 staP 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, quaJerly), 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.

1. Program Vision

The Chemical Engineering Program at Tikrit University aspires to provide a nationally recognized undergraduate education in Chemical Engineering, distinguished by excellence in teaching, innovation, and research, with particular strengths in petrochemical industries, process safety, process systems engineering, water treatment, and artificial intelligence applications. The program seeks to prepare highly qualified graduates capable of contributing effectively to industry, research, and sustainable societal development at both national and international levels

2. Program Mission

The Chemical Engineering Program at Tikrit University is committed to educating future leaders and innovators in chemical engineering and related disciplines by providing high-quality education, fostering research and innovation, advancing chemical engineering knowledge, developing technologies that address societal and industrial needs, and contributing to the welfare and sustainable development of Iraq through professional practice, ethical responsibility, and lifelong learning.

3. Program Objectives

PEO 1: Apply chemical engineering principles, modern engineering tools, and problem-solving skills to successfully practice in chemical, petroleum, petrochemical, environmental, and related industries.

PEO 2: Design, operate, analyze, and improve chemical processes and systems while considering economic, environmental, safety, and sustainability requirements.

PEO 3: Demonstrate professionalism, ethical responsibility, effective communication, leadership, and teamwork in multidisciplinary engineering environments.

PEO 4: Engage in lifelong learning, professional development, research, innovation, and advanced studies to adapt to emerging technologies and industry needs.

PEO 5: Contribute to societal welfare and national development through engineering solutions that address industrial, environmental, and community challenges.

4. Program Accreditation

Does the program have program accreditation? And from which agency?

Yes, from the ICAEE for six years starting from batch of 2023-2024. (Certificate)

5. Other external influences
Is there a sponsor for the program? Ministry of Higher Education and Scientific Research

6 Program Structure				
Program Structure	Number of Courses	Credit hours	Percentage	Reviews•
Institution Requirements	9	19	10.6%	--
College Requirements	8	40	22.3%	---
Department requirements	32	120	67%	----
Summer Training	---	----	----	
Other				

7.Program Description

7

Year / Level	Course Code	Course Name	Credit Hours
First Level	CHEM_ENG 101	Introduction to Chemical Engineering	6
First Level	MATH 101	Calculus I	6
First Level	CHEM 101	Organic Chemistry	6
First Level	ENG-102	Engineering Mechanics	5
First Level	CHEM_ENG 102	Laboratory Safety	3
First Level	ENG-107	English Language I	2
First Level	CHEM_ENG 103	Material Balance	6
First Level	MATH 102	Calculus II	6
First Level	CHEM 102	Analytical Chemistry	6
First Level	ENG-106	Engineering Workshops	3
First Level	ENG-104	Computer Science	3
First Level	ENG-101	Engineering Drawing	4
Second Level	MATH 201	Engineering Analysis	6
Second Level	CHEM_ENG 201	Energy Balance	6
Second Level	CHEM_ENG 202	Fluid Flow I	6
Second Level	CHEM 201	Physical Chemistry	6
Second Level	CHEM_ENG 203	Environmental Pollution	4
Second Level	CHEM_ENG 204	Industrial and Petrochemical Processes	6
Second Level	MATH 202	Numerical Analysis	6
Second Level	CHEM_ENG 206	Fluid Flow II	6
Second Level	CHEM_ENG 207	Engineering Materials	5
Second Level	ENG-105	Computer Programming	3
Second Level	ENG-109	English Language II	2
Third Level	331a CHE	Engineering Analysis I	3
Third Level	341a CHE	Thermodynamics I	3
Third Level	342a CHE	Mass Transfer I	3
Third Level	343a CHE	Heat Transfer I	3

Third Level	333a CHE	Engineering Statistics	2
Third Level	344a CHE	Chemical Industries	2
Third Level	321a CHE	Numerical Methods	3
Third Level	331b CHE	Engineering Analysis II	3
Third Level	341b CHE	Thermodynamics II	3
Third Level	342b CHE	Mass Transfer II	3
Third Level	343b CHE	Heat Transfer II	4
Third Level	333b CHE	Engineering Economics	2
Third Level	344b CHE	Petrochemical Industries	2
Fourth Level	441a CHE	Unit Operations I	2
Fourth Level	445a CHE	Reactor Design I	3
Fourth Level	447a CHE	Process Control I	3
Fourth Level	443a CHE	Petroleum Refining I	3
Fourth Level	444a CHE	Equipment Design I	3
Fourth Level	446a CHE	Engineering Project I	2
Fourth Level	448a CHE	Computer Applications	3
Fourth Level	441b CHE	Unit Operations II	3
Fourth Level	445b CHE	Reactor Design II	3
Fourth Level	447b CHE	Process Control II	4
Fourth Level	443b CHE	Petroleum Refining II	2
Fourth Level	444b CHE	Equipment Design II	3
Fourth Level	446b CHE	Engineering Project II	2
Fourth Level	449 CHE	Instrumental Analysis Techniques	2

8. Expected Program Learning Outcomes

Knowledge

- Demonstrate knowledge of the fundamental principles of mathematics, science, and chemical engineering and apply them to analyze and solve engineering problems.
- Understand the principles of chemical process and equipment design, operation, and development.
- Recognize environmental, economic, health, safety, and sustainability aspects related to engineering processes and industrial operations.

Skills

- Identify, formulate, and solve engineering problems using appropriate scientific and engineering methodologies.
- Design engineering processes and systems that meet technical requirements while considering safety, environmental, economic, and sustainability constraints.
- Conduct experiments, analyze data, interpret results, and draw valid engineering conclusions.
- Utilize modern engineering techniques, computational tools, and software for analysis, design, and simulation.
- Communicate effectively in oral and written forms and work efficiently as a member or leader of multidisciplinary teams.

Values

- Adhere to professional ethics and responsibilities in engineering practice.
- Respect quality standards, occupational health and safety requirements, environmental protection principles, and community service obligations.
- Promote lifelong learning and continuous professional development.
- Demonstrate teamwork, cooperation, respect for diversity, and inclusion in professional environments.

---

9. Teaching and Learning Strategies

1. Interactive lectures to introduce fundamental concepts and principles of chemical engineering and supporting sciences.
2. Practical laboratory experiments to develop hands-on skills and verify engineering concepts and theories.
3. Problem-Based Learning (PBL) to enhance analytical thinking and the ability to address complex engineering problems.
4. Project-Based Learning through engineering design projects and capstone graduation projects.
5. Industrial summer training programs to bridge academic knowledge with professional practice.
6. Cooperative learning and teamwork through group activities and collaborative projects.
7. Case studies and industrial applications to connect theoretical knowledge with real-world engineering challenges.
8. Use of engineering software and computational tools for analysis, design, and

simulation.

9. Seminars, presentations, and scientific discussions to strengthen communication, presentation, and persuasion skills.
10. Self-directed and lifelong learning through assignments, research activities, and engagement with current scientific resources.
11. Academic advising and mentoring to support students academically and professionally throughout their studies.

10. Assessment Methods

The Chemical Engineering Program employs a variety of assessment methods to evaluate the achievement of the intended learning outcomes, including:

a) Written examinations (midterm and final examinations).
b) Quizzes to assess continuous understanding of course materials.
c) Laboratory reports and practical performance evaluations.
d) Homework assignments and individual/group coursework.
e) Engineering design projects, capstone projects, and evaluation of associated reports and presentations.
f) Seminars, presentations, and scientific discussions.
g) Assessment of industrial summer training through training reports and performance evaluation.
h) Case studies and engineering problem-solving activities.
i) Evaluation of teamwork, leadership, and communication skills through group activities and projects.
j) Direct observation of practical performance during laboratory and applied activities.
k) Feedback from graduates, employers, and the Industrial Advisory Board to assess the long-term achievement of program learning outcomes and educational objectives.

Professional Development

Mentoring new faculty members

Mentoring New Faculty Members

The Department of Chemical Engineering follows a structured mentoring process to support new, visiting, full-time, and part-time faculty members in their academic and professional responsibilities. At the institutional level, newly appointed faculty participate in orientation programs that introduce university policies, academic regulations, quality assurance procedures, teaching methodologies, and the use of learning management systems and administrative services.

At the departmental level, each new faculty member is assigned an experienced academic mentor who provides guidance on course planning, classroom management, assessment methods, student advising, research activities, and departmental procedures. Regular meetings are conducted between mentors and mentees to discuss teaching performance, professional development needs, research opportunities, and integration into the academic community.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	**Lecturer**
Prof. Dr. Saba Adnan Gheni	Chemical Eng.	Reactor Design			X	
Prof. Dr. Adel Abdulrazaq Mohammed Saeed	Mechanical Eng.	Power			X	
Prof. Dr. Ayser Talib Jarallah	Chemical Eng.	Reactor Design			X	
Prof. Dr. Safaa Mohammed Rashid Ahmed	Chemical Eng.	Reactor Design			X	
Prof. Dr. Harith Nuri Muhammad	Chemical Eng.	Separation processes			X	
Prof. Dr. Shaima Ali Hamid	Chemical Eng.	Reactor Design			X	
Ass.Prof. Dr. Suhaib Shwish Saleh	Chemical Eng.	Separation processes			X	
Lecturer Dr. Haider Akram Aref	Chemical Eng.	Multiphase flow			X	
Lecturer Dr. Thaer Adnan Abdullah	Chemical Eng.	Process control			X	

Lecturer Dr. Mahmood Ghani Jubor	Chemical Eng.	Wastewater treatment			X	
Ass,Lecturer Mudheher M. Abed	Chemical Eng.	Reactor Design			X	
Lecturer Heba Saadi Ayoub*	Chemical Eng.	Separation processes			X	
Lecturer Maha Nizar Ismail	Chemical Eng.	Process control			X	
Ass,Lecturer Omar Saeed Lateef	Chemical Eng.	Simulation			X	
Ass,Lecturer Faten Hassan Yahya	Chemical Eng.	Wastewater treatment			X	
Ass. Prof. Safa Walid Shaker	Chemical Eng.	Wastewater treatment			X	
Lecturer Kumait Saeed Awad	Administration and economy	Finance			X	
Ass, Lecturer Ghazwan Saleh Ahmed**	Chemical Eng.	Reactor Design			X	
Ass,Lecturer Maaly N. Tawfeeq	Chemical Eng.	Wastewater treatment			X	
Ass,Lecturer Rana Najah Hachem	Chemical Eng.	Wastewater treatment			X	
Ass,Lecturer Heba Ramadhan Mohammed	Chemical Eng.	Reactor Design			X	
Ass,Lecturer Wasnaa Yonis Abdullah	Islamic Sciences	Legislation			X	
Ass,Lecturer Nada Ahmed Mousa	English Language	Literature			X	
Ass,Lecturer Thekra Sabar Hussein	Administration and economy	Finance			X	

14. Program Development Plan

Course Information				Knowledge				Skills				Values			
Year / Level	**Course Code**	**Course Name**	**Core or Elective**	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**	**C1**	**C2**	**C3**	**C4**
2025-2026 / First	CHEM_ENG 101	Introduction to Chemical Engineering	Core		X			X						X	
2025-2026 / First	MATH 101	Calculus I	Core	X				X						X	
2025-2026 / First	CHEM_101	Organic Chemistry	Core	X	X			X						X	
2025-2026 / First	ENG-102	Engineering Mechanics	Core	X				X						X	
2025-2026 / First	CHEM_ENG 102	Laboratory Safety	Core				X		X			X	X		
2025-2026 / First	ENG-107	English Language I	Core	X				X						X	
2025-2026 / First	CHEM_ENG 103	Material Balance	Core	X			X						X		
2025-2026 / First	MATH 102	Calculus II	Core	X				X						X	
2025-2026 / First	CHEM_102	Analytical Chemistry	Core	X	X			X						X	
2025-2026 / First	ENG-106	Engineering Workshops	Core	X				X						X	
2025-2026 / First	ENG-104	Computer Science	Core		X					X				X	
2025-2026 / First	ENG-101	Engineering Drawing	Core		X					X					X
2025-2026 /	MATH 201	Engineering	Core	X				X						X	

Second		Analysis													
2025-2026 / Second	CHEM_ENG 201	Energy Balance	Core	X			X						X		X
2025-2026 / Second	CHEM_ENG 202	Fluid Flow I	Core	X			X						X		X
2025-2026 / Second	CHEM 201	Physical Chemistry	Core	X	X			X						X	
2025-2026 / Second	CHEM_ENG 203	Environmental Pollution	Core				X	X				X	X		
2025-2026 / Second	CHEM_ENG 204	Industrial and Petrochemical Processes	Core	X			X						X		
2025-2026 / Second	MATH 202	Numerical Analysis	Core	X	X			X	X						
2025-2026 / Second	CHEM_ENG 206	Fluid Flow II	Core		X	X	X							X	
2025-2026 / Second	CHEM_ENG 207	Engineering Materials	Core	X	X			X	X						
2025-2026 / Second	ENG-105	Computer Programming	Core		X					X				X	
2025-2026 / Second	ENG-109	English Language II	Core	X				X						X	
2025-2026 / Third	331a CHE	Engineering Analysis I	Core	X				X						X	
2025-2026 / Third	341a CHE	Thermodynamics I	Core		X	X		X	X					X	
2025-2026 / Third	342a CHE	Mass Transfer I	Core		X	X		X	X					X	
2025-2026 / Third	343a CHE	Heat Transfer I	Core		X	X		X	X					X	
2025-2026 /	333a CHE	Engineering	Core	X				X						X	

Third		Statistics													
2025-2026 / Third	344a CHE	Chemical Industries	Core		X	X		X	X					X	
2025-2026 / Third	321a CHE	Numerical Methods	Core	X				X						X	
2025-2026 / Third	331b CHE	Engineering Analysis II	Core	X				X						X	
2025-2026 / Third	341b CHE	Thermodynamics II	Core		X	X		X	X					X	
2025-2026 / Third	342b CHE	Mass Transfer II	Core		X	X		X	X					X	
2025-2026 / Third	343b CHE	Heat Transfer II	Core		X	X		X	X					X	
2025-2026 / Third	333b CHE	Engineering Economics	Core	X				X			X		X		
2025-2026 / Third	344b CHE	Petrochemical Industries	Core		X	X		X	X					X	
2025-2026 / Fourth	441a CHE	Unit Operations I	Core			X		X	X	X		X			X
2025-2026 / Fourth	445a CHE	Reactor Design I	Core			X		X	X	X		X			X
2025-2026 / Fourth	447a CHE	Process Control I	Core			X		X	X	X		X			X
2025-2026 / Fourth	443a CHE	Petroleum Refining I	Core			X		X	X	X		X			X
2025-2026 / Fourth	444a CHE	Equipment Design I	Core			X		X	X	X		X			X
2025-2026 / Fourth	446a CHE	Engineering Project I	Core			X		X	X	X		X			X
2025-2026 / Fourth	448a CHE	Computer Applications	Core		X					X				X	

2025-2026 / Fourth	441b CHE	Unit Operations II	Core				X		X	X	X		X		
2025-2026 / Fourth	445b CHE	Reactor Design II	Core				X		X	X	X		X		
2025-2026 / Fourth	447b CHE	Process Control II	Core				X		X	X	X		X		
2025-2026 / Fourth	443b CHE	Petroleum Refining II	Core				X		X	X	X		X		
2025-2026 / Fourth	444b CHE	Equipment Design II	Core				X		X	X	X		X		
2025-2026 / Fourth	446b CHE	Engineering Project II	Core			X		X	X	X		X			X
2025-2026 / Fourth	449 CHE	Instrumental Analysis Techniques	Core		X	X			X	X				X	

Course Description Form

1. Introduction to Chemical Engineering

Course Name	Introduction to Chemical Engineering
Course Code	CHEM_ENG 101
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures (Lecture) Tutorial Classes / Exercises Seminars
Total Study Hours / Total Units	150 Hours / 6 ECTS
Course Administrator Name	Lect. Dr. Marwa Nouri Mohammed

8. Course Objectives

Introduce students to the basic unit operations in chemical engineering, dimensions, units, symbols, and conversion factors.

Develop students' understanding of the fundamentals of engineering calculations and the concepts of density and specific gravity.

Clarify the concepts of temperature and pressure and their related units of measurement.

Introduce students to the ideal gas law and equations of state for real gases and their applications.

Enable students to understand material balance and its applications in different industrial processes.

Build a solid scientific foundation in chemical engineering principles to support subsequent specialized courses.

9. Teaching and Learning Strategies

The Introduction to Chemical Engineering course (CHEM_ENG 101) uses the following teaching and learning strategies:

Theoretical lectures to present the basic concepts and principles of chemical engineering.

Tutorials to solve engineering problems and apply theoretical concepts.

Seminars to develop presentation and scientific discussion skills.

Problem-based learning by applying chemical engineering principles to realistic problems.

Class discussions and direct interaction to strengthen understanding and comprehension.

Self-learning and homework assignments to develop research skills and independent thinking.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Dimensions, Units, and Conversion Factors	Lecture and Exercises	Quiz	4	1

1	Mass, Weight, Mole, and Density	Lecture and Exercises	Assignment	4	2
1	Mole Fraction and Mass Fraction	Lecture and Exercises	Assignment	4	3
1	Analysis of Multicomponent Mixtures	Lecture and Exercises	Quiz	4	4
1	Solution Concentrations	Lecture and Exercises	Assignment	4	5
1	Temperature and Its Scales	Lecture and Exercises	Quiz	4	6
1	Pressure and Its Units	Lecture and Exercises	Assignment	4	7
1	Midterm Examination	Examination	Examination	2	8
1	Pressure Calculation in Static Fluids	Lecture and Exercises	Problem Solving	4	9
1	Ideal Gas Law	Lecture and Exercises	Quiz	4	10
1	Gas Mixtures and Partial Pressure	Lecture and Exercises	Assignment	4	11
1	Concept of Material Balance	Lecture and Exercises	Assignment	4	12
1	Steps for Solving Material Balance Problems	Lecture and Exercises	Problem Solving	4	13
1,4,7	Material Balance for Multiple Units and Case Study	Problem Solving + Seminar	Project + Presentation	4	14
1,4,7	Final Examination	Examination	Final Examination	3	15

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester

Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	David M. Himmelblau, Basic Principles and Calculations in Chemical Engineering, Seventh Edition.
Main References (Sources)	Himmelblau, D. M., Basic Principles and Calculations in Chemical Engineering, Seventh Edition, which is the main approved reference for the course. Hougen, O. A., Watson, K. M., & Ragatz, R. A., Chemical Process Principles. Felder, R. M. & Rousseau, R. W., Elementary Principles of Chemical Processes.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	American Institute of Chemical Engineers (AIChE) Institution of Chemical Engineers (IChemE) MIT OpenCourseWare – Chemical Engineering NPTEL Chemical Engineering Courses ScienceDirect SpringerLink Google Scholar Knovel Engineering Database Perry's Chemical Engineers' Handbook Resources

Course Description Form

2. Calculus I

Course Name	Calculus I
Course Code	MATH-101
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures (Lecture) Tutorial Classes / Exercises Seminars
Total Study Hours / Total Units	150 Hours / 6 ECTS
Course Administrator Name	Lect. Dr. Mahmoud Ghani Jabr

8. Course Objectives

The course aims to enable students to solve equations algebraically and graphically, analyze and solve engineering problems using appropriate mathematical methods, develop logical understanding of mathematical concepts, and build the mathematical skills required to apply mathematical principles and methods in solving various engineering problems.

9. Teaching and Learning Strategies

The course relies on theoretical lectures to explain fundamental concepts and analytical methods using appropriate applied examples, in addition to tutorial classes that provide students with sufficient opportunities to practice solving a large number of carefully selected problems in order to develop their mathematical and analytical skills.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Transcendental Functions	Lectures and Exercises	Quiz	6	1
1	Transcendental Functions (continued)	Lectures and Exercises	Assignment	6	2
1	Examples and Solved Problems	Applied Exercises	Assignment	6	3
1	Integration Techniques - Integration by Parts	Lectures and Exercises	Quiz	6	4
1	Integration of Powers and Trigonometric Functions	Lectures and Exercises	Assignment	6	5

1	Integration of Even Powers of Sine and Cosine	Lectures and Exercises	Quiz	6	6
1	Trigonometric Substitutions	Lectures and Exercises	Assignment	6	7
1	Hyperbolic Functions, Their Derivatives and Integrals	Lectures and Exercises	Quiz	6	8
1	Inverse Hyperbolic Functions	Lectures and Exercises	Assignment	6	9
1	Midterm Examination	Examination	Midterm Examination	2	10
1	Applied Examples and Problems	Applied Exercises	Assignment	6	11
1 , 6	Power Series and Taylor Polynomials	Lectures and Exercises	Quiz	6	12
1 , 6	Taylor Series for Trigonometric and Exponential Functions	Lectures and Exercises	Assignment	6	13
1	Binomial Theorem	Lectures and Exercises	Project or Assignment	6	14
1	Comprehensive Problems and Review	Discussions and Exercises	Continuous Assessment	6	15
1	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	George B. Thomas Jr., Calculus and Analytical Geometry, 14th Edition, Addison-Wesley Publishing Company, 2018.
Main References (Sources)	George B. Thomas Jr., Calculus and Analytical Geometry, 14th Edition. James Stewart, Calculus, 10th Edition, 2003.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	MIT OpenCourseWare Mathematics Khan Academy Calculus Paul's Online Math Notes Wolfram MathWorld Math Stack Exchange Coursera Mathematics Courses

Course Description Form

3. Organic Chemistry

Course Name	Organic Chemistry
Course Code	CHEM 101
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures (Lecture) Tutorial Classes / Exercises Seminars Laboratory (Laboratory)
Total Study Hours / Total Units	150 Hours / 6 ECTS
Course Administrator Name	Asst. Prof. Dr. Mohammed Muzher Aftan

8. Course Objectives

The course aims to introduce students to the basic principles of organic chemistry and to develop their understanding of the structure, properties, and chemical reactions of organic compounds, with emphasis on hydrocarbons, aromatic compounds, and carbonyl compounds, as well as the techniques used for identifying and characterizing organic compounds.

9. Teaching and Learning Strategies

The course relies on theoretical lectures, laboratory experiments, classroom discussions, and seminars, linking theoretical concepts to practical applications while encouraging students to analyze chemical reactions and interpret laboratory experiment results.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Introduction to Organic Chemistry and Hybridization	Lectures and Exercises	Quiz	3	1
1	Hydrocarbons (Alkanes, Alkenes and Alkynes)	Lectures and Exercises	Assignment	3	2
1	Cyclic and Aliphatic Hydrocarbons	Applied Exercises	Assignment	3	3
1	Aromatic Compounds	Lectures and Exercises	Quiz	3	4
1	Aromatic Compounds and Their	Lectures and Exercises	Assignment	3	5

	Reactions				
1	Alkyl Halides and Their Reactions	Lectures and Exercises	Quiz	3	6
—	Midterm Examination	Lectures and Exercises	Assignment	2	7
1,3	Alcohols, Ethers, Epoxides and Sulfides	Lectures and Exercises	Quiz	3	8
1	Stereochemistry	Lectures and Exercises	Assignment	3	9
1	Stereochemistry (continued)	Examination	Midterm Examination	3	10
1	Carbonyl Group (Aldehydes and Ketones)	Applied Exercises	Assignment	3	11
1	Carboxylic Acids and Their Derivatives	Lectures and Exercises	Quiz	3	12
1,3	Spectroscopic Identification Techniques: NMR, FTIR, UV, MS	Lectures and Exercises	Assignment	3	13
1,3	Spectroscopic Identification Techniques	Lectures and Exercises	Project or Assignment	3	14
1,3,4	Applications and Discussions in Organic Compound Identification	Discussions and Exercises	Continuous Assessment	3	15
All	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	Finar, Organic Chemistry, Vol. I and Vol. II, ELBS.
Main References (Sources)	Finar, Organic Chemistry, Vol. I & II. Morrison & Boyd, Organic Chemistry. Paula Yurkanis Bruice, Organic Chemistry. Sony, P.L., Organic Chemistry.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	American Chemical Society (ACS) Royal Society of Chemistry (RSC) ChemLibreTexts Organic Chemistry Organic Chemistry Portal NIST Chemistry WebBook

Course Description Form

4. Engineering Mechanics

Course Name	Engineering Mechanics
Course Code	ENG-102
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures (Lecture) Tutorial Classes / Exercises Seminars
Total Study Hours / Total Units	125 Hours / 5 ECTS
Course Administrator Name	Asst. Prof. Sabah Mahdi Saleh

8. Course Objectives

The course aims to provide students with the fundamental concepts of engineering mechanics, study forces, moments, equilibrium, and the analysis of simple structures, and develop the ability to apply the principles of statics in solving various engineering problems, thereby building an essential engineering foundation for subsequent engineering courses.

9. Teaching and Learning Strategies

The course relies on theoretical lectures to explain the basic concepts, tutorial classes to solve engineering problems, and the use of practical examples and illustrative drawings, while encouraging students to develop analytical thinking, problem-solving skills, and cooperative work in selected classroom activities.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Introduction to Engineering Mechanics and Vector Quantities	Lectures and Exercises	Quiz	4	1
1	Force Systems and Analysis	Lectures and Exercises	Assignment	4	2
1	Resultant of Forces	Lectures and Exercises	Assignment	4	3
1	Moments and Varignon’s Theorem	Lectures and Exercises	Quiz	4	4
1	Equilibrium of Particles	Lectures and Exercises	Assignment	4	5
1	Equilibrium of	Lectures and	Quiz	4	6

	Rigid Bodies	Exercises			
1 , 7	Trusses	Lectures and Exercises	Assignment	4	7
1	Midterm Examination	Examination	Midterm Examination	2	8
1	Centroids and Areas	Lectures and Exercises	Assignment	4	9
1	Friction	Lectures and Exercises	Quiz	4	10
1	Second Moments of Areas	Lectures and Exercises	Assignment	4	11
1 , 2	Analysis of Simple Engineering Structures	Lectures and Exercises	Assignment	4	12
1 , 2	Engineering Applications of Statics	Lectures and Exercises	Project or Assignment	4	13
1 , 4	Problem Solving and Engineering Discussions	Discussions and Exercises	Continuous Assessment	4	14
1 , 4 , 7	Comprehensive Review and Applied Exercises	Discussions and Exercises	Continuous Assessment	4	15
1 , 2	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	Beer, F. P., Johnston, E. R., & Mazurek, D. F., Vector Mechanics for Engineers: Statics.
Main References (Sources)	Beer & Johnston, Vector Mechanics for

	Engineers: Statics. Hibbeler, R.C., Engineering Mechanics: Statics. Meriam & Kraige, Engineering Mechanics: Statics.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	MIT OpenCourseWare – Engineering Mechanics Khan Academy Physics and Mechanics NPTEL Engineering Mechanics Learn Engineering Engineering LibreTexts

Course Description Form

5. Laboratory Safety

Course Name	Laboratory Safety
Course Code	CHEM_ENG 102
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Practical Classes (Practical) Seminars (Seminar)
Total Study Hours / Total Units	75 Hours / 3 ECTS
Course Administrator Name	Prof. Dr. Israa Talib Humaidi

8. Course Objectives

The course aims to introduce students to the basic principles of safety and occupational health in engineering and chemical laboratories, develop awareness of potential hazards and prevention methods, enhance the ability to handle chemicals and laboratory equipment safely, and promote proper behavior in emergency and accident situations to ensure a safe working environment according to approved professional standards.

9. Teaching and Learning Strategies

The course relies on theoretical lectures to explain safety and occupational health concepts, practical training in the use of personal protective equipment and emergency procedures, classroom discussions, real case studies of laboratory accidents, demonstrations, and cooperative learning that helps students apply safety requirements in different work environments.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
5	Introduction to Laboratory Safety and Its Importance	Lectures and Discussions	Quiz	3	1
5	General Safety Rules in Laboratories	Lectures and Discussions	Assignment	3	2
5	Personal Protective Equipment (PPE) and Its Use	Lectures and Practical Demonstrations	Quiz	3	3
5	Classification of Hazardous	Lectures and Case Studies	Assignment	3	4

	Chemicals and Handling Methods				
5,3	Storage and Handling of Chemicals	Lectures and Practical Applications	Practical Evaluation	3	5
5,3	Emergency Procedures and Firefighting	Lectures and Practical Training	Practical Test	3	6
5,3	First Aid for Laboratory Accidents	Practical Training	Practical Evaluation	3	7
5	Midterm Examination	Examination	Midterm Examination	2	8
5,3	Safe Disposal of Chemical Waste	Lectures and Practical Applications	Assignment	3	9
5,3	Electrical and Mechanical Safety in the Laboratory	Lectures and Practical Demonstrations	Quiz	3	10
5,3	Risk Assessment and Safety Management	Lectures and Case Studies	Assignment	3	11
5,7	Preparation of Accident and Safety Reports	Seminars	Presentation and Report	3	12
5,7	Effective Communication in Emergencies	Discussions and Role Play	Continuous Assessment	3	13
5,7	Projects and Applications in Laboratory Safety	Cooperative Learning	Project	3	14
7 , 5,3	Comprehensive Review and Applied Exercises	Discussions and Applications	Continuous Assessment	3	15
5,3	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or	40%	Continuous assessment throughout the semester

group projects)		
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	Laboratory Safety for Chemistry Students, Robert H. Hill & David C. Finster. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Research Council.
Main References (Sources)	Robert H. Hill & David C. Finster, Laboratory Safety for Chemistry Students. National Research Council, Prudent Practices in the Laboratory. James A. Kaufman, Laboratory Safety Guidelines. Occupational Safety and Health Administration (OSHA) Laboratory Standards.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	Occupational Safety and Health Administration (OSHA) National Institute for Occupational Safety and Health (NIOSH) American Chemical Society – Laboratory Safety Chemical Safety Board (CSB) Royal Society of Chemistry – Health and Safety

Course Description Form

6. English I

Course Name	English I
Course Code	ENG-107
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Classroom Exercises and Discussions Seminars (Seminar)
Total Study Hours / Total Units	50 Hours / 2 ECTS
Course Administrator Name	Asst. Prof. Ahmed Subhi Abdullah

8. Course Objectives

The course aims to develop students' basic English language skills, enhance their reading, writing, listening, and speaking abilities, develop academic and professional communication skills, and enable them to use English in university and engineering contexts, thereby improving their ability to understand scientific references and communicate effectively in their future careers.

9. Teaching and Learning Strategies

The course relies on interactive lectures, classroom discussions, individual and group language activities, oral presentations, reading and writing exercises, cooperative learning, and the use of modern teaching aids and audiovisual materials to develop the different language skills.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
4	Introductions and Basic Communication in English	Lectures and Discussions	Quiz	2	1
4	Basic Grammar (Parts of Speech)	Lectures and Exercises	Assignment	2	2
4	Basic English Tenses	Lectures and Exercises	Quiz	2	3
4	Reading and Comprehension Skills	Guided Reading and Discussion	Assignment	2	4
4	Academic Vocabulary Development	Classroom Activities	Quiz	2	5

4	Basic Writing Skills	Writing Exercises	Assignment	2	6
4	Writing Short Paragraphs	Practical Applications	Written Evaluation	2	7
4	Midterm Examination	Examination	Midterm Examination	2	8
4	Listening and Comprehension Skills	Listening Activities	Quiz	2	9
4	Conversation and Oral Communication	Discussions and Role Play	Oral Evaluation	2	10
7,4	Teamwork and Communication	Cooperative Learning	Group Activity	2	11
4	English for Academic Purposes	Lectures and Exercises	Assignment	2	12
4	Basic Engineering Terminology	Lectures and Discussions	Quiz	2	13
7,4	Short Presentations	Oral Presentations	Presentation	2	14
4	Comprehensive Review and Applied Exercises	Discussions and Exercises	Continuous Assessment	2	15
4	Final Examination	Examination	Final Examination	2	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	New Headway Elementary / Pre-Intermediate or the textbook approved by the English Language Committee in the College for the

	academic year.
Main References (Sources)	Soars, Liz & John Soars, New Headway English Course. Murphy, Raymond, English Grammar in Use. Oxford English for Engineering. Technical Communication for Engineers.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	British Council Learn English BBC Learning English Cambridge English Oxford Learner's Dictionaries EnglishClub

Course Description Form

7. Material Balance

Course Name	Material Balance
Course Code	CHEM_ENG 103
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Classroom Exercises and Discussions Seminars (Seminar)
Total Study Hours / Total Units	150 Hours / 6 ECTS
Course Administrator Name	Lect. Dr. Marwa Nouri Mohammed

8. Course Objectives

The course aims to introduce students to the basic principles of material balance in chemical processes, develop the ability to analyze different engineering systems and perform material calculations for steady and unsteady processes, and apply the laws of conservation of mass to different industrial operations, preparing students for advanced courses in chemical engineering.

9. Teaching and Learning Strategies

The course relies on theoretical lectures, engineering problem-solving, tutorial classes, problem-based learning, and the use of realistic industrial examples to develop students' analytical and deductive skills, while encouraging teamwork and scientific discussions.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Introduction to Material Balance and Engineering Systems	Lectures and Exercises	Quiz	6	1
1	Units, Dimensions and Engineering Conversions	Lectures and Exercises	Assignment	6	2
1	Mixture Composition and Mole/Mass Fractions	Lectures and Exercises	Assignment	6	3
1	Physical Processes and Simple	Lectures and Exercises	Quiz	6	4

	Material Balance				
1	Material Balance for Multi-Unit Systems	Lectures and Exercises	Assignment	6	5
1	Mixing and Separation Processes	Lectures and Exercises	Quiz	6	6
1	Recycle and Bypass	Lectures and Exercises	Assignment	6	7
1	Midterm Examination	Examination	Midterm Examination	2	8
1	Material Balance with Chemical Reactions	Lectures and Exercises	Assignment	6	9
1	Limiting Reactant and Conversion	Lectures and Exercises	Quiz	6	10
1	Steady and Unsteady Processes	Lectures and Exercises	Assignment	6	11
1,6	Use of Computer Software in Material Balance	Computer Applications	Practical Evaluation	6	12
1	Industrial Applications in Material Balance	Case Studies	Project or Assignment	6	13
1,4	Solving Advanced Engineering Problems	Discussions and Exercises	Continuous Assessment	6	14
1,4,7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment	6	15
1	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities,	40%	Continuous assessment throughout the semester

seminars, and individual or group projects)		
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	David M. Himmelblau and James B. Riggs, Basic Principles and Calculations in Chemical Engineering
Main References (Sources)	Himmelblau & Riggs, Basic Principles and Calculations in Chemical Engineering. Felder & Rousseau, Elementary Principles of Chemical Processes. Hougen, Watson & Ragatz, Chemical Process Principles.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	AIChE Academy MIT OpenCourseWare – Chemical Engineering LearnChemE NPTEL Chemical Engineering Courses Chemical Engineering Education Resources

Course Description Form

8. Calculus II

Course Name	Calculus II
Course Code	MATH-102
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Classroom Exercises and Discussions Seminars (Seminar)
Total Study Hours / Total Units	150 Hours / 6 ECTS
Course Administrator Name	Lect. Dr. Mahmoud Ghani Jabr

8. Course Objectives

The course aims to develop students' advanced mathematical skills through the study of polar coordinates, vector analysis, multiple integrals, partial differentiation, and ordinary differential equations, and to enable them to apply these concepts in solving various engineering problems in chemical engineering fields.

9. Teaching and Learning Strategies

The course relies on theoretical lectures, tutorial classes, mathematical and engineering problem-solving, and problem-based learning, using applied examples to develop students' analytical and logical thinking.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Integration Techniques	Lectures and Exercises	Quiz	6	1
1	Integration Techniques (continued)	Lectures and Exercises	Assignment	6	2
1	Polar Coordinates	Lectures and Exercises	Assignment	6	3
1	Polar Coordinates (continued)	Lectures and Exercises	Quiz	6	4
1	Areas and Lengths in Polar Coordinates	Lectures and Exercises	Assignment	6	5
1	Vectors and Dot Product	Lectures and Exercises	Quiz	6	6
1	Vectors and	Lectures and	Assignment	6	7

	Cross Product	Exercises			
1	Lines and Planes in Space	Lectures and Exercises	Assignment	6	8
1	Midterm Examination	Examination	Midterm Examination	2	9
1	Double Integrals	Lectures and Exercises	Quiz	6	10
1	Area Calculation Using Double Integrals	Lectures and Exercises	Assignment	6	11
1	Double Integrals in Polar Coordinates	Lectures and Exercises	Assignment	6	12
1	Partial Differentiation	Lectures and Exercises	Quiz	6	13
1	Chain Rule	Lectures and Exercises	Assignment	6	14
1	First- and Second-Order Ordinary Differential Equations	Lectures and Exercises	Project or Assignment	6	15
1	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	George B. Thomas, Calculus and Analytical Geometry, 14th Edition.
Main References (Sources)	George B. Thomas, Calculus and Analytical Geometry. James Stewart, Calculus.

	Erwin Kreyszig, Advanced Engineering Mathematics.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	MIT OpenCourseWare Mathematics Khan Academy Calculus Paul's Online Math Notes Wolfram MathWorld NPTEL Mathematics Courses

Course Description Form

9. Analytical Chemistry

Course Name	Analytical Chemistry
Course Code	CHEM_102
Semester / Year	Annual: First 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Laboratory (Laboratory) Seminars (Seminar)
Total Study Hours / Total Units	150 Hours / 6 ECTS
Course Administrator Name	Lect. Dr. Mahmoud Ghani Jabr

8. Course Objectives

The course aims to introduce students to the basic principles of analytical chemistry and methods of quantitative and qualitative analysis, develop skills in preparing standard solutions and performing stoichiometric calculations, using different laboratory instruments, interpreting analytical results, and evaluating their accuracy, thereby qualifying students to conduct chemical analyses required in engineering and industrial applications.

9. Teaching and Learning Strategies

The course relies on theoretical lectures to explain basic concepts, practical laboratory experiments to apply chemical analysis methods, solving calculation problems, classroom discussions, and preparing laboratory reports, with emphasis on practice-based and experiment-based learning.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
1	Introduction to Analytical Chemistry and Review of Basic Concepts	Lectures and Exercises	Quiz	5	1
1	Good Laboratory Practice (GLP) and Quality Assurance	Lectures and Discussions	Assignment	5	2
1	Solution Concentrations and Chemical Calculations	Lectures and Exercises	Quiz	5	3

1, 3	Stoichiometric Calculations and Volumetric Analysis	Lectures and Laboratory	Laboratory Report	5	4
1, 3	Acid-Base Titrations	Lectures and Laboratory	Practical Evaluation	5	5
1, 3	Redox Titrations	Lectures and Laboratory	Laboratory Report	5	6
1, 3	Precipitation and Complexometric Titrations	Lectures and Laboratory	Practical Test	5	7
1, 3	Midterm Examination	Examination	Midterm Examination	2	8
1, 3	Gravimetric Analysis	Lectures and Laboratory	Laboratory Report	5	9
1, 3	Analytical Errors and Data Processing	Lectures and Exercises	Assignment	5	10
1, 3	Instrumental Analysis and Principles of Analytical Instruments	Lectures and Laboratory	Quiz	5	11
1, 3	Basic Spectroscopic Measurements	Lectures and Laboratory	Laboratory Report	5	12
1, 3 , 6	Computer Applications in Analytical Data Processing	Computer Applications	Assignment	5	13
1 , 3 , 4	Results Analysis and Report Writing	Discussions and Reports	Continuous Assessment	5	14
1 , 3 , 4 ,	Comprehensive Review and Laboratory Applications	Cooperative Learning	Continuous Assessment	5	15
13,	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester

Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	Daniel C. Harris, Quantitative Chemical Analysis. Skoog, West, Holler & Crouch, Fundamentals of Analytical Chemistry.
Main References (Sources)	Harris, Quantitative Chemical Analysis. Skoog et al., Fundamentals of Analytical Chemistry. Vogel, Textbook of Quantitative Chemical Analysis. Christian, Analytical Chemistry.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	American Chemical Society (ACS) Royal Society of Chemistry (RSC) Analytical Chemistry Journal ChemLibreTexts – Analytical Chemistry NIST Chemistry WebBook

Course Description Form

10. Engineering Workshops

Course Name	Engineering Workshops
Course Code	ENG-106
Semester / Year	Annual: Second 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Field Workshop Training Seminars
Total Study Hours / Total Units	75 Hours / 3 ECTS
Course Administrator Name	Asst. Prof. Sabah Mahdi Saleh

8. Course Objectives

The course aims to introduce students to the different engineering workshops, their tools, and equipment; develop basic practical skills in blacksmithing, carpentry, welding, turning, and metal forming; reinforce occupational safety concepts during work; and develop the ability to use tools and devices correctly and safely in engineering environments.

9. Teaching and Learning Strategies

The course relies on direct practical training inside engineering workshops, demonstrations, individual and group practice, and learning through observation and application, with emphasis on occupational safety procedures and the development of students' manual and technical skills.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
3,5	Introduction to Engineering Workshops and Occupational Safety	Lecture and Practical Training	Quiz	3	1
3,5	Workshop Tools and Their Uses	Practical Training	Practical Evaluation	3	2
3	Measurement and Engineering Inspection Works	Practical Training	Practical Assignment	3	3
3	Cutting, Sawing and Filing	Practical Training	Practical Evaluation	3	4

	Operations				
3	Drilling and Metal Forming Operations	Practical Training	Practical Report	3	5
3	Welding Principles and Types	Practical Training	Practical Evaluation	3	6
3,7	Welding Applications and Teamwork	Group Practical Training	Practical Evaluation	3	7
3	Midterm Examination	Exam Practical	Midterm Examination	2	8
3	Basic Turning Operations	Practical Training	Practical Evaluation	3	9
3	Milling and Machining Operations	Practical Training	Practical Report	3	10
3	Maintenance of Equipment and Tools	Practical Training	Practical Assignment	3	11
3,5	Safety During Equipment Operation	Practical Training	Practical Evaluation	3	12
3,4	Preparation of Technical Workshop Reports	Practical Training and Discussions	Report	3	13
3,7	Mini Engineering Workshop Project	Cooperative Learning	Practical Project	3	14
3 7 , 4 ,	Comprehensive Review and Practical Applications	Practical Training	Continuous Assessment	3	15
3	Final Examination	Exam Practical	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester

Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	Workshop Technology, W.A.J. Chapman. Manufacturing Processes for Engineering Materials, Kalpakjian & Schmid.
Main References (Sources)	Chapman, Workshop Technology. Hajra Choudhury, Workshop Technology. Kalpakjian & Schmid, Manufacturing Processes for Engineering Materials. Lindberg, Processes and Materials of Manufacture.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	MIT OpenCourseWare – Manufacturing Processes American Welding Society (AWS) The Engineering Toolbox Manufacturing Guide Engineering LibreTexts

Course Description Form

Computer Science

Course Name	Computer Science
Course Code	ENG-104
Semester / Year	Annual: Second 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Computer Laboratory Tutorials
Total Study Hours / Total Units	75 Hours / 3 ECTS
Course Administrator Name	Asst. Lect. Hiba Ramadan Mohammed

8. Course Objectives

The course aims to introduce students to the basic concepts of computer science and information technology, develop skills in using computers and office software, understand the fundamentals of programming and algorithms, and use computer applications in data processing and solving engineering problems, thereby supporting subsequent engineering courses.

9. Teaching and Learning Strategies

The course relies on theoretical lectures to explain basic concepts, practical training in computer laboratories, small project-based learning, solving applied exercises, and using different software packages to develop students' skills in working with computers and their engineering applications.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
6	Introduction to Computers and Information Technology	Lectures and Laboratory	Quiz	4	1
6	Computer Components and Operating Systems	Lectures and Laboratory	Assignment	4	2
6	File and Data Management	Practical Training	Practical Evaluation	4	3
6	Microsoft Word and Its Applications	Computer Laboratory	Practical Assignment	4	4
6	Microsoft Excel and Its Applications	Computer Laboratory	Practical Evaluation	4	5

6	Basics of Algorithms and Flowcharts	Lectures and Exercises	Quiz	4	6
1,6	Introduction to Programming	Lectures and Laboratory	Programming Assignment	4	7
1,6	Midterm Examination	Examination	Midterm Examination	2	8
1,6	Variables and Data Types	Computer Laboratory	Practical Evaluation	4	9
1,6	Conditional and Iterative Statements	Laboratory and Exercises	Programming Assignment	4	10
1,6	Functions and Procedures	Computer Laboratory	Quiz	4	11
1,6	Data Processing Using Computers	Practical Applications	Practical Evaluation	4	12
1,64	Preparation of Electronic Reports and Presentations	Computer Laboratory	Project	4	13
1,6,7	Applied Project Using Computers	Cooperative Learning	Practical Project	4	14
1,4,6,7	Comprehensive Review and Practical Applications	Laboratory and Discussions	Continuous Assessment	4	15
1,6	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if	Introduction to Computers and Information

any)	Technology. Computer Fundamentals and Programming Basics.
Main References (Sources)	Peter Norton, Introduction to Computers. Shelly Cashman Series, Discovering Computers. Behrouz Forouzan, Computer Science: A Structured Programming Approach. J Glenn Brookshear, Computer Science: An Overview.
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	Microsoft Learn Cisco Networking Academy W3Schools Codecademy MIT OpenCourseWare – Computer Science

12. Engineering Drawing

Course Name	Engineering Drawing
Course Code	ENG-101
Semester / Year	Annual: Second 2025-2026
Description Preparation Date	12-10-2026
Available Attendance Forms	Theoretical Lectures Engineering Drawing Studio Tutorial Classes (Tutorials)
Total Study Hours / Total Units	100 Hours / 4 ECTS
Course Administrator Name	Asst. Lect. Qusay Akla Saleh

8. Course Objectives

The course aims to introduce students to the fundamentals of engineering drawing and geometric representation of objects, develop skills in reading and preparing engineering drawings according to approved standards, and develop the ability to visualize three-dimensional shapes and convert them into accurate engineering projections, thereby supporting subsequent engineering and design courses.

9. Teaching and Learning Strategies

The course relies on theoretical lectures to explain the rules of engineering drawing, practical training in drawing studios, learning by practice, solving various engineering drawing exercises, and using traditional drawing tools and engineering drawing software when available.

10. Course Structure

Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method	Hours	Week
2	Introduction to Engineering Drawing and Drawing Tools	Lectures and Practical Application	Quiz	4	1
2	Engineering Lines and Their Types	Practical Application	Practical Assignment	4	2
2	Engineering Lettering and Dimensions	Practical Application	Practical Evaluation	4	3
2	Basic Geometric Shapes	Practical Drawing	Assignment	4	4
2	Engineering Projections	Lectures and Practical Application	Quiz	4	5
2	Orthographic Views	Practical Drawing	Practical Evaluation	4	6
2	Auxiliary Views	Practical Drawing	Practical Assignment	4	7
2	Midterm	Examination	Midterm	2	8

	Examination		Examination		
2	Isometric Drawing	Practical Drawing	Practical Evaluation	4	9
2	Engineering Sections and Sectional Views	Lectures and Practical Application	Quiz	4	10
2	Assembly and Detailed Drawings	Practical Drawing	Practical Assignment	4	11
2,6	Introduction to Computer-Aided Drawing (CAD)	Computer Laboratory	Practical Evaluation	4	12
2,6	Basic AutoCAD Applications	Computer Laboratory	Practical Project	4	13
2,4	Reading and Analysis of Engineering Drawings	Discussions and Applications	Continuous Assessment	4	14
2,7	Integrated Engineering Drawing Project	Cooperative Learning	Project	4	15
2	Final Examination	Examination	Final Examination	3	16

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, classroom activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester
Midterm Examination	10%	Assesses topics studied in the first half of the semester
Final Examination	50%	Comprehensive assessment at the end of the semester

12. Learning and Teaching Resources

Resource	Details
Required Textbooks (methodological, if any)	Engineering Drawing, N. D. Bhatt. Engineering Drawing and Design, David A. Madsen.
Main References (Sources)	N.D. Bhatt, Engineering Drawing. David A. Madsen, Engineering Drawing and Design. Luzadder & Duff, Fundamentals of Engineering Drawing. Warren J. Luzadder, Technical Drawing
Recommended Supporting Books and References (journals, reports, etc.)	None
Electronic References and Websites	Autodesk Education AutoCAD Tutorials Engineering Drawing Tutorials MIT Open CourseWare CADTutor

Course Description Form

1. Course Name	Engineering Analysis
2. Course Code	MATH-201
3. Semester / Year	Annual System: First/Second Semester 2025-2026
4. Description Preparation Date	12-10-2026
5. Available Attendance Forms	Theory Lectures; Lectures; Tutorial Classes; Practical Applications; Seminars
6. Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 hours
7. Course Administrator	Assistant Lecturer Omar Saeed Latif

8. Course Objectives

The course aims to enable students to formulate mathematical models for chemical engineering systems, apply analytical methods and computer software to obtain solutions, estimate system behavior, and predict system performance. It also focuses on studying and applying different modeling techniques to construct mathematical descriptions of chemical engineering systems.

9. Teaching and Learning Strategies

The teaching strategy is based on careful coverage of fundamental concepts and analytical methods in lectures, supported by appropriate examples and practical applications whenever possible. Adequate time is provided for students to practice problem solving through a large number of carefully selected problems and exercises.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	6	1	Introduction to Engineering Analysis and Mathematical Modeling	Lectures and Tutorials	Quiz
2	6	1	Vectors and Engineering Applications	Lectures and Tutorials	Assignment
3	6	1	Laplace Transform	Lectures and Tutorials	Assignment
4	6	1	Applications of Laplace Transform	Lectures and Tutorials	Quiz
5	6	1	Inverse Laplace Transform	Lectures and Tutorials	Assignment
6	6	1	Fourier Series	Lectures and Tutorials	Quiz
7	6	1	Applications of Fourier Series	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
9	6	1	Power Series	Lectures and Tutorials	Assignment
10	6	1	Lumped Models	Lectures and Tutorials	Quiz
11	6	1	Distributed Models	Lectures and Tutorials	Assignment
12	6	1,6	Finite Difference Models	Lectures and Computer Applications	Practical Assessment
13	6	1,6	Computer-Based Modeling Applications	Computer Laboratory	Project
14	6	1,6	Processing of Experimental Results	Practical Applications	Assignment
15	6	1,4	Comprehensive Review and Advanced Problem Solving	Discussions and Tutorials	Continuous Assessment
16	3	1	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, class tasks, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses the topics covered during the first half of the semester.
Final Examination	50%	A comprehensive examination at the end of the semester covering the course learning outcomes.

12. Learning and Teaching Resources

Resource Type	Details
Required Textbooks	Advanced Engineering Mathematics, K.A. Stroud. Advanced Engineering Mathematics, H.K. Dass.
Main References	K.A. Stroud, Advanced Engineering Mathematics. H.K. Dass, Advanced Engineering Mathematics. Erwin Kreyszig, Advanced Engineering

	Mathematics. Peter O'Neil, Advanced Engineering Mathematics.
Recommended Supporting References	None.
Electronic References / Websites	MIT OpenCourseWare Mathematics. Wolfram MathWorld. MathWorks MATLAB Documentation. Paul's Online Math Notes.

Course Description Form

1. Course Name	Energy Balance
2. Course Code	CHEM_ENG 201
3. Semester / Year	Annual System: First/Second Semester 2025-2026
4. Description Preparation Date	12-10-2026
5. Available Attendance Forms	Theory Lectures; Lectures; Tutorial Classes; Seminars
6. Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 hours
7. Course Administrator	Assist. Prof. Dr. Khalil Aidan Hamad

8. Course Objectives

The course aims to introduce students to the principles of energy balance in engineering and chemical systems, apply the first law of thermodynamics to different processes, analyze energy transfer in industrial processes, calculate energy requirements for open and closed systems, and develop the ability to solve energy-related problems in engineering applications.

9. Teaching and Learning Strategies

The course relies on theoretical lectures, engineering problem solving, problem-based learning, classroom discussions, and linking theoretical concepts to real industrial applications, while encouraging students to analyze, infer, and use supporting software when needed.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	6	1	Introduction to Energy Balance and Its Importance in Chemical Engineering	Lectures and Tutorials	Quiz
2	6	1	Review of Energy Concepts and Forms	Lectures and Tutorials	Assignment
3	6	1	First Law of Thermodynamics	Lectures and Tutorials	Assignment
4	6	1	Closed Systems and Energy Balance	Lectures and Tutorials	Quiz
5	6	1	Open Systems and Energy Balance	Lectures and Tutorials	Assignment
6	6	1	Enthalpy and Internal Energy Calculations	Lectures and Tutorials	Quiz
7	6	1	Energy Balance for Non-Reactive Processes	Lectures and Tutorials	Assignment
8	2	1	Midterm	Examination	Midterm

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
			Examination		Exam
9	6	1	Energy Balance for Reactive Processes	Lectures and Tutorials	Assignment
10	6	1	Heat of Reaction and Combustion	Lectures and Tutorials	Quiz
11	6	1	Energy Balance with Phase Changes	Lectures and Tutorials	Assignment
12	6	1,6	Computer Applications in Energy Balance	Computer Applications	Practical Assessment
13	6	1	Industrial Applications of Energy Balance	Case Studies	Project or Assignment
14	6	1,4	Data Analysis and Advanced Problem Solving	Discussions and Tutorials	Continuous Assessment
15	6	1,4,7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment
16	3	1	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, class tasks, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses the topics covered during the first half of the semester.
Final Examination	50%	A comprehensive examination at the end of the semester covering the course learning outcomes.

12. Learning and Teaching Resources

Resource Type	Details
Required Textbooks	Basic Principles and Calculations in Chemical Engineering, David M. Himmelblau & James B. Riggs. Elementary Principles of Chemical Processes, Felder & Rousseau.
Main References	Himmelblau & Riggs, Basic Principles and Calculations in Chemical Engineering. Felder & Rousseau, Elementary Principles of Chemical Processes. Smith, Van Ness & Abbott, Introduction to Chemical Engineering Thermodynamics. Hougen, Watson & Ragatz, Chemical Process Principles.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE. AIChE Academy. MIT OpenCourseWare - Chemical Engineering. NPTEL Chemical Engineering Courses.

Course Description Form

1. Course Name	Fluid Flow I
2. Course Code	CHEM_ENG 202
3. Semester / Year	Annual System: First/Second Semester 2025-2026
4. Description Preparation Date	12-10-2026
5. Available Attendance Forms	Theory Lectures; Lectures; Tutorial Classes; Seminars
6. Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 hours
7. Course Administrator	Prof. Dr. Safaa Mohammed Rasheed Ahmed

8. Course Objectives

The course aims to introduce students to the physical properties and behavior of fluids, explain the principles of fluid statics and dynamics, apply conservation equations of mass, energy, and momentum to different flow systems, and analyze flow in pipes, channels, and engineering equipment used in chemical industries.

9. Teaching and Learning Strategies

The teaching strategy is based on theoretical lectures to explain the fundamental concepts and laws of fluid flow, using applied engineering examples, solving a large number of selected problems, encouraging scientific discussions, and employing practical applications to connect theoretical concepts with industrial practice.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	6	1	Introduction to Fluid Flow and Physical Properties of Fluids	Lectures and Tutorials	Quiz
2	6	1	Pressure and Pressure Distribution in Static Fluids	Lectures and Tutorials	Assignment
3	6	1	Fluid Statics and Its Applications	Lectures and Tutorials	Assignment
4	6	1	Continuity Equation	Lectures and Tutorials	Quiz
5	6	1	Bernoulli Equation and Its Applications	Lectures and Tutorials	Assignment
6	6	1	Flow Measurement and Measuring Devices	Lectures and Tutorials	Quiz
7	6	1,3	Flow in Pipes	Lectures and	Assignment

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
			and Friction Losses	Practical Applications	
8	2	1	Midterm Examination	Examination	Midterm Exam
9	6	1	Analysis of Laminar and Turbulent Flow	Lectures and Tutorials	Assignment
10	6	1	Momentum Equations and Their Applications	Lectures and Tutorials	Quiz
11	6	1	Momentum Transfer in Fluids	Lectures and Tutorials	Assignment
12	6	1,6	Computer Applications in Fluid Flow	Computer Applications	Practical Assessment
13	6	1,2	Pumps and Fluid Transportation Systems	Lectures and Case Studies	Project or Assignment
14	6	1,2	Design of Simple Pipe Lines	Lectures and Tutorials	Continuous Assessment
15	6	1,4,7	Comprehensive Review and Engineering Problem Solving	Group Discussions and Tutorials	Continuous Assessment
16	3	1	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, class tasks, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses the topics covered during the first half of the semester.
Final Examination	50%	A comprehensive examination at the end of the semester covering the course learning outcomes.

12. Learning and Teaching Resources

Resource Type	Details
Required Textbooks	McCabe, W.L., Smith, J.C. & Harriott, P.,

	Unit Operations of Chemical Engineering.
Main References	McCabe, Smith & Harriott, Unit Operations of Chemical Engineering. Coulson & Richardson, Chemical Engineering, Volume 1: Fluid Flow, Heat Transfer and Mass Transfer.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE. MIT OpenCourseWare - Fluid Mechanics. AIChE Academy. NPTEL Fluid Mechanics. Engineering Toolbox.

Course Description Form

1. Course Name	Physical Chemistry I
2. Course Code	CHEM_201
3. Semester / Year	Annual System: First/Second Semester 2025-2026
4. Description Preparation Date	12-10-2026
5. Available Attendance Forms	Theory Lectures; Laboratory; Tutorial Classes; Seminars
6. Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 hours
7. Course Administrator	Assistant Lecturer Mudher Mohammed Ali

8. Course Objectives

The course aims to introduce students to the fundamental principles of physical chemistry, understand the behavior of gases, liquids, and solutions, study chemical thermodynamics and chemical equilibrium, and explain the physical and chemical phenomena that occur in engineering and chemical systems.

9. Teaching and Learning Strategies

The teaching strategy is based on theoretical lectures, laboratory experiments, solving numerical problems, scientific discussions, and linking fundamental concepts to practical engineering and chemical applications, while encouraging students to analyze and draw scientific conclusions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	6	1	Introduction to Physical Chemistry	Lectures and Tutorials	Quiz
2	6	1	Properties and Laws of Gases	Lectures and Tutorials	Assignment
3	6	1	Real Gases and Equations of State	Lectures and Tutorials	Assignment
4	6	1	First Law of Thermodynamics	Lectures and Tutorials	Quiz
5	6	1	Enthalpy and Internal Energy	Lectures and Tutorials	Assignment
6	6	1	Second Law of Thermodynamics	Lectures and Tutorials	Quiz
7	6	1,3	Entropy and Its Applications	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	6	1	Free Energy and Equilibrium Criteria	Lectures and Tutorials	Assignment
10	6	1	Chemical Equilibrium	Lectures and Tutorials	Quiz

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
11	6	1,3	Solutions and Their Physical Properties	Lectures and Laboratory	Laboratory Report
12	6	1,3	Colligative Properties of Solutions	Lectures and Laboratory	Assignment
13	6	1,3	Electrochemistry and Introduction to Electrochemical Cells	Lectures and Laboratory	Practical Test
14	6	1,4	Engineering Applications of Physical Chemistry	Discussions and Tutorials	Continuous Assessment
15	6	1,3,7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment
16	3	1	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, class tasks, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses the topics covered during the first half of the semester.
Final Examination	50%	A comprehensive examination at the end of the semester covering the course learning outcomes.

12. Learning and Teaching Resources

Resource Type	Details
Required Textbooks	Physical Chemistry, Peter Atkins & Julio de Paula. Physical Chemistry, Ira N. Levine.
Main References	Atkins & de Paula, Physical Chemistry. Levine, Physical Chemistry. Castellan, Physical Chemistry. Engel & Reid, Thermodynamics, Statistical Thermodynamics and Kinetics.
Recommended Supporting References	None.

Electronic References / Websites	ChemLibreTexts Physical Chemistry. American Chemical Society (ACS). Royal Society of Chemistry (RSC). NIST Chemistry WebBook. MIT OpenCourseWare Chemistry.

Course Description Form

1. Course Name	Environmental Pollution
2. Course Code	CHEM_ENG-203
3. Semester / Year	Annual System: First/Second Semester 2025-2026
4. Description Preparation Date	12-10-2026
5. Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
6. Number of Credit Hours (Total) / Number of Units (Total)	4 ECTS / 100 hours
7. Course Administrator	Assistant Lecturer Sabah Mohammed Hassan

8. Course Objectives

The course aims to introduce students to the concept of environmental pollution, its various sources, and its effects on humans and the environment; develop the ability to analyze environmental problems resulting from industrial activities; identify methods for pollution reduction and industrial waste treatment according to modern environmental standards; and strengthen professional and ethical responsibility toward environmental protection and sustainable development.

9. Teaching and Learning Strategies

The course relies on theoretical lectures, classroom discussions, presentations, real case studies related to environmental pollution, cooperative learning, and the analysis of environmental problems with appropriate proposed solutions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	3	1,5	Introduction to Environmental Pollution and Basic Concepts	Lectures and Discussions	Quiz
2	3	1,5	Sources and Types of Environmental Pollution	Lectures and Discussions	Assignment
3	3	1,5	Air Pollution and Its Sources	Lectures and Tutorials	Quiz
4	3	1,5	Gaseous and Particulate Pollutants	Lectures and Tutorials	Assignment
5	3	1,5	Water Pollution and Its Sources	Lectures and Discussions	Quiz
6	3	1,5	Industrial Wastewater Treatment	Lectures and Tutorials	Assignment
7	3	1,5	Soil Pollution and Solid Waste	Lectures and Discussions	Assignment

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
8	2	1,5	Midterm Examination	Examination	Midterm Exam
9	3	1,5	Hazardous Industrial Wastes	Lectures and Tutorials	Quiz
10	3	1,5,2	Pollution Control Techniques	Lectures and Tutorials	Assignment
11	3	1,5,2	Environmental Impact Assessment	Lectures and Case Studies	Assignment
12	3	1,5	Environmental Legislation and Quality Standards	Lectures and Discussions	Quiz
13	3	1,4	Environmental Management and Sustainable Development	Seminars	Presentation
14	3	7,5,4	Environmental Case Studies in Chemical Industries	Cooperative Learning	Project
15	3	7,5,4,1	Comprehensive Review and Applied Discussions	Discussions and Tutorials	Continuous Assessment
16	3	1,5	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, class tasks, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses the topics covered during the first half of the semester.
Final Examination	50%	A comprehensive examination at the end of the semester covering the course learning outcomes.

12. Learning and Teaching Resources

Resource Type	Details
Required Textbooks	Environmental Pollution and Control, J.

	Jeffrey Peirce. Introduction to Environmental Engineering and Science, Gilbert M. Masters.
Main References	Peirce, Environmental Pollution and Control. Masters, Introduction to Environmental Engineering and Science. Davis & Cornwell, Introduction to Environmental Engineering. Vesilind, Peirce & Weiner, Environmental Engineering.
Recommended Supporting References	None.
Electronic References / Websites	United Nations Environment Programme (UNEP). United States Environmental Protection Agency (EPA). World Health Organization - Environment. European Environment Agency (EEA). Environmental Protection UK.

Course Description Form

1. Course Name	Industrial & Petrochemical Processes
2. Course Code	CHEM_ENG-204
3. Semester / Year	Annual System: First/Second Semester 2025-2026
4. Description Preparation Date	12-10-2026
5. Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
6. Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 hours
7. Course Administrator	Assistant Lecturer Mudher Mohammed Ali

8. Course Objectives

The course aims to introduce students to the major chemical and petrochemical industries, explain the industrial processes used to convert raw materials into products of economic value, identify industrial process flow diagrams and production stages, analyze operational problems in chemical and petrochemical industries, and evaluate the technical and economic performance of these processes.

9. Teaching and Learning Strategies

The course relies on theoretical lectures, presentations, seminars, industrial case studies, and analysis of process flow diagrams for chemical and petrochemical processes, in addition to scientific discussions that develop students' ability to connect theoretical aspects with industrial applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Chemical and Petrochemical Industries	Lectures and Discussions	Quiz
2	5	1	Raw Materials for Petrochemical Industries	Lectures and Tutorials	Assignment
3	5	1	Oil and Natural Gas Industry	Lectures and Discussions	Quiz
4	5	1,2	Process Flow Diagrams for Industrial Operations	Lectures and Applications	Assignment
5	5	1,2	Chemical Fertilizer Industry	Lectures and Case Studies	Assignment
6	5	1	Sulfuric Acid Industry	Lectures and Tutorials	Quiz
7	5	1	Ammonia and	Lectures and	Assignment

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
			Urea Industry	Tutorials	
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Polymer and Plastics Industry	Lectures and Case Studies	Quiz
10	5	1	Refining and Petrochemical Industry	Lectures and Tutorials	Assignment
11	5	1,2	Downstream Industries Derived from Petroleum	Lectures and Discussions	Assignment
12	5	1,2	Industrial Performance Evaluation of Processes	Seminars	Presentation
13	5	1,4	Case Studies in Chemical Industries	Seminars	Report
14	5	1,2,7	Analysis of Integrated Industrial Processes	Cooperative Learning	Project
15	5	1,2,4	Comprehensive Review and Applied Discussions	Discussions and Tutorials	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, assignments, class tasks, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses the topics covered during the first half of the semester.
Final Examination	50%	A comprehensive examination at the end of the semester covering the course learning outcomes.

12. Learning and Teaching Resources

Resource Type	Details
Required Textbooks	Shreve's Chemical Process Industries, George T. Austin. Petroleum Refining: Technology and Economics,

	James H. Gary & Glenn E. Handwerk.
Main References	Austin, Shreve's Chemical Process Industries. Gary & Handwerk, Petroleum Refining: Technology and Economics. Dryden's Outlines of Chemical Technology. Nelson, Petroleum Refinery Engineering.
Recommended Supporting References	None.
Electronic References / Websites	American Institute of Chemical Engineers (AIChE). PetroWiki. Energy Institute. ScienceDirect Chemical Engineering Collection. LearnChemE.

Course Description Form

Course Name	Numerical Analysis
Course Code	CHEM_ENG-205
Semester / Year	Annual System – Second Semester / Second Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Mr. Omar Saeed Latif

8. Course Objectives

This course aims to introduce students to the basic principles of numerical analysis and the use of numerical methods to solve engineering and mathematical problems that are difficult to solve analytically. It also develops students' ability to use computers to implement numerical algorithms, analyze results, and interpret them in various engineering applications.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, numerical problem solving, computer applications, problem-based learning, and the use of engineering software to implement numerical algorithms, in addition to scientific discussions and applied activities.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1,6	Introduction to Numerical Analysis and Numerical Errors	Lectures and Tutorials	Quiz
2	5	1,6	Number Representation and Approximation Errors	Lectures and Tutorials	Assignment
3	5	1,6	Roots of Nonlinear Equations: Bisection Method	Lectures and Computer Applications	Assignment
4	5	1,6	Newton–Raphson	Lectures and Computer	Quiz

			Method	Applications	
5	5	1,6	Solving Linear Systems Using Gaussian Elimination	Lectures and Tutorials	Assignment
6	5	1,6	Matrices and Numerical Applications	Lectures and Computer Applications	Quiz
7	5	1,6	Numerical Interpolation	Lectures and Tutorials	Assignment
8	2	1,6	Midterm Examination	Examination	Midterm Exam
9	5	1,6	Numerical Regression and Data Analysis	Lectures and Computer Applications	Assignment
10	5	1,6	Numerical Differentiation	Lectures and Tutorials	Quiz
11	5	1,6	Numerical Integration	Lectures and Tutorials	Assignment
12	5	1,6	Numerical Solution of Differential Equations	Lectures and Computer Applications	Practical Assessment
13	5	1,6	Engineering Applications of Numerical Methods	Computer Laboratory	Project
14	5	1,4,6	Analysis and Interpretation of Numerical Results	Discussions and Applications	Report
15	5	1,4,6,7	Comprehensive Review and Applied Projects	Cooperative Learning	Continuous Assessment
16	3	1,6	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of concepts and topics covered in the first half of the semester.

Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Numerical Methods for Engineers, Steven C. Chapra & Raymond P. Canale. Applied Numerical Methods with MATLAB, Steven Chapra.
Main References	1. Chapra & Canale, Numerical Methods for Engineers. 2. Burden & Faires, Numerical Analysis. 3. Gerald & Wheatley, Applied Numerical Analysis. 4. Kreyszig, Advanced Engineering Mathematics.
Recommended Supporting References	None.
Electronic References / Websites	MATLAB Documentation MIT OpenCourseWare Mathematics Paul’s Online Math Notes Wolfram MathWorld Numerical Methods Resources

Course Description Form

Course Name	Fluid Flow II
Course Code	CHEM_ENG-206
Semester / Year	Annual System – Second Semester / Second Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Safaa Mohammed Rashid Ahmed

8. Course Objectives

This course aims to develop students' understanding of advanced principles of fluid flow in chemical engineering, study fluid motion through pipelines and different industrial equipment, analyze the performance of pumps, compressors, and transportation systems, and enable students to design and select fluid-handling equipment and calculate operating requirements in industrial applications.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, tutorial classes, engineering problem solving, laboratory experiments, industrial case studies, and the use of computer applications to analyze and design fluid-flow systems.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Basic Fluid Flow Principles	Lectures and Tutorials	Quiz
2	5	1	Flow in Pipe Networks	Lectures and Tutorials	Assignment
3	5	1,2	Design of Industrial Piping Systems	Lectures and Tutorials	Assignment
4	5	1	Minor Losses in Pipes and Fittings	Lectures and Tutorials	Quiz
5	5	1,2	Pumps: Types and Operating Principles	Lectures and Tutorials	Assignment
6	5	1,2	Pump Selection and Efficiency Calculations	Lectures and Tutorials	Quiz
7	5	1,3	Compressors	Lectures and	Assignment

			and Blowers	Practical Applications	
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,3	Fluid Flow Through Packed Beds	Lectures and Laboratory	Laboratory Report
10	5	1	Non-Newtonian Fluid Transport	Lectures and Tutorials	Quiz
11	5	1,2	Fluid Transport Systems in Chemical Industries	Lectures and Case Studies	Assignment
12	5	1,6	Computer Applications in Fluid Flow	Computer Laboratory	Practical Assessment
13	5	1,2,6	Design and Operation of Pipeline Networks	Computer Applications	Project
14	5	1,4	Analysis of Operational Problems in Flow Systems	Discussions and Tutorials	Report
15	5	1,4,7	Comprehensive Review and Advanced Problem Solving	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	McCabe, Smith and Harriott, Unit Operations of Chemical Engineering. Coulson & Richardson's Chemical Engineering, Volume 1.
Main References	1. McCabe, Smith & Harriott, Unit Operations of Chemical Engineering. 2. Coulson & Richardson, Chemical Engineering, Volume 1. 3. Geankoplis, Transport Processes and Separation Process Principles. 4. Fox & McDonald, Introduction to Fluid Mechanics.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE AIChE Academy MIT OpenCourseWare – Fluid Mechanics Engineering Toolbox NPTEL Fluid Mechanics Courses

Course Description Form

Engineering Materials

Course Name	Engineering Materials
Course Code	CHEM_ENG-207
Semester / Year	Annual System – Second Semester / Second Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars; Laboratory
Number of Credit Hours (Total) / Number of Units (Total)	5 ECTS / 125 Hours
Course Administrator	Assist. Prof. Mohammed Saleh Ahmed

8. Course Objectives

This course aims to introduce students to engineering materials used in industrial and engineering applications, study their structure and physical, mechanical, and chemical properties, understand the relationship between the microstructure of materials and their engineering behavior, and enable students to select appropriate materials for different industrial applications, especially in chemical and petrochemical industries.

9. Teaching and Learning Strategies

The course is based on theoretical lectures to explain fundamental concepts, laboratory experiments to study the properties of engineering materials, tutorial classes, demonstrations, and analysis of industrial case studies, while encouraging students to relate material properties to design and operational requirements.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Engineering Materials and Their Classification	Lectures and Tutorials	Quiz
2	5	1	Atomic Structure and Bonding in Materials	Lectures and Tutorials	Assignment
3	5	1	Crystal Structure of Materials	Lectures and Tutorials	Quiz
4	5	1,3	Crystal Defects and Their Effect on	Lectures and Laboratory	Laboratory Report

			Properties		
5	5	1,3	Mechanical Properties of Materials	Lectures and Laboratory	Practical Assessment
6	5	1,3	Tensile, Hardness, and Toughness Tests	Laboratory and Practical Applications	Laboratory Report
7	5	1,2	Engineering Metals and Alloys	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Heat Treatment of Metals	Lectures and Laboratory	Quiz
10	5	1,2	Corrosion and Protection Mechanisms	Lectures and Tutorials	Assignment
11	5	1,2	Polymeric Materials and Their Applications	Lectures and Tutorials	Quiz
12	5	1,2	Ceramic and Composite Materials	Lectures and Tutorials	Assignment
13	5	1,2,3	Materials Selection in Engineering Applications	Lectures and Case Studies	Project
14	5	1,4	Engineering Materials Reports and Results Analysis	Discussions and Reports	Continuous Assessment
15	5	1,4,7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment
16	3	1,2,3	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.

Midterm Examination	10%	Measures students' understanding of concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Materials Science and Engineering: An Introduction, William D. Callister. Engineering Materials, Michael F. Ashby & David R.H. Jones.
Main References	Callister, Materials Science and Engineering: An Introduction. Ashby & Jones, Engineering Materials. Smith & Hashemi, Foundations of Materials Science and Engineering. Higgins, Engineering Metallurgy.
Recommended Supporting References	None.
Electronic References / Websites	ASM International Materials Project MIT OpenCourseWare – Materials Science DoITPoMS – University of Cambridge AZoM Materials Database

Course Description Form

Course Name	Computer Programming
Course Code	ENG-105
Semester / Year	Annual System – Second Semester / Second Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars; Laboratory
Number of Credit Hours (Total) / Number of Units (Total)	3 ECTS / 75 Hours
Course Administrator	Ms. Hiba Ramadan Mohammed

8. Course Objectives

This course aims to introduce students to the fundamentals of programming, algorithms, and computer software development. It develops students' ability to analyze engineering problems and formulate them algorithmically, use programming languages to build simple and intermediate programs, and apply programming to solve engineering and computational problems related to chemical engineering.

9. Teaching and Learning Strategies

The course is based on theoretical lectures to explain fundamental programming concepts, practical training in computer laboratories, problem-based learning, and the implementation of programming exercises and projects, while encouraging students to develop software solutions for various engineering problems.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	4	6	Introduction to Programming and Algorithms	Lectures and Laboratory	Quiz
2	4	6	Flowcharts	Lectures and Laboratory	Assignment
3	4	1,6	Programming Language Fundamentals	Lectures and Laboratory	Practical Assignment
4	4	1,6	Variables and Data Types	Computer Laboratory	Practical Assessment
5	4	1,6	Operators and Programming Expressions	Lectures and Laboratory	Quiz
6	4	1,6	Conditional Statements	Computer Laboratory	Programming Assignment
7	4	1,6	Loops	Computer	Practical

				Laboratory	Assessment
8	2	1,6	Midterm Examination	Examination	Midterm Exam
9	4	1,6	Arrays	Lectures and Laboratory	Assignment
10	4	1,6	Functions and Procedures	Computer Laboratory	Quiz
11	4	1,6	File and Data Processing	Computer Laboratory	Practical Assignment
12	4	1,6	Engineering Applications Using Programming	Computer Laboratory	Practical Assessment
13	4	1,6	Developing Programs to Solve Engineering Problems	Computer Laboratory	Project
14	4	1,4,6	Program Documentation and Presentation of Results	Discussions and Presentations	Report
15	4	1,4,6,7	Group Programming Project	Cooperative Learning	Project
16	3	1,6	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Programming in C, Stephen G. Kochan. Problem Solving and Program Design in C,

	Jeri R. Hanly & Elliot B. Koffman.
Main References	Kochan, Programming in C. Hanly & Koffman, Problem Solving and Program Design in C. Deitel & Deitel, C How to Program. Forouzan & Gilberg, Computer Science: A Structured Programming Approach Using C.
Recommended Supporting References	None.
Electronic References / Websites	W3Schools Programming Tutorials Learn C Programming GeeksforGeeks Programming Microsoft Learn Codecademy

Course Description Form

Course Name	English Language II
Course Code	EENG-108
Semester / Year	Annual System – Second Semester / Second Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Laboratory Sessions
Number of Credit Hours (Total) / Number of Units (Total)	2 ECTS / 50 Hours
Course Administrator	Ms. Nada Ahmed Mousa

8. Course Objectives

This course aims to develop the language skills acquired by students in English Language I and enhance their abilities in reading, writing, listening, and speaking. It focuses on academic language and scientific and engineering terminology, while developing the oral and written communication skills required for university study and engineering work.

9. Teaching and Learning Strategies

The course is based on interactive lectures, classroom discussions, individual and group language activities, reading and listening exercises, oral presentations, and written assignments, with the use of modern audiovisual tools to develop the different language skills.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	2	4	Review of Basic Language Skills	Lectures and Exercises	Quiz
2	2	4	Development of Academic Reading Skills	Reading and Discussions	Assignment
3	2	4	Strategies for Understanding Scientific Texts	Lectures and Exercises	Quiz
4	2	4	Expanding Academic and Engineering Vocabulary	Class Activities	Assignment
5	2	4	Academic Writing Skills	Writing Exercises	Written Assessment
6	2	4	Writing Reports and Summaries	Practical Applications	Assignment

7	2	4	Listening and Comprehension Skills	Listening Activities	Quiz
8	2	4	Midterm Examination	Examination	Midterm Exam
9	2	4	Speaking and Communication Skills	Discussions and Role Play	Oral Assessment
10	2	4	English for Engineering Purposes	Lectures and Exercises	Assignment
11	2	4	Scientific and Engineering Terminology	Class Activities	Quiz
12	2	4,7	Teamwork and Professional Communication	Cooperative Learning	Group Activity
13	2	4	Presentations in English	Oral Presentations	Presentation
14	2	4	Writing Technical Correspondence and Reports	Practical Applications	Assignment
15	2	4,7	Comprehensive Review and Group Activities	Discussions and Exercises	Continuous Assessment
16	2	4	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	New Headway Intermediate.

	English for Academic Purposes (EAP).
Main References	Soars, Liz & John Soars, New Headway Intermediate. Murphy, Raymond, English Grammar in Use. Oxford English for Engineering. Technical Communication for Engineers.
Recommended Supporting References	None.
Electronic References / Websites	British Council Learn English BBC Learning English Cambridge English Oxford Learner's Dictionaries EnglishClub

Course Description Form

Course Name	Thermodynamics I
Course Code	CHEM_ENG-308
Semester / Year	Annual System - First Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Laboratory Sessions
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Assist. Prof. Dr. Khalil Aidan Hamad

8. Course Objectives

This course aims to introduce students to the fundamental concepts of thermodynamics and its engineering applications, understand the properties of pure substances and their thermal behavior, study the first and second laws of thermodynamics, analyze energy transfer and conversion in different engineering systems, and develop the ability to solve engineering problems related to energy and heat.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, engineering problem solving, classroom discussions, problem-based learning, and the use of applied examples related to chemical and industrial processes to clarify the fundamental concepts of thermodynamics.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Thermodynamics and Basic Concepts	Lectures and Tutorials	Quiz
2	5	1	Thermodynamic Systems and Physical Properties	Lectures and Tutorials	Assignment
3	5	1	Forms of Energy and Energy Transfer	Lectures and Tutorials	Assignment
4	5	1	First Law of Thermodynamics	Lectures and Tutorials	Quiz
5	5	1	Applications of the First Law to Closed Systems	Lectures and Tutorials	Assignment

6	5	1	Applications of the First Law to Open Systems	Lectures and Tutorials	Quiz
7	5	1	Thermodynamic Properties of Pure Substances	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1	Second Law of Thermodynamics	Lectures and Tutorials	Quiz
10	5	1	Entropy and Its Applications	Lectures and Tutorials	Assignment
11	5	1	Thermal Efficiency and Cyclic Processes	Lectures and Tutorials	Assignment
12	5	1	Basic Power and Refrigeration Cycles	Lectures and Tutorials	Quiz
13	5	1,2	Thermodynamic Applications in Chemical Processes	Case Studies	Project or Assignment
14	5	1,4	Analysis and Solution of Advanced Thermal Problems	Discussions and Tutorials	Continuous Assessment
15	5	1 , 4 , 7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment
16	3	1	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Introduction to Chemical Engineering Thermodynamics, Smith, Van Ness & Abbott. Fundamentals of Engineering Thermodynamics, Moran & Shapiro.
Main References	Smith, Van Ness & Abbott, Introduction to Chemical Engineering Thermodynamics. Moran & Shapiro, Fundamentals of Engineering Thermodynamics. Sonntag, Borgnakke & Van Wylen, Fundamentals of Thermodynamics. Cengel & Boles, Thermodynamics: An Engineering Approach.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE Thermodynamics Resources MIT OpenCourseWare Thermodynamics AIChE Academy NPTEL Thermodynamics Courses Engineering Toolbox

Course Description Form

Course Name	Mass Transfer I
Course Code	CHEM_ENG-209
Semester / Year	Annual System - First Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Assist. Prof. Dr. Suhaib Shweish Salih

8. Course Objectives

This course aims to introduce students to the basic principles of mass transfer and diffusion mechanisms in engineering and chemical systems, understand mass transfer theories and their applications in industrial processes, analyze transfer processes between different phases, and develop the ability to solve engineering problems related to mass transfer in chemical industries.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, engineering problem solving, laboratory experiments, problem-based learning, and demonstrations, while linking theoretical concepts to various industrial applications in separation and transport processes.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Mass Transfer and Its Engineering Importance	Lectures and Tutorials	Quiz
2	5	1	Molecular Diffusion and Fick's First Law	Lectures and Tutorials	Assignment
3	5	1	Fick's Second Law and Its Applications	Lectures and Tutorials	Assignment
4	5	1	Diffusion in Gases	Lectures and Tutorials	Quiz
5	5	1	Diffusion in Liquids	Lectures and Tutorials	Assignment
6	5	1,3	Convective	Lectures and	Laboratory

			Mass Transfer	Laboratory	Report
7	5	1,3	Mass Transfer Coefficients	Lectures and Laboratory	Practical Test
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1	Theories of Interphase Mass Transfer	Lectures and Tutorials	Assignment
10	5	1	Gas-Liquid Mass Transfer	Lectures and Tutorials	Quiz
11	5	1,2	Absorption and Its Basic Principles	Lectures and Tutorials	Assignment
12	5	1 , 2	Extraction and Its Basic Principles	Lectures and Tutorials	Assignment
13	5	1,6	Computer Applications in Mass Transfer	Computer Laboratory	Practical Assessment
14	5	1,4	Industrial Applications and Mass Transfer in Chemical Processes	Discussions and Case Studies	Report
15	5	1 , 4 , 7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Transport Processes and Separation Process Principles, Christie J. Geankoplis. Unit Operations of Chemical Engineering, McCabe, Smith & Harriott.
Main References	Geankoplis, Transport Processes and Separation Process Principles. McCabe, Smith & Harriott, Unit Operations of Chemical Engineering. Treybal, Mass Transfer Operations. Coulson & Richardson, Chemical Engineering, Volume 2.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE AIChE Academy MIT OpenCourseWare - Chemical Engineering NPTEL Mass Transfer Operations Engineering LibreTexts - Mass Transfer

Course Description Form

Course Name	Heat Transfer I
Course Code	CHEM_ENG-310
Semester / Year	Annual System - First Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Dr. Harith Nouri Mohammed

8. Course Objectives

This course aims to introduce students to the basic principles and mechanisms of heat transfer, understand the governing laws of conduction, convection, and thermal radiation, analyze heat transfer rates in different engineering systems, and develop the ability to solve thermal problems and apply them in the design and operation of thermal equipment in chemical industries.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, tutorial classes, laboratory experiments, engineering problem solving, and problem-based learning, while linking theoretical concepts to industrial applications and thermal processes used in chemical engineering.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Heat Transfer and Its Mechanisms	Lectures and Tutorials	Quiz
2	5	1	Heat Conduction and Fourier's Law	Lectures and Tutorials	Assignment
3	5	1	Heat Conduction Through Plane and Cylindrical Walls	Lectures and Tutorials	Assignment
4	5	1	Unsteady-State Heat Conduction	Lectures and Tutorials	Quiz
5	5	1	Natural Convection	Lectures and Tutorials	Assignment

6	5	1	Forced Convection	Lectures and Tutorials	Quiz
7	5	1,3	Heat Transfer Coefficients	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1	Thermal Radiation and Its Basic Concepts	Lectures and Tutorials	Assignment
10	5	1	Thermal Radiation Laws	Lectures and Tutorials	Quiz
11	5	1,2	Heat Exchangers and Their Types	Lectures and Tutorials	Assignment
12	5	1 , 2	Basic Design of Heat Exchangers	Lectures and Tutorials	Assignment
13	5	1,6	Computer Applications in Heat Transfer	Computer Laboratory	Practical Assessment
14	5	1,4	Industrial Applications in Heat Transfer	Discussions and Case Studies	Report
15	5	1 , 4 , 7	Comprehensive Review and Advanced Problem Solving	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Heat and Mass Transfer, Yunus A. Cengel. Fundamentals of Heat and Mass Transfer, Incropera & DeWitt.
Main References	Cengel, Heat and Mass Transfer. Incropera & DeWitt, Fundamentals of Heat and Mass Transfer. Holman, Heat Transfer. Kern, Process Heat Transfer.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE MIT OpenCourseWare - Heat Transfer AIChE Academy Engineering Toolbox NPTEL Heat Transfer Courses

Course Description Form

Engineering Statistics

Course Name	Engineering Statistics
Course Code	Math-302
Semester / Year	Annual System - First Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	4 ECTS / 100 Hours
Course Administrator	Lect. Kumait Saeed Awad

8. Course Objectives

This course aims to introduce students to the basic concepts of engineering statistics and methods for collecting, organizing, and analyzing data. It develops the ability to use statistical methods to solve engineering problems, interpret results, and make appropriate decisions based on statistical analysis, while employing computer software in data processing and analysis.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, solving statistical exercises and problems, computer applications, analysis of engineering data, problem-based learning, scientific discussions, and applied examples from chemical engineering fields.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	4	1	Introduction to Engineering Statistics and Its Importance	Lectures and Tutorials	Quiz
2	4	1	Data Collection, Organization, and Presentation	Lectures and Tutorials	Assignment
3	4	1	Measures of Central Tendency	Lectures and Tutorials	Assignment
4	4	1	Measures of Dispersion	Lectures and Tutorials	Quiz
5	4	1	Probability and Its Basic Rules	Lectures and Tutorials	Assignment
6	4	1	Random	Lectures and	Quiz

			Variables and Probability Distributions	Tutorials	
7	4	1,6	Normal Distribution and Its Applications	Lectures and Computer Applications	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	4	1,6	Statistical Estimation and Confidence Intervals	Lectures and Computer Applications	Assignment
10	4	1,6	Hypothesis Testing	Lectures and Tutorials	Quiz
11	4	1,6	Correlation and Regression Analysis	Lectures and Computer Applications	Assignment
12	4	1 , 6	Data Analysis Using Statistical Software	Computer Laboratory	Practical Assessment
13	4	1,6, 4	Statistical Applications in Chemical Engineering	Case Studies	Project
14	4	1,4	Interpretation of Results and Writing Statistical Reports	Discussions and Reports	Presentation and Report
15	4	1 , 4 , 7	Comprehensive Review and Group Exercises	Cooperative Learning	Continuous Assessment
16	3	1,6	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.

Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Probability and Statistics for Engineers and Scientists, Ronald E. Walpole. Applied Statistics and Probability for Engineers, Douglas C. Montgomery & George C. Runger.
Main References	Walpole, Probability and Statistics for Engineers and Scientists. Montgomery & Runger, Applied Statistics and Probability for Engineers. Devore, Probability and Statistics for Engineering and the Sciences. Spiegel, Schaum's Outline of Statistics.
Recommended Supporting References	None.
Electronic References / Websites	NIST Engineering Statistics Handbook Khan Academy Statistics and Probability Stat Trek MIT OpenCourseWare Statistics R Project Documentation

Course Description Form

Chemical Process Safety and Engineering Ethics

Course Name	Chemical Process Safety and Engineering Ethics
Course Code	CHEM_ENG-305
Semester / Year	Annual System - First Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	4 ECTS / 100 Hours
Course Administrator	Ms. Hiba Ramadan Mohammed

8. Course Objectives

This course aims to introduce students to the principles of chemical process safety and industrial risk management, enhance awareness of the importance of occupational safety in chemical industries, develop the ability to identify, analyze, and evaluate hazards, and reinforce the principles of engineering ethics and the professional and social responsibility of engineers in the workplace.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, studies of real industrial accidents, hazard analysis, group discussions, presentations, case studies in engineering ethics, and problem-based learning.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	4	5	Introduction to Chemical Process Safety	Lectures and Discussions	Quiz
2	4	5	Concepts of Hazards and Industrial Accidents	Lectures and Case Studies	Assignment
3	4	5	Hazard Identification and Assessment	Lectures and Tutorials	Quiz
4	4	1,5	Hazard and Operability Analysis (HAZOP)	Lectures and Case Studies	Assignment
5	4	1,5	Industrial Risk Management	Lectures and Tutorials	Assignment
6	4	5	Safety and	Lectures and	Quiz

			Protection Systems in Chemical Plants	Discussions	
7	4	5	Industrial Accident Investigation	Case Studies	Report
8	2	5	Midterm Examination	Examination	Midterm Exam
9	4	5	Engineering Professional Ethics	Lectures and Discussions	Assignment
10	4	5	Professional and Social Responsibility of the Engineer	Lectures and Discussions	Quiz
11	4	5	Ethics of Engineering Decision-Making	Case Studies	Assignment
12	4	4 , 5	Professional and Ethical Communication Skills	Seminars	Presentation
13	4	1,5	Safety Applications in Chemical Industries	Case Studies	Project
14	4	5,7	Analysis of Real Cases in Safety and Ethics	Cooperative Learning	Group Report
15	4	4 , 5 , 7	Comprehensive Review and Applied Discussions	Discussions and Tutorials	Continuous Assessment
16	3	5	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.

Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Chemical Process Safety: Fundamentals with Applications, Daniel A. Crowl & Joseph F. Louvar. Engineering Ethics: Concepts and Cases, Charles E. Harris Jr.
Main References	Crowl & Louvar, Chemical Process Safety: Fundamentals with Applications. Charles E. Harris Jr., Engineering Ethics: Concepts and Cases. Lees, Loss Prevention in the Process Industries. CCPS, Guidelines for Hazard Evaluation Procedures.
Recommended Supporting References	None.
Electronic References / Websites	Center for Chemical Process Safety (CCPS) Occupational Safety and Health Administration (OSHA) American Institute of Chemical Engineers (AIChE) Institution of Chemical Engineers (IChemE) National Safety Council (NSC)

Course Description Form

Thermodynamics II

Course Name	Thermodynamics II
Course Code	CHEM_ENG-301
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Assist. Prof. Dr. Safa Ramadan Ahmed

8. Course Objectives

This course aims to develop students' advanced knowledge of engineering thermodynamics, study the behavior of multicomponent systems, phase equilibrium, and the thermodynamic properties of solutions and mixtures, analyze chemical reactions from a thermodynamic perspective, and apply these concepts in the design and operation of chemical and industrial processes.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, advanced engineering problem solving, scientific discussions, applied case studies, problem-based learning, and the use of computer software to analyze complex thermal systems.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Basic Thermodynamic Concepts	Lectures and Tutorials	Quiz
2	5	1	Properties of Pure Fluids and Equations of State	Lectures and Tutorials	Assignment
3	5	1	Thermodynamic Relationships	Lectures and Tutorials	Assignment
4	5	1	Chemical Free Energy and Chemical Potential	Lectures and Tutorials	Quiz
5	5	1	Thermodynamic Behavior of Ideal Solutions	Lectures and Tutorials	Assignment
6	5	1	Non-Ideal Solutions and Chemical	Lectures and Tutorials	Quiz

			Activity		
7	5	1,2	Phase Equilibrium for Single-Component Systems	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Phase Equilibrium for Multicomponent Systems	Lectures and Tutorials	Assignment
10	5	1,2	Vapor-Liquid Equilibrium (VLE)	Lectures and Tutorials	Quiz
11	5	1,2	Liquid-Liquid Equilibrium (LLE)	Lectures and Tutorials	Assignment
12	5	1	Thermodynamics of Chemical Reactions	Lectures and Tutorials	Assignment
13	5	1,2	Chemical Equilibrium and Equilibrium Constant Calculation	Lectures and Tutorials	Quiz
14	5	1,6	Computer Applications in Thermodynamics	Computer Laboratory	Practical Assessment
15	5	1,4,7	Industrial Applications and Comprehensive Review	Group Discussions and Tutorials	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Introduction to Chemical Engineering Thermodynamics, J.M. Smith, H.C. Van Ness and M.M. Abbott. Chemical and Engineering Thermodynamics, Stanley I. Sandler.
Main References	Smith, Van Ness & Abbott, Introduction to Chemical Engineering Thermodynamics. Stanley I. Sandler, Chemical and Engineering Thermodynamics. Y.V.C. Rao, Chemical Engineering Thermodynamics. Kyle, Chemical and Process Thermodynamics. Elliott & Lira, Introductory Chemical Engineering Thermodynamics.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE Thermodynamics Resources MIT OpenCourseWare - Thermodynamics AIChE Academy NPTEL Chemical Engineering Thermodynamics Engineering Toolbox

Course Description Form

Mass Transfer II

Course Name	Mass Transfer II
Course Code	CHEM_ENG-302
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Assist. Prof. Dr. Suhaib Shweish Salih

8. Course Objectives

This course aims to deepen students' understanding of advanced mass transfer operations and their industrial applications, study the design and operation of different separation equipment, analyze absorption, extraction, distillation, adsorption, and drying operations, and apply mass transfer principles in the design and operation of industrial units in chemical engineering.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, tutorial classes, laboratory experiments, engineering problem solving, problem-based learning, industrial case studies, and the use of computer software to analyze and design mass transfer equipment.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Mass Transfer Principles	Lectures and Tutorials	Quiz
2	5	1, 2	Gas Absorption and Its Principles	Lectures and Tutorials	Assignment
3	5	1, 2	Design of Absorption Towers	Lectures and Tutorials	Assignment
4	5	1, 2	Liquid-Liquid Extraction	Lectures and Tutorials	Quiz
5	5	1, 2	Design of Extraction Units	Lectures and Tutorials	Assignment
6	5	1, 2	Adsorption	Lectures and Tutorials	Quiz
7	5	1, 2, 3	Ion Exchange	Lectures and	Laboratory

				Laboratory	Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1, 2	Distillation and Equilibrium Principles	Lectures and Tutorials	Assignment
10	5	1, 2	Design of Distillation Columns	Lectures and Tutorials	Quiz
11	5	1, 2	Humidification and Drying	Lectures and Tutorials	Assignment
12	5	1, 2, 3	Membrane Processes	Lectures and Laboratory	Laboratory Report
13	5	1, 2, 6	Computer Simulation of Separation Processes	Computer Laboratory	Practical Assessment
14	5	1 , 4	Industrial Applications in Mass Transfer	Case Studies	Project or Report
15	5	1,4,7	Comprehensive Review and Advanced Problem Solving	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Mass Transfer Operations, Robert E. Treybal. Transport Processes and Separation Process

	Principles, Christie J. Geankoplis.
Main References	Treybal, Mass Transfer Operations. Geankoplis, Transport Processes and Separation Process Principles. McCabe, Smith & Harriott, Unit Operations of Chemical Engineering. Coulson & Richardson, Chemical Engineering, Volume 2. Wankat, Separation Process Engineering.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE AIChE Academy MIT OpenCourseWare - Separation Processes NPTEL Mass Transfer Operations Engineering LibreTexts - Mass Transfer

Course Description Form

Heat Transfer II

Course Name	Heat Transfer II
Course Code	CHEM_ENG-303
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars; Laboratory
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Dr. Harith Nouri Mohammed

8. Course Objectives

This course aims to deepen students' understanding of advanced heat transfer processes and their industrial applications, study the design and analysis of heat exchangers, condensers, and evaporators, analyze heat transfer accompanied by phase change, and apply heat transfer principles in the design and operation of thermal equipment used in chemical industries.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, tutorial classes, laboratory experiments, engineering problem solving, industrial case studies, problem-based learning, and the use of computer software in the design and analysis of thermal equipment.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Heat Transfer Principles	Lectures and Tutorials	Quiz
2	5	1,2	Heat Exchangers and Their Types	Lectures and Tutorials	Assignment
3	5	1,2	Heat Exchanger Design Methods	Lectures and Tutorials	Assignment
4	5	1,2	Log Mean Temperature Difference (LMTD) Method	Lectures and Tutorials	Quiz
5	5	1,2	Effectiveness-NTU Method	Lectures and Tutorials	Assignment
6	5	1	Condensation	Lectures and	Quiz

				Tutorials	
7	5	1,3	Boiling and Heat Transfer with Phase Change	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Design of Condensers	Lectures and Tutorials	Assignment
10	5	1,2	Design of Evaporators	Lectures and Tutorials	Quiz
11	5	1,2	Heat Transfer in Multiphase Media	Lectures and Tutorials	Assignment
12	5	1,3	Laboratory Applications of Heat Exchangers	Laboratory	Laboratory Report
13	5	1,2, 6	Computer Simulation of Thermal Equipment	Computer Laboratory	Practical Assessment
14	5	1 , 4	Industrial Applications in Heat Transfer	Case Studies	Project or Report
15	5	1 , 4	Comprehensive Review and Advanced Problem Solving	Cooperative Learning	Continuous Assessment
16	3	1 , 2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Process Heat Transfer, Donald Q. Kern. Fundamentals of Heat and Mass Transfer, Incropera & DeWitt.
Main References	Kern, Process Heat Transfer. Incropera & DeWitt, Fundamentals of Heat and Mass Transfer. Cengel, Heat and Mass Transfer. Holman, Heat Transfer. Coulson & Richardson, Chemical Engineering, Volume 1.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE AIChE Academy MIT OpenCourseWare - Heat Transfer Engineering Toolbox NPTEL Heat Transfer Courses

Course Description Form

Engineering Economics

Course Name	Engineering Economics
Course Code	CHEM_ENG-304
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	4 ECTS / 100 Hours
Course Administrator	Lect. Kumait Saeed Awad

8. Course Objectives

This course aims to introduce students to the basic principles of engineering economics and project evaluation, develop the ability to analyze economic alternatives and make appropriate investment decisions, understand the concepts of the time value of money, costs, and revenues, and apply economic methods in the evaluation of engineering and industrial projects.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, economic problem solving, applied case studies, classroom discussions, presentations, and problem-based learning, with emphasis on realistic engineering and economic applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	4	1	Introduction to Engineering Economics	Lectures and Tutorials	Quiz
2	4	1	Time Value of Money	Lectures and Tutorials	Assignment
3	4	1	Simple and Compound Interest	Lectures and Tutorials	Assignment
4	4	1	Cash Flows and Cash Flow Diagrams	Lectures and Tutorials	Quiz
5	4	1	Methods for Evaluating Economic Alternatives	Lectures and Tutorials	Assignment
6	4	1,2	Present Worth and Future Worth	Lectures and Tutorials	Quiz

7	4	1,2	Internal Rate of Return (IRR)	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	4	1,2	Benefit-Cost Analysis	Lectures and Tutorials	Assignment
10	4	1,2	Depreciation	Lectures and Tutorials	Quiz
11	4	1,2	Evaluation of Engineering Projects	Lectures and Case Studies	Assignment
12	4	1,2	Risk and Uncertainty Analysis	Lectures and Tutorials	Assignment
13	4	1,2,6	Use of Computer Software in Economic Analysis	Computer Laboratory	Practical Assessment
14	4	1 ,4	Case Studies in Engineering Economics	Seminars	Presentation and Report
15	4	1,4,7	Comprehensive Review and Group Projects	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Engineering Economy, Leland Blank & Anthony Tarquin. Contemporary Engineering Economics,

	Chan S. Park.
Main References	Blank & Tarquin, Engineering Economy. Chan S. Park, Contemporary Engineering Economics. Sullivan, Wicks & Koelling, Engineering Economy. Newnan, Lavelle & Eschenbach, Engineering Economic Analysis.
Recommended Supporting References	None.
Electronic References / Websites	Investopedia - Engineering Economics Concepts MIT OpenCourseWare Coursera Engineering Economics Resources Khan Academy Finance & Capital Markets Project Management Institute (PMI)

Course Description Form

Unit Operations I

Course Name	Unit Operations I
Course Code	CHEM_ENG-310
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars; Laboratory
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Mr. Mazhar Mohammed Ali

8. Course Objectives

This course aims to introduce students to the basic principles of unit operations used in chemical industries, understand the foundations of design and operation of industrial equipment related to momentum, heat, and mass transfer, develop the ability to analyze the performance of different operating units, and apply engineering principles to solve industrial problems.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, tutorial classes, laboratory experiments, engineering problem solving, industrial case studies, and computer applications to connect theoretical principles with the design and operation of unit operations equipment.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Unit Operations and Their Industrial Importance	Lectures and Tutorials	Quiz
2	5	1	Classification of Unit Operations	Lectures and Tutorials	Assignment
3	5	1,2	Flow Through Pipes and Equipment	Lectures and Tutorials	Assignment
4	5	1,2	Pumps and Compressors	Lectures and Tutorials	Quiz
5	5	1,2	Filtration	Lectures and Tutorials	Assignment
6	5	1,2,3	Industrial Filtration	Lectures and Laboratory	Laboratory Report

			Equipment		
7	5	1,2	Sedimentation and Mechanical Separation	Lectures and Tutorials	Quiz
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Mixing and Agitation	Lectures and Tutorials	Assignment
10	5	1,2,3	Mixing and Agitation Equipment	Lectures and Laboratory	Laboratory Report
11	5	1,2	Size Reduction and Grinding	Lectures and Tutorials	Quiz
12	5	1,2	Classification and Separation of Solid Particles	Lectures and Tutorials	Assignment
13	5	1,2,6	Computer Applications in Unit Operations	Computer Laboratory	Practical Assessment
14	5	1 ,4	Industrial Applications and Case Studies	Seminars	Presentation and Report
15	5	1,4,7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Unit Operations of Chemical Engineering,

	McCabe, Smith & Harriott. Introduction to Chemical Engineering, Badger & Banchero.
Main References	McCabe, Smith & Harriott, Unit Operations of Chemical Engineering. Coulson & Richardson, Chemical Engineering. Geankoplis, Transport Processes and Separation Process Principles. Perry's Chemical Engineers' Handbook. Foust et al., Principles of Unit Operations.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE AIChE Academy MIT OpenCourseWare - Chemical Engineering NPTEL Chemical Engineering Courses Engineering Toolbox

Course Description Form

Reactor Design I

Course Name	Reactor Design I
Course Code	CHEM_ENG-310
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Dr. Saba Adnan Gheni

8. Course Objectives

This course aims to introduce students to the basic principles of chemical reaction engineering, study chemical reaction kinetics and mechanisms, analyze the performance of different chemical reactors, apply the basic design equations for batch and continuous reactors, and develop the ability to select and design suitable reactors for industrial processes.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, engineering problem solving, laboratory applications, industrial case studies, problem-based learning, and the use of computer software for the analysis and design of chemical reactors.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Chemical Reaction Engineering	Lectures and Tutorials	Quiz
2	5	1	Classification of Chemical Reactions	Lectures and Tutorials	Assignment
3	5	1	Chemical Reaction Kinetics and Reaction Rate	Lectures and Tutorials	Assignment
4	5	1	Determination of Reaction Order and Rate Constant	Lectures and Tutorials	Quiz
5	5	1 , 3	Analysis of Chemical Reaction Data	Lectures and Laboratory	Laboratory Report

6	5	1	Batch Reactor	Lectures and Tutorials	Assignment
7	5	1 , 2	Batch Reactor Design	Lectures and Tutorials	Quiz
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1 , 2	Continuous Stirred Tank Reactor (CSTR)	Lectures and Tutorials	Assignment
10	5	1 , 2	CSTR Design	Lectures and Tutorials	Quiz
11	5	1 , 2	Plug Flow Reactor (PFR)	Lectures and Tutorials	Assignment
12	5	1 , 2	Plug Flow Reactor Design	Lectures and Tutorials	Assignment
13	5	1 , 2 , 6	Comparison of Reactor Types Using Computer Applications	Computer Laboratory	Practical Assessment
14	5	1 , 4	Industrial Applications of Chemical Reactors	Case Studies	Report or Presentation
15	5	1 , 4 , 7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1 , 2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Elements of Chemical Reaction Engineering, H. Scott Fogler. Chemical Reaction Engineering, Octave Levenspiel.
Main References	Fogler, Elements of Chemical Reaction Engineering. Levenspiel, Chemical Reaction Engineering. Smith, Chemical Engineering Kinetics. Froment & Bischoff, Chemical Reactor Analysis and Design. Hill, An Introduction to Chemical Engineering Kinetics and Reactor Design.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE - Reaction Engineering AIChE Academy MIT OpenCourseWare - Chemical Reaction Engineering NPTEL Chemical Reaction Engineering Wolfram Demonstrations Project

Course Description Form

Course Name	Chemical Process Dynamics
Course Code	CHEM_ENG-404
Semester / Year	Annual System - First Semester / Fourth Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	5 ECTS / 125 Hours
Course Administrator	Dr. Thaer Adnan Abdullah

8. Course Objectives

This course aims to develop students' ability to analyze the dynamic behavior of complex chemical processes, build mathematical models of industrial systems, study process responses to disturbances and operational changes, and use computer simulation to analyze and improve the performance of chemical processes.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, computer applications, engineering problem solving, industrial case studies, the use of simulation and mathematical modeling software, cooperative learning, and applied projects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Process Dynamics Fundamentals	Lectures and Tutorials	Quiz
2	5	1	Dynamic Modeling of Chemical Systems	Lectures and Tutorials	Assignment
3	5	1,6	Unsteady-State Mass and Energy Balances	Lectures and Computer Applications	Assignment
4	5	1,6	Modeling of Tanks and Mixing Systems	Lectures and Tutorials	Quiz
5	5	1,6	Dynamics of Heat	Lectures and Computer	Assignment

			Exchangers	Applications	
6	5	1,6	Dynamics of Distillation Columns	Lectures and Tutorials	Quiz
7	5	1,6	Dynamics of Chemical Reactors	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1 , 2	Dynamic Stability Analysis	Lectures and Tutorials	Assignment
10	5	1 , 2	Linear and Nonlinear Systems	Lectures and Tutorials	Quiz
11	5	1,2,6	Time Response Analysis of Processes	Computer Applications	Assignment
12	5	1,2,6	Dynamic Simulation of Chemical Processes	Computer Laboratory	Practical Assessment
13	5	1,6	Applications of Aspen and MATLAB Software	Computer Laboratory	Project
14	5	1 , 4	Industrial Case Studies	Seminars	Presentation and Report
15	5	1 , 4, 7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Process Modeling, Simulation and Control for Chemical Engineers, William L. Luyben. Process Dynamics and Control, Seborg, Edgar & Mellichamp.
Main References	Luyben, Process Modeling, Simulation and Control for Chemical Engineers. Seborg et al., Process Dynamics and Control. Bequette, Process Dynamics: Modeling, Analysis and Simulation. Marlin, Process Control. Riggs & Karim, Chemical Process Modeling and Computer Simulation.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE MATLAB Documentation AspenTech MIT OpenCourseWare AIChE Academy

Course Description Form

Reactor Design II

Course Name	Reactor Design II
Course Code	CHEM_ENG-312
Semester / Year	Annual System - Second Semester / Third Year (2025-2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Dr. Saba Adnan Gheni

8. Course Objectives

This course aims to develop advanced knowledge in the design and analysis of industrial chemical reactors, study heterogeneous and catalytic reactions, analyze the performance of multiphase reactors, and apply advanced principles of chemical reaction engineering in the design and operation of industrial reactors under non-isothermal and multiple-reaction conditions.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, advanced engineering problem solving, laboratory applications, industrial case studies, the use of computer simulation software, problem-based learning, and applied projects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Reactor Design Fundamentals	Lectures and Tutorials	Quiz
2	5	1	Heterogeneous Reactions	Lectures and Tutorials	Assignment
3	5	1 , 2	Chemical Catalysis and Industrial Catalysts	Lectures and Tutorials	Assignment
4	5	1 , 2	Kinetics of Catalytic Reactions	Lectures and Tutorials	Quiz
5	5	1 , 2	Design of Fixed-Bed Catalytic Reactors	Lectures and Tutorials	Assignment
6	5	1 , 2	Design of Fluidized-Bed	Lectures and Tutorials	Quiz

			Reactors		
7	5	1 , 3	Analysis of Industrial Reactor Data	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1 , 2	Multiphase Reactors	Lectures and Tutorials	Assignment
10	5	1 , 2	Mass and Heat Transfer in Reactors	Lectures and Tutorials	Quiz
11	5	1 , 2	Non-Isothermal Reactors	Lectures and Tutorials	Assignment
12	5	1 , 2	Advanced Design of Industrial Reactors	Lectures and Tutorials	Assignment
13	5	1 , 2 , 6	Computer Simulation of Chemical Reactors	Computer Laboratory	Practical Assessment
14	5	1 , 4	Industrial Applications and Case Studies	Seminars	Presentation and Report
15	5	1 , 4 , 7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1 , 2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class activities, seminars, and individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Assesses understanding of the concepts and topics studied during the first half of the semester.
Final Examination	50%	Comprehensive examination at the end of the semester to assess achievement of course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Elements of Chemical Reaction Engineering, H. Scott Fogler. Chemical Reaction Engineering, Octave Levenspiel.
Main References	Fogler, Elements of Chemical Reaction Engineering. Levenspiel, Chemical Reaction Engineering. Froment & Bischoff, Chemical Reactor Analysis and Design. Smith, Chemical Engineering Kinetics. Hill, An Introduction to Chemical Engineering Kinetics and Reactor Design.
Recommended Supporting References	None.
Electronic References / Websites	LearnChemE - Reaction Engineering AIChE Academy MIT OpenCourseWare - Chemical Reaction Engineering NPTEL Chemical Reaction Engineering Wolfram Demonstrations Project

Course Description Form

Chemical Process Dynamics

Course Name	Chemical Process Dynamics
Course Code	CHEM_ENG-404
Semester / Year	Annual System – First Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	5 ECTS / 125 Hours
Course Administrator	Dr. Thaer Adnan Abdullah

8. Course Objectives

This course aims to develop students' ability to analyze the dynamic behavior of complex chemical processes, build mathematical models of industrial systems, study process responses to disturbances and operating changes, and use computer simulation to analyze and improve the performance of chemical processes.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, computer applications, engineering problem solving, industrial case studies, the use of simulation and mathematical modeling software, cooperative learning, and applied projects.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of the Fundamentals of Process Dynamics	Lectures and Tutorials	Quiz
2	5	1	Dynamic Modeling of Chemical Systems	Lectures and Tutorials	Assignment
3	5	1,6	Unsteady-State Mass and Energy Balances	Lectures and Computer Applications	Assignment
4	5	1,6	Tank and Mixing Modeling	Lectures and Tutorials	Quiz
5	5	1,6	Dynamics of Heat Exchangers	Lectures and Computer Applications	Assignment
6	5	1,6	Dynamics of Distillation Columns	Lectures and Tutorials	Quiz
7	5	1,6	Dynamics of Chemical Reactors	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Dynamic Stability Analysis	Lectures and Tutorials	Assignment
10	5	1,2	Linear and Nonlinear Systems	Lectures and Tutorials	Quiz
11	5	1,2,6	Time-Response Analysis of Processes	Computer Applications	Assignment
12	5	1,2,6	Dynamic Simulation of Chemical	Computer Laboratory	Practical Assessment

			Processes		
13	5	1,6	Aspen and MATLAB Software Applications	Computer Laboratory	Project
14	5	1,4	Industrial Case Studies	Seminars	Presentation and Report
15	5	1,4,7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Process Modeling, Simulation and Control for Chemical Engineers – William L. Luyben. Process Dynamics and Control – Seborg, Edgar & Mellichamp.
Main References	Luyben, Process Modeling, Simulation and Control for Chemical Engineers. Seborg et al., Process Dynamics and Control. Bequette, Process Dynamics: Modeling, Analysis and Simulation. Marlin, Process Control. Riggs & Karim, Chemical Process Modeling and Computer Simulation.
Recommended Supporting References	None specified.
Electronic References / Websites	LearnChemE MATLAB Documentation AspenTech MIT OpenCourseWare AIChE Academy

Course Description Form

Reactor Design II

Course Name	Reactor Design II
Course Code	CHEM_ENG-312
Semester / Year	Annual System – Second Semester / Third Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Saba Adnan Gheni

8. Course Objectives

This course aims to develop advanced knowledge in the design and analysis of industrial chemical reactors, study heterogeneous and catalytic reactions, analyze the performance of multiphase reactors, and apply advanced principles of chemical reaction engineering in the design and operation of industrial reactors under non-isothermal and multiple-reaction conditions.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, advanced engineering problem solving, laboratory applications, industrial case studies, computer simulation software, problem-based learning, and applied projects.

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or Subject Name**	**Learning Method**	**Evaluation Method**
1	5	1	Review of Reactor Design Fundamentals	Lectures and Tutorials	Quiz
2	5	1	Heterogeneous Reactions	Lectures and Tutorials	Assignment
3	5	1,2	Chemical Catalysis and Industrial Catalysts	Lectures and Tutorials	Assignment
4	5	1,2	Kinetics of Catalytic Reactions	Lectures and Tutorials	Quiz
5	5	1,2	Design of Fixed-Bed Catalytic Reactors	Lectures and Tutorials	Assignment
6	5	1,2	Design of Fluidized-Bed Reactors	Lectures and Tutorials	Quiz
7	5	1,3	Analysis of Industrial Reactor Data	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Multiphase Reactors	Lectures and Tutorials	Assignment
10	5	1,2	Mass and Heat Transfer in Reactors	Lectures and Tutorials	Quiz
11	5	1,2	Non-Isothermal Reactors	Lectures and Tutorials	Assignment
12	5	1,2	Design of Advanced	Lectures and Tutorials	Assignment

			Industrial Reactors		
13	5	1,2,6	Computer Simulation of Chemical Reactors	Computer Laboratory	Practical Assessment
14	5	1,4	Industrial Applications and Case Studies	Seminars	Presentation and Report
15	5	1,4,7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Elements of Chemical Reaction Engineering, H. Scott Fogler. Chemical Reaction Engineering, Octave Levenspiel.
Main References	Fogler, Elements of Chemical Reaction Engineering. Levenspiel, Chemical Reaction Engineering.
Recommended Supporting References	None specified.
Electronic References / Websites	LearnChemE MIT OpenCourseWare AIChE Academy NPTEL Chemical Reaction Engineering resources

Course Description Form

Petroleum Refining I

Course Name	Petroleum Refining I
Course Code	CHEM_ENG-402
Semester / Year	Annual System – First Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars; Laboratory
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Prof. Aysar Talib Jarallah

8. Course Objectives

This course aims to introduce students to crude oil properties and different refining processes, study the main units in petroleum refineries, develop the ability to analyze petroleum products and evaluate their performance, and apply engineering principles in operating and improving refining processes. The course also covers crude oil composition and properties, basic refinery operations, petroleum product specifications, and performance evaluation of refinery units.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, engineering problem solving, industrial case studies, analysis of refinery flow diagrams, demonstrations, problem-based learning, and linking theoretical concepts with industrial applications.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Petroleum Refining	Lectures and Tutorials	Quiz
2	5	1	Origin and Classification of Crude Oil	Lectures and Tutorials	Assignment
3	5	1	Physical and Chemical Properties of Crude Oil	Lectures and Tutorials	Assignment
4	5	1	Crude Oil Characterization Methods	Lectures and Tutorials	Quiz
5	5	1	Petroleum Products and Their Specifications	Lectures and Tutorials	Assignment
6	5	1,2	Atmospheric Distillation Unit	Lectures and Tutorials	Quiz
7	5	1,2	Vacuum Distillation Unit	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Thermal Cracking Processes	Lectures and Tutorials	Assignment
10	5	1,2	Catalytic Cracking Processes	Lectures and Tutorials	Quiz
11	5	1,2	Catalytic Reforming	Lectures and Tutorials	Assignment

			Processes		
12	5	1,2	Hydrotreating and Desulfurization	Lectures and Tutorials	Assignment
13	5	1,2,6	Computer Applications in Refinery Operation	Computer Laboratory	Practical Assessment
14	5	1,4	Refinery Flow Diagrams and Case Studies	Case Study	Report or Presentation
15	5	1,4,7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Gary, Handwerk & Kaiser, Petroleum Refining: Technology and Economics. Nelson, Petroleum Refinery Engineering.
Main References	Gary, Handwerk & Kaiser, Petroleum Refining: Technology and Economics. Nelson, Petroleum Refinery Engineering. Speight, The Chemistry and Technology of Petroleum. Fahim, Al-Sahhaf & Elkilani, Fundamentals of Petroleum Refining. Watkins, Petroleum Refinery Distillation.
Electronic References	AIChE educational resources; SPE technical publications; NPTEL lectures in petroleum engineering; MIT OpenCourseWare resources.
Websites	www.aiche.org www.spe.org ocw.mit.edu nptel.ac.in www.energy.gov
Other Resources	Refinery operating manuals, industrial flow diagrams, technical reports, petroleum industry standards, and refinery case studies.

Course Description Form

Equipment Design I

Course Name	Equipment Design I
Course Code	CHEM_ENG-403
Semester / Year	Annual System – First Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	5 ECTS / 125 Hours
Course Administrator	Dr. Haider Akram Arif

8. Course Objectives

This course aims to introduce students to the fundamentals of designing equipment used in chemical industries, study engineering standards and specifications for industrial equipment, develop the ability to design pressure vessels, tanks, heat exchangers, and piping systems, and use modern engineering software in design and analysis. It also emphasizes understanding chemical equipment design principles, applying codes and specifications, designing industrial equipment used in chemical plants, and using computer software for engineering design and analysis.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, engineering problem solving, practical applications, engineering software, industrial case studies, problem-based learning, and individual and group projects related to chemical equipment design.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Introduction to Engineering Equipment Design	Lectures and Tutorials	Quiz
2	5	1	Engineering Design Principles and Industrial Standards	Lectures and Tutorials	Assignment
3	5	1,2	Materials Selection in Equipment Design	Lectures and Tutorials	Assignment
4	5	1,2	Mechanical Loads and Stresses	Lectures and Tutorials	Quiz
5	5	1,2	Design of Pressure Vessels	Lectures and Tutorials	Assignment
6	5	1,2	Design of Industrial Tanks	Lectures and Tutorials	Quiz
7	5	1,2,3	Practical Applications in Equipment Design	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Design of Heat Exchangers	Lectures and Tutorials	Assignment
10	5	1,2	Design of Pipes and Fittings	Lectures and Tutorials	Quiz
11	5	1,2	Design of Support and Fixing	Lectures and Tutorials	Assignment

			Systems		
12	5	1,2	Engineering Codes and Specifications (ASME)	Lectures and Tutorials	Assignment
13	5	1,2,6	Use of Engineering Software in Design	Computer Laboratory	Practical Assessment
14	5	1,4	Case Studies of Chemical Industry Equipment	Case Study	Report or Presentation
15	5	1,4,7	Comprehensive Review and Group Design Project	Cooperative Learning	Continuous Assessment
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Brownell & Young, Process Equipment Design. Ludwig, Applied Process Design for Chemical and Petrochemical Plants.
Main References	Brownell & Young, Process Equipment Design. Ludwig, Applied Process Design for Chemical and Petrochemical Plants. Sinnott & Towler, Chemical Engineering Design. Coulson & Richardson, Chemical Engineering Design. ASME Boiler and Pressure Vessel Code.
Electronic References	ASME resources, AIChE courses, and NPTEL lectures related to engineering equipment design.
Websites	www.asme.org www.aiche.org ocw.mit.edu nptel.ac.in
Other Resources	Equipment manufacturers' catalogs, engineering design manuals, industrial standards, engineering design software, and chemical equipment case studies.

Course Description Form

Computer Applications (Aspen HYSYS)

Course Name	Computer Applications (Aspen HYSYS)
Course Code	CHEM_ENG-411
Semester / Year	Annual System – First Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Computer Laboratory; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	4 ECTS / 100 Hours
Course Administrator	Mr. Omar Saeed Latif

8. Course Objectives

This course aims to introduce students to Aspen HYSYS and its uses in chemical process simulation, develop the ability to build and analyze engineering models of industrial processes, perform material and energy balances, simulate different process equipment, and use simulation results to improve chemical process performance. The course also covers the Aspen HYSYS interface, model building, material and energy balance calculations, and performance analysis and optimization of industrial equipment and processes.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, practical applications in the computer laboratory, project-based learning, engineering problem solving, industrial case studies, and the use of Aspen HYSYS to simulate and analyze different chemical processes.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	3	6	Introduction to Aspen HYSYS	Computer Laboratory	Practical Assessment
2	3	6	Software Interface and Project Management	Computer Laboratory	Practical Assignment
3	3	1,6	Entering Components and Selecting Thermodynamic Packages	Computer Laboratory	Practical Assignment
4	3	1,6	Creating Flow Streams and Performing Material Balance	Computer Laboratory	Practical Assessment
5	3	1,6	Energy Balance in Chemical Processes	Computer Laboratory	Practical Assignment
6	3	1,2,6	Simulation of Heat Exchangers	Computer Laboratory	Practical Assessment
7	3	1,2,6	Simulation of Pumps and Compressors	Computer Laboratory	Mini Project
8	2	6	Midterm Examination	Practical Examination	Midterm Exam
9	3	1,2,6	Simulation of Distillation Columns	Computer Laboratory	Practical Assignment

10	3	1,2,6	Design and Analysis of Absorption Columns	Computer Laboratory	Practical Assessment
11	3	1,2,6	Simulation of Advanced Heat Exchangers	Computer Laboratory	Practical Assignment
12	3	1,2,6	Simulation of Chemical Reactors	Computer Laboratory	Mini Project
13	3	1,2,6	Process Optimization Using Aspen HYSYS	Computer Laboratory	Practical Assessment
14	3	1,4,6	Integrated Industrial Case Study	Practical Project	Report and Presentation
15	3	1,4,6,7	Integrated Group Simulation Project	Cooperative Learning	Final Project
16	2	1,2,6	Final Examination	Practical Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Aspen HYSYS User Guide. Aspen HYSYS Simulation Basis Manual.
Main References	Aspen HYSYS Documentation. Seider et al., Product and Process Design Principles. Sinnott & Towler, Chemical Engineering Design. Turton et al., Analysis, Synthesis and Design of Chemical Processes.
Electronic References	AspenTech Documentation; LearnChemE Simulation Resources; AIChE Academy Learning Materials.
Websites	www.aspentech.com www.learncheme.com www.aiche.org ocw.mit.edu
Other Resources	Practical simulation files, laboratory manuals, industrial case studies, and chemical process design projects.

Course Description Form

Process Control

Course Name	Process Control
Course Code	CHEM_ENG-406
Semester / Year	Annual System – Second Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Laboratory; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	6 ECTS / 150 Hours
Course Administrator	Dr. Thaer Adnan Abdullah

8. Course Objectives

This course aims to introduce students to the basic concepts of industrial process control, understand the behavior of dynamic systems, study the components of control systems and measuring and control devices, and develop the ability to design and analyze control systems used in chemical industries and improve their performance. It also covers automatic control principles, industrial sensors and measurement devices, analysis and design of control loops, and computer simulation of control systems.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, practical applications, engineering problem solving, computer simulation software, industrial case studies, problem-based learning, and applied projects related to industrial control systems.

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or Subject Name**	**Learning Method**	**Evaluation Method**
1	5	1	Introduction to Process Control	Lectures and Tutorials	Quiz
2	5	1	Dynamic Systems and Process Behavior	Lectures and Tutorials	Assignment
3	5	1	Mathematical Modeling of Chemical Processes	Lectures and Tutorials	Assignment
4	5	1	Laplace Transform and Its Applications in Control	Lectures and Tutorials	Quiz
5	5	1,6	Transfer Functions	Lectures and Computer Applications	Assignment
6	5	1,6	Response of First- and Second-Order Systems	Lectures and Tutorials	Quiz
7	5	1,3	Measurement Devices and Industrial Sensors	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,3	Final Control Elements and	Lectures and Laboratory	Assignment

			Valves		
10	5	1,2	Open-Loop and Closed-Loop Control	Lectures and Tutorials	Quiz
11	5	1,2	P, PI, and PID Controllers	Lectures and Tutorials	Assignment
12	5	1,2,6	Controller Tuning and Performance Analysis	Computer Laboratory	Practical Assessment
13	5	1,2,6	Computer Simulation of Control Systems	Computer Laboratory	Practical Project
14	5	1,4	Industrial Applications and Case Studies	Case Study	Report or Presentation
15	5	1,4,7	Comprehensive Review and Group Project	Cooperative Learning	Continuous Assessment
16	3	1,2,6	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Seborg, Edgar & Mellichamp, Process Dynamics and Control. Coughanowr & LeBlanc, Process Systems Analysis and Control.
Main References	Seborg et al., Process Dynamics and Control. Coughanowr & LeBlanc, Process Systems Analysis and Control. Marlin, Process Control. Luyben, Process Modeling, Simulation and Control for Chemical Engineers. Stephanopoulos, Chemical Process Control.
Electronic References	LearnChemE Process Control Resources; AIChE Academy; MATLAB Documentation; NPTEL Process Control Courses.
Websites	www.learncheme.com www.aiche.org www.mathworks.com ocw.mit.edu nptel.ac.in
Other Resources	Laboratory manuals, MATLAB/Simulink software, industrial case studies, and industrial control system operating manuals.

Course Description Form

Petroleum Refining II

Course Name	Petroleum Refining II
Course Code	CHEM_ENG-407
Semester / Year	Annual System – Second Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	5 ECTS / 125 Hours
Course Administrator	Prof. Aysar Talib Jarallah

8. Course Objectives

This course aims to deepen students' knowledge of advanced refining processes, study modern conversion and treatment units in petroleum refineries, analyze the production of fuels, lubricants, and petrochemical products, and understand the economic and environmental aspects of modern refining operations. It emphasizes advanced refinery conversion processes, fuel production according to standard specifications, environmental and economic aspects, and the use of computer applications in refinery analysis.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, engineering problem solving, analysis of refinery flow diagrams, industrial case studies, presentations, project-based learning, and linking theoretical aspects with practical applications in the refining industry.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Basic Refining Operations	Lectures and Tutorials	Quiz
2	5	1,2	Hydrocracking Processes	Lectures and Tutorials	Assignment
3	5	1,2	Alkylation and Polymerization Processes	Lectures and Tutorials	Assignment
4	5	1,2	Production of High-Octane Gasoline	Lectures and Tutorials	Quiz
5	5	1,2	Diesel Fuel Production and Property Improvement	Lectures and Tutorials	Assignment
6	5	1,2	Manufacture of Petroleum Oils and Greases	Lectures and Tutorials	Quiz
7	5	1,2	Production of Petrochemical Feedstocks	Lectures and Tutorials	Assignment
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Treatment of Petroleum Gases	Lectures and Tutorials	Assignment
10	5	1,2	Sulfur Recovery and Pollutant	Lectures and Tutorials	Quiz

			Treatment		
11	5	1,2	Economics of Petroleum Refining	Lectures and Tutorials	Assignment
12	5	1,5	Environmental Aspects in Petroleum Refineries	Lectures and Discussions	Report
13	5	1,2,6	Computer Simulation of Refining Units	Computer Laboratory	Practical Assessment
14	5	1,4	Case Studies of International Oil Refineries	Case Study	Presentation and Report
15	5	1,4,7	Group Project and Refinery Analysis	Cooperative Learning	Project
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Gary, Handwerk & Kaiser, Petroleum Refining: Technology and Economics. Fahim, Al-Sahhaf & Elkilani, Fundamentals of Petroleum Refining.
Main References	Gary, Handwerk & Kaiser, Petroleum Refining: Technology and Economics. Fahim, Al-Sahhaf & Elkilani, Fundamentals of Petroleum Refining. Speight, The Chemistry and Technology of Petroleum. Meyers, Handbook of Petroleum Refining Processes. Nelson, Petroleum Refinery Engineering.
Electronic References	AIChE educational resources; SPE technical publications; NPTEL lectures on petroleum refining; MIT OpenCourseWare resources; U.S. Energy Information Administration resources.
Websites	www.aiche.org www.spe.org www.energy.gov ocw.mit.edu nptel.ac.in
Other Resources	Refinery operating manuals, global fuel specifications, technical reports from oil companies, and industrial case studies of petroleum refineries.

Course Description Form

Equipment Design II

Course Name	Equipment Design II
Course Code	CHEM_ENG-408
Semester / Year	Annual System – Second Semester / Fourth Year (2025–2026)
Description Preparation Date	12-10-2026
Available Attendance Forms	Theory Lectures; Tutorial Classes; Seminars
Number of Credit Hours (Total) / Number of Units (Total)	5 ECTS / 125 Hours
Course Administrator	Dr. Haider Akram Arif

8. Course Objectives

This course aims to develop students' skills in advanced design of chemical equipment, apply international engineering standards in the design of industrial equipment, analyze and design towers, reactors, heat exchangers, and separation equipment, and use modern engineering software to prepare detailed designs for industrial equipment. It also emphasizes applying ASME/API codes, designing chemical process equipment, using design software, and analyzing industrial design case studies.

9. Teaching and Learning Strategies

The course is based on theoretical lectures, design applications, engineering problem solving, specialized computer software, individual and group projects, and realistic industrial case studies related to chemical equipment design.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning Method	Evaluation Method
1	5	1	Review of Chemical Equipment Design Principles	Lectures and Tutorials	Quiz
2	5	1,2	Design of Industrial Towers	Lectures and Tutorials	Assignment
3	5	1,2	Design of Distillation Columns	Lectures and Tutorials	Assignment
4	5	1,2	Design of Absorption and Extraction Columns	Lectures and Tutorials	Quiz
5	5	1,2	Design of Industrial Reactors	Lectures and Tutorials	Assignment
6	5	1,2	Thermal Design of Heat Exchangers	Lectures and Tutorials	Quiz
7	5	1,2,3	Practical Applications in Equipment Design	Lectures and Laboratory	Laboratory Report
8	2	1	Midterm Examination	Examination	Midterm Exam
9	5	1,2	Design of Industrial Piping Systems	Lectures and Tutorials	Assignment
10	5	1,2	Design of Mechanical	Lectures and Tutorials	Quiz

			Separation Equipment		
11	5	1,2	Stress Analysis in Industrial Equipment	Lectures and Tutorials	Assignment
12	5	1,2	Design According to ASME and API Codes	Lectures and Tutorials	Assignment
13	5	1,2,6	Use of Advanced Engineering Design Software	Computer Laboratory	Practical Assessment
14	5	1,4	Case Studies in Industrial Equipment Design	Case Study	Report or Presentation
15	5	1,4,7	Integrated Design Project for Chemical Plant Equipment	Cooperative Learning	Final Project
16	3	1,2	Final Examination	Examination	Final Exam

11. Course Evaluation

Assessment Method	Weight (%)	Notes
Formative Assessment (quizzes, homework, class assignments, seminars, individual or group projects)	40%	Continuous assessment throughout the semester to monitor student progress and support learning.
Midterm Examination	10%	Measures students' understanding of the concepts and topics covered in the first half of the semester.
Final Examination	50%	Comprehensive examination conducted at the end of the semester to assess achievement of the course learning outcomes.

12. Learning and Teaching Resources

Required Textbooks	Brownell & Young, Process Equipment Design. Ludwig, Applied Process Design for Chemical and Petrochemical Plants.
Main References	Brownell & Young, Process Equipment Design. Ludwig, Applied Process Design for Chemical and Petrochemical Plants. Sinnott & Towler, Chemical Engineering Design. Coulson & Richardson, Chemical Engineering Design. ASME Boiler and Pressure Vessel Code. API Design Standards.
Electronic References	ASME and API resources, AIChE educational courses, and NPTEL lectures related to industrial equipment design.
Websites	www.asme.org www.api.org www.aiche.org ocw.mit.edu nptel.ac.in
Other Resources	Equipment manufacturers' catalogs, engineering design software (PV Elite, AutoCAD, Aspen EDR), international industrial standards, and case studies of industrial equipment design.