Ministry of Higher Education & Scientific Research
Scientific Supervision and Evaluation Device
Department of Quality Assurance and Academic accreditation
Department Accreditation

Academic Program and Course Description Guide

Environment and Pollution Techniques Engineering Department

2025

Introduction:

The academic program serves as a coordinated and organized package of study courses that encompass procedures and experiences regulated by individual study vocabulary. The main purpose is to build and refine graduates' skills, making them qualified to meet the demands of the job market. It is reviewed and evaluated annually through internal or external audit procedures and programs such as the External Examiner Program**.**

The academic program description provides a brief summary of the key features of the program and its courses, outlining the skills that students will acquire based on the objectives of the academic program. The importance of this description lies in its representation of the cornerstone for obtaining program accreditation. It is jointly written by the teaching staff under the supervision of scientific committees in the academic departments**.**

This guide includes a description of the academic program in its second edition after updating the vocabulary and paragraphs of the previous guide in light of the developments and changes in the educational system in Iraq. It includes the description of the academic program in its traditional form (annual, semester) as well as adopting the generalized description of the academic program according to the circular of the Studies Department No. 3/2906 dated 5/3/2023 regarding programs that primarily adopt the Bologna Process**.**

In this context, we cannot but emphasize the importance of writing academic program descriptions and study courses to ensure the smooth running of the educational process.

Concepts and Terminologies:

Academic Program Description: Provides a concise overview of its vision, mission, and objectives, including a precise description of the targeted learning outcomes according to specific learning strategies**.**

Course Description: Offers a succinct summary of the main features of the course and the expected learning outcomes for students to achieve, demonstrating whether they have maximized their learning opportunities. It is derived from the program description**.**

Program Vision: A visionary image of the academic program's future, aiming to make it an advanced, inspiring, motivating, realistic, and implementable program**.**

Program Mission: Clarifies the objectives and activities necessary to achieve them briefly, outlining the program's development paths and trends**.**

Program Objectives: Statements describing what the academic program intends to achieve within a specific timeframe, measurable and observable**.**

Curriculum Structure: All study courses included in the academic program according to the adopted learning system (semester, annual, Bologna process), whether mandatory (ministry, university, college, scientific department) with the number of credit hours**.**

Learning Outcomes: A coherent set of knowledge, skills, and values acquired by the student upon successful completion of the academic program. Learning outcomes for each course must be specified in a manner that achieves the program's objectives**.**

Teaching and Learning Strategies: Refers to the strategies used by faculty members to develop student teaching and learning. These are plans followed to achieve the program's learning objectives, encompassing all classroom and extracurricular activities to achieve learning outcomes for the program**.**

Republic of Iraq
Ministry of Higher Education & Scientific Research
Supervision and Scientific Evaluation Directorate
Quality Assurance and Academic Accreditation

Academic Program Specification Form for Colleges and Institutions

University: Northern Technical University
College: Technical Engineering College of Kirkuk
Department: Environment and Pollution Techniques Engineering
Date of Form Completion: / /2025

Dean	Dean's Assistant	Head of Department
Dr. Sami Aslan	Dr. Gilan ismat Safa Al-deen	Dr. Qayssar Mahmood Aja
Date: 2024/10/01	Date: 2024/10/01	Date: 2024/10/01

Quality Assessment and performance Assessment Division Manager
Dr. Rana Hilmi Abduljabbar

Date: 2025/02/01

Signature

1. Program Vision

Providing scientific and practical skills to prepare technical engineers capable of creating a clean and sustainable environment for society.

2. The program's message

Providing advanced and modern technical education to achieve the required societal progress and realize sustainable development goals through robust and globally recognized scientific methodologies.

3. Program Objectives

1) Graduating technical engineers specialized in environmental engineering sciences.
2) Producing scientific and applied research to identify environmental problems and develop engineering solutions.
3) Actively contributing to societal advancement and progress through organizing local and international seminars and conferences.
4) Adopting a continuous improvement approach for all departmental curricula to ensure achieving the department's vision and delivering its mission to society.

4. Program Accreditation

None

5. Other External Influences
None

6. Program Structure				
Program Structure	**Number of Courses**	**European Credit Units (ECTS)**	**Percentage**	**Notes**
Institutional Requirements	9	18	11.3	All courses are core.
College Requirements	15	32	20.1	All courses are core.
Department Requirements	39	112	70.4	33 core courses and 6 elective courses.
Summer Training	-	-	There are	Core.

Bologna / First Academic Level (First Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
University Requirements	Democracy and Human Rights	NTU100	2	–	2
	English Language I	NTU101	2	–	2
College Requirements	Differential and Integration	TECK101	4	-	6
	Engineering Drawing	TECK102	1	2	5
Departmental Requirements	Analytical Chemistry	ENPE111	2	3	7
	Principles of Environmental Engineering	ENPE112	4	–	8
	Total		15	5	30

Semester 1 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / First Academic Level (Second Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
University Requirements	Computer Principles	NTU102	2	1	3
	Arabic Language	NTU103	2	–	2
College Requirements	Workshops & Laboratories	TECK103	-	3	4
	Physics	TECK104	4	-	5
Departmental Requirements	Engineering Mechanics	ENPE113	4	-	5
	Organic Chemistry	ENPE114	2	3	6
	Applications of Differential and Integration	ENPE115	4	-	5
	Total		18	7	30

Semester 2 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / Second Academic Level (Third Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
University Requirements	Baath Crimes in Iraq	NTU200	2	–	2
College Requirements	Differential Equations	TECK200	3	-	5
Departmental Requirements	Environmental Chemistry	ENPE210	2	3	5
	Computer Programming	ENPE211	1	2	3
	Fluid Mechanics I	ENPE212	2	3	5
	Environmental Geology	ENPE214	2	3	5
	Principles of Surveying	ENPE213	2	3	5
	Total		14	13	30

Semester 3 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / Second Academic Level (Four Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
College Requirements	Environmental Ststistics	NTU201	2	–	3
	Summer Training I	NTU204	–	–	–
Departmental Requirements	Micro-Organism Techniques	ENPE218	2	3	7
	Ecology	ENPE219	3	2	6
	Hydrology	ENPE215	3	2	7
	Fluid Mechanics II	ENPE213	2	3	7
	Total		12	9	30

Semester 4 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / Third Academic Level (Fifth Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
College Requirements	Numerical and engineering analyses	TECK300	3	-	6
Departmental Requirements	Water Pollution	ENPE310	2	3	7
	Soil Pollution and Remediation	ENPE311	2	3	6
	Environmental Thermodynamic	ENPE318	2	-	5
	Air pollution and control	ENPE312	2	3	6
	Total		11	9	30

Semester 5 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / Third Academic Level (Sixth Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
College Requirements	Numerical analysis	TECK301	2	2	5
	Summer Training II	TECK302	-	-	-
	Hydraulic	ENPE314	4	-	6
	Water pollution control	ENPE315	2	-	7
	Air pollution control	ENPE313	2	3	7
	Solid Waste Management	ENPE319	2	3	5
	Total		12	8	30

Semester 6 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / Four Academic Level (Seventh Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
Departmental Requirements	Engineering Project I	TECK401	-	3	6
	Health and Safety	TECK 400	2	3	5
	Waste water Pollution Control	ENPE412	2	3	7
	Water Supply Engineering	ENPE413	2	3	7
	Environmental Impact Assessment and Legislation	ENPE418	2	1	5
	Total		8	13	30

Semester 7 | 30 ECTS | 1 ECTS = 25 hrs

Bologna / Four Academic Level (Eighth Semester)					
Requirement Type	Course Name	Course Code	Theory Hours	Practical Hours	Units
College Requirements	Engineering Economy	TECK402	2	-	6
	Engineering Project II	TECK403	-	3	6
Departmental Requirements	Water Distribution and Sewage	ENPE414	2	3	6
	Control and Measurement Engineering	ENPE413	2	3	6
	Sludge Treatment	ENPE416	2	3	6
	Total		8	12	30

Semester 8 | 30 ECTS | 1 ECTS = 25 hrs

7. Program Description				
Year/ Level	**Course or Module Coode**	**Course or Module Title**	**Credit Hours**	
			Theory	**Practical**
2023-2024/First		Environment and Pollution Engineering Department	33	12
2023-2024/Second		Environment and Pollution Engineering Department	26	22
2023-2024/Third		Environment and Pollution Engineering Department	23	17
2023-2024/Fourth		Environment and Pollution Engineering Department	16	25

8. Expected Learning Outcomes for the Program	
Knowledge	
A- Cognitive Objectives	**1)** To understand the concept of environment and pollution. **2)** To learn how to operate laboratory equipment and work with it. **3)** To understand experiments related to environmental pollution and its control. **4)** To learn procedures that help reduce pollution and methods to control it.
Skills	
B- Skills Objectives of the Program	**1)** To acquire skills in computer, use and project management. **2)** To use modern and advanced tools to deliver knowledge to the students. **3)** To understand the concept of the environment and pollution and sample testing. **4)** To understand how to diagnose theories and general principles in the study.
Values	
C- Affective and Value-Based Objectives	**1)** To acquire concepts and fundamentals of environmental laboratory management. **2)** To analyze problems faced by workers in the field and develop solutions. **3)** To evaluate proposed solutions and choose the best one.

	4) To design and open environmental laboratories and enhance self-learning skills.

9. Teaching and Learning Strategies

General strategies and methods of teaching and learning adopted in the program.

10. Assessment Methods

Daily tests, reports, seminars, mid-term exams, and final exams.

11. Teaching Staff

Teaching Staff

Academic Rank	Degree	Specialization		Total Staffing	
		General		Permanent	Part-time
Professor	Ph.D.	Geology	Petroleum Geology	Permanent	
Assistant Professor	Ph.D.	Civil Engineering	Environmental Engineering	Permanent	
Assistant Professor	Ph.D.	Chemistry	Organic Chemistry	Permanent	
Assistant Professor	Ph.D.	Industrial Management	Production and Operations Management	Permanent	
Assistant Professor	Ph.D.	Law	Law	Permanent	
Assistant Professor	Master's	Civil Engineering	Environmental Engineering	Permanent	
Lecturer	Ph.D.	Environmental Engineering	Environmental Engineering	Permanent	
Lecturer	Ph.D.	Chemical Engineering	Chemical Engineering	Permanent	
Lecturer	Master's	Electrical Engineering	Control Engineering	Permanent	
Lecturer	Master's	Surveying Engineering	Remote Sensing	Permanent	
Lecturer	Master's	Political Science	Political System	Permanent	
Lecturer	Master's	Mechanical Engineering	Thermodynamics	Permanent	
Lecturer	Master's	Chemical	Environmental	Permanent	

		Engineering	Engineering		
Lecturer	Master's	Civil Engineering	Hydraulics	Permanent	
Assistant Lecturer	Master's	Mechanical Engineering	Thermodynamics	Permanent	
Assistant Lecturer	Master's	Civil Engineering	Environmental Engineering	Permanent	
Assistant Lecturer	Master's	English Language	English Literature	Permanent	
Assistant Lecturer	Master's	Electrical Engineering	Electronics	Permanent	
Assistant Lecturer	Master's	Surveying Engineering	Surveying	Permanent	
Assistant Lecturer	Master's	Applied Geology	Environment	Permanent	
Assistant Lecturer	Master's	Chemical Engineering	Fuel and Energy	Permanent	

12. Admission Criteria

- The college sets the admission plan for the upcoming academic year through forms sent by the Ministry of Higher Education and Scientific Research to universities. This plan determines the capacity of colleges and future admission plans, which are defined by the department.
- The admission plan is sent to the Central Admission Directorate at the Ministry of Education, which is responsible for distributing students to colleges in Iraqi universities and to institutes and technical colleges affiliated with technical universities. Distribution is based on the department's criteria.
- Central distribution depends primarily on the final ministry exam results for the sixth preparatory year in various branches (scientific, literary, commercial, industrial), and each college specifies the qualifications for admitting students to its different departments.
- The department's admission criteria specify that students must come from the scientific branch of preparatory studies, either from within or outside Iraq, based on the college's submission plan according to the department's preferences.
- Students must provide the necessary information based on their grades from the final exams and their preferences for department selection, using forms provided by the college to allocate them based on competitive scores.
- The college allocates students to departments based on the following factors:
- The college's plan for student intake and department capacity.
- The students' total grades.
- The students' preferences.

Professional Development for Teaching Staff

- Scientific or academic trips.
- Educational meetings.
- Attending seminars.
- Recreational trips.
- Sports activities.
- Attending scientific debates.
- Training courses, both within and outside the country.

13. Major Information Sources for the Program

1) Textbooks.
2) Supplementary manuals.
3) External internet sources.
4) Scientific research.

14. Program Development Plan

1) Developing the department's infrastructure.
2) Developing the department's laboratories.
3) Updating the curriculum by removing, replacing, or adding courses.

	Curriculum Skills Map																			
	Please tick relevant boxes where individual programmer Learning Outcomes are being assessed																			
	Programmed Learning Outcomes																			
																	General and			
Year/ Level	Course code	Course title	Basic or Optional	Knowledge and understanding				Subject specific Skills				Thinking Skills				Transferable Skills (or) Other Skills relevant to employability and personal development			
				A 1	A 2	A 3	A 4	B 1	B 2	B 3	B 4	C 1	C 2	C 3	C 4	D 1	D 2	D 3	D 4
Bologna First Level First Stage	NTU100	Human Rights	Basic						√			√	√	√	√		√	√	√
	NTU101	English Language I	Basic						√			√	√	√	√	√	√	√	√
	TECK102	Engineering Drawing	Core		√			√	√			√	√	√	√		√	√	√
	TECK101	Derivatives and Integral	Core						√		√	√	√	√	√		√	√	√
	ENPE111	Analytical Chemistry	Core					√	√			√	√	√	√		√	√	√
	ENPE112	Principles of Environmental	Basic						√		√	√	√	√	√		√	√	√
	NTU103	Arabic Language	Basic	√			√			√	√	√	√	√	√		√		√

	NTU102	**Computer**	**Basic**	√				√			√	√	√	√			√	√	√
	TECK104	**Physics**	**Core**	√			√	√			√	√	√	√		√	√	√	√
Bologna First Level Second Stage	**TECK103**	**Workshop**	**Core**	√				√			√	√	√	√	√		√	√	√
	ENPE114	**Organic Chemistry**	**Core**	√				√			√	√	√	√	√		√	√	√
	ENPE113	**Engineering Mechanics**	**Supportive**	√				√		√	√	√	√	√			√	√	√

Courses Second Level First Stage	**NTU200**	**English II**	**Basic**		√			√			√	√	√	√	√	√		√	
	TECK201	**Mathematics I**	**Basic**		√				√			√	√	√	√			√	√
	ENPE210	**Environmental Chemistry**	**Basic**		√				√			√	√	√	√	√		√	√
	ENPE211	**Computer Programming**	**Basic**		√				√			√	√	√	√	√		√	√
	ENPE212	**Fluid Mechanics I**	**Basic**		√				√		√	√	√	√	√			√	√
	ENPE214	**Environmental Geology**	**Basic**		√				√		√	√	√	√	√		√	√	√
	ENPE217	**Principles of Surveying**	**Basic**	√	√	√			√	√	√	√	√	√	√		√	√	√
Courses Second Level Second Stage																			
	NTU201	**Environmental Statistics**	**Basic**						√		√	√	√	√	√		√	√	√
	TECK204	**Summer Training I**	**Basic**		√			√	√			√	√	√	√		√	√	√
	ENPE218	**Micro-Organism Techniques**	**Basic**		√	√			√	√	√	√	√	√	√		√	√	√

	ENPE219	**Ecology**	**Basic**	√	√	√		√	√		√	√	√	√	√		√	√	√
	ENPE215	**Hydrology**	**Basic**						√		√	√	√	√	√		√	√	√
	ENPE213	**Fluid Mechanics II**	**Basic**						√		√	√	√	√	√		√	√	√

	TECK300	**Numerical and Engineering Analysis**	**Basic**						√			√	√	√	√		√	√	√
	ENPE310	**Water Pollution**	**Basic**						√			√	√	√	√		√	√	√
	ENPN311	**Soil Pollution & Remediation**	**Basic**	√	√	√			√	√	√	√	√	√	√		√	√	√
	ENPE318	**Environmental Thermodynamics**	**Basic**	√	√	√	√		√	√	√	√	√	√	√		√	√	√
	ENPE312	**Air Pollution and Control**	**Basic**	√	√	√		√	√		√	√	√	√	√		√	√	√
Courses Third Level Second Stage																				
	TECK301	**Numerical and Engineering Analysis**	**Basic**	√	√	√	√		√	√	√	√	√	√	√		√	√	√
	TECK302	**Summer Training II**	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√		√	√	√
	ENPE315	**Water Pollution Control**	**Basic**		√	√			√	√	√	√	√	√	√		√	√	√
	ENPE313	**Air Pollution Control**	**Basic**	√	√	√	√		√		√	√	√	√	√		√	√	√
	ENPE319	**Solid Waste Management**	**Basic**		√			√	√			√	√	√	√		√	√	√
	ENPE317	**Hydrulic**	**Basic**						√			√	√	√	√	√	√	√	√

	TECK401	**Engineering Project I**	Basic		√	√	√		√		√	√	√	√	√		√	√	√
	TECK400	**Health And Safety**	Basic						√			√	√	√	√		√	√	√
	ENPE412	**Control Of Waste Water Pollutants**	Basic	√	√	√	√		√	√	√	√	√	√	√		√	√	√
	ENPE413	**Wayer Distribution Engineering**	Basic		√			√	√			√	√	√	√		√	√	√
	ENPE418	**Environmental Impact Assessment**	Basic	√			√		√		√	√	√	√	√		√	√	√
	TECK402	**Engineering Economy**	Basic	√	√	√		√	√		√	√	√	√	√		√	√	√
	TECK403	**Engineering Project II**	Basic	√	√	√	√		√	√	√	√	√	√	√		√	√	√
	ENPE414	**Sewage Engineering**	Basic	√	√	√	√		√	√	√	√	√	√	√		√	√	√
Annual Fourth Level Second Stage	**ENPE413**	**Control and Measurement Engineering**	Basic	√			√	√			√	√	√	√		√	√	√	
	ENPE416	**Sludge Treatment**	Basic		√	√			√	√	√	√	√	√	√		√	√	√

Undergraduate Courses
Level One (First Semester)

Module 1

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Democracy and Human Rights NTU100
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1-Introduction to Human Rights: The study of human rights aims to introduce students to the basic concepts of human rights and to learn about relevant international documents and treaties. The principles of human rights and their importance in different societies are explored.

2-Understanding human rights issues: The study of human rights aims to develop a deep understanding of human rights issues facing contemporary societies. Challenges and violations related to human rights such as discrimination, violence, torture, and social justice are discussed.

3-Critical analysis ability: The study of human rights enhances students' ability to analyze and evaluate issues related to human rights from a critical perspective. Students are encouraged to understand and evaluate policies and laws related to human rights and their impact on societies and individuals.

4-Enhancing cultural awareness: The study of human rights includes understanding and appreciating cultural diversity and respecting the rights and freedoms of individuals from different cultural backgrounds. The subject deals with issues such as tolerance, respect, and peaceful coexistence between different cultures.

5-Enhancing social awareness and civic participation: The study of human rights enhances students' social awareness and encourages them to participate civically in human rights issues. Students learn how to contribute to the promotion and protection of human rights and the promotion of justice and equality in society.

6-Critical thinking and problem solving: The study of human rights enhances students' critical thinking and problem-solving abilities. Students learn how to deal with complex human rights issues and develop their ability to propose innovative and effective solutions.

7-Promoting values and ethics: The study of human rights contributes to promoting values and ethics related to mutual respect, justice and equality. Students are encouraged to embrace the values of justice, equality, compassion and respect for the rights of others.

10. Course outcomes and teaching, learning and evaluation methods

1- Deep understanding of human rights: Students gain a deep understanding of the concept of human rights and the principles and laws related to them. They gain knowledge of relevant international treaties and documents and understand the importance of human rights in contemporary societies. 2-Ability to analyze human rights issues: Students gain the ability to analyze human rights issues and understand the challenges and violations facing human rights. They are able to analyze the legal, political and social status of human rights issues and evaluate them based on international principles and standards. 3-Cultural awareness and respect for diversity: Students learn about cultural diversity and develop the ability to respect different cultures and the rights of individuals regardless of their backgrounds. They learn the importance of peaceful coexistence, tolerance and mutual respect between different cultures. 4-Civil participation and social work: Students learn the importance of civic participation and social work in the field of human rights. They acquire the skills necessary to influence society and defend the rights of individuals and marginalized groups. 5-Critical thinking and problem solving: Students' abilities in critical thinking and problem solving are developed through the study of human rights
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure					
Week	Hours	Unit/Module or Topic Title	ILOs	Teaching Method	Assessment Method
1	2	Human rights, definition, objectives Human rights in ancient civilizations / Human rights in heavenly laws	Reports Theoretical	Reports Theoretical	Reports Theoretical
2	2	Human Rights in Contemporary and Modern History (International Recognition of Human Rights since the First World War and the League of the United Nations) / Regional Recognition of Human Rights: European Convention on Human Rights 1950, American Convention on Human Rights 1969, African	Reports Theoretical	Reports Theoretical	Reports Theoretical

		Charter on Human Rights 1981, Arab Charter on Human Rights 1994			
3	2	NGOs and human rights (ICRC, Amnesty International, Human Rights Watch, National Human Rights Organizations	Reports Theoretical	Reports Theoretical	Reports Theoretical
4	2	Human rights in Iraqi constitutions between theory and reality / the relationship between human rights and public freedoms: 1- In the Universal Declaration of Human Rights. 2- In regional charters and national constitutions	Reports Theoretical	Reports Theoretical	Reports Theoretical
5	2	Economic, social and cultural human rights, Civil and political human rights / Modern human rights: Facts in development, right to clean environment, right to solidarity, right to religion	Reports Theoretical	Reports Theoretical	Reports Theoretical
6	2	Guarantees of respect and protection of human rights at the national level, guarantees in the Constitution and laws, guarantees in the principle of the rule of law, guarantees in constitutional oversight, guarantees in freedom of the press and public opinion, the role of non-governmental organizations in respecting and protecting human rights / guarantees, respect and protection of human rights at the international level: 1. Role of the United Nations and its specialized agencies in providing safeguards 2- The role of regional organizations (Arab League, European Union,	Reports Theoretical	Reports Theoretical	Reports Theoretical

		African Union, Organization of American States, ASEAN .) 3 . Role of international, regional non-governmental organizations and public opinion in respecting and protecting human rights			
7	2	The general theory of freedoms: the origin of rights and freedoms, the legislator's position on public rights and freedoms, the use of the term public freedoms	Reports Theoretical	Reports Theoretical	Reports Theoretical
8	2	Organizing public freedoms from the previousness of equality: the historical development of the concept of equality the modern development of the idea of equality - Gender equality -Equality between individuals according to their beliefs and race to public authorities	Reports Theoretical	Reports Theoretical	Reports Theoretical
9	2	Freedom of learning, freedom of the press, freedom of assembly Freedom of association, freedom of work Right of ownership	Reports Theoretical	Reports Theoretical	Reports Theoretical
10	2	freedom of trade and industry Freedom of security and a sense of security Freedom to go and return Freedom of trade and industry Women's freedom	Reports Theoretical	Reports Theoretical	Reports Theoretical
11	2	Scientific and technical progress and public freedoms the future of public freedoms	Reports Theoretical	Reports Theoretical	Reports Theoretical
12	2	The crime of genocide	Reports Theoretical	Reports Theoretical	Reports Theoretical
13	2	Democracy, its characteristics and types	Reports Theoretical	Reports Theoretical	Reports Theoretical
14	2	Elections, their definition and types	Reports Theoretical	Reports Theoretic	Reports Theoretical

				al	
15	2	Contemporary political systems	Reports Theoretical	Reports Theoretic al	Reports Theoretical

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Analytical Chemistry ENPE110
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1**) Giving general information about chemicals and methods of dealing with them.**

2) Explanation of methods of chemical analysis of chemical compounds.

3) Calculations of reactant and product quantities in chemical reactions.

4) Analysis and calculation of the number of substances constituting chemical compounds.

5) Give detailed information about pH.

10. Course outcomes and teaching, learning and evaluation methods

1) Using both techniques and concepts in calculations related to chemicals. **2) Knowledge of quantitative and qualitative analysis methods.** **3) Analyzing chemical compounds and rocks and knowing the quality and quantity of each element.** **4) Using mathematical methods to calculate the pH values.**
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1	Introduction of analytical chemistry, quantitative analysis, qualitative analysis
Week 2	Gravimetric calculations of chemical analysis
Week 3	Calculations involving concentrations of solutions, physical methods, Molar Methods, Equivalent Methods
Week 4	Dilution of solutions
Week 5	Analysis of samples by titration with standard solution
Week 6	Calculation of Oxidation – Reduction titration, Equilibrium reactions
Week 7	Midterm Exam
Week 8	Acid – base equilibrium and PH of solutions, Equilibrium constant
Week 9	Expression of equilibrium constant in acidic medium
Week 10	Expression of equilibrium constant in basic medium
Week 11	Calculation of pH of aqueous solution, Weak acid plus its salt
Week 12	Titration curves, Strong acid- strong base, Weak acid – strong base
Week 13	Titration curves, strong acid – weak base, weak acid – weak base
Week 14	Acid — Base indicator
Week 15	pH dilution

Weekly lab schedule	
	Material Covered
Week 1	Lab 1: Identifying laboratory chemicals, their conditions, risks, and the correct ways to identify them
Week 2	Lab 2: Identifying laboratory equipment, names, and terms
Week 3	Lab 3: Preparation & Standardization From solid
Week 4	Lab 4: Preparation & Standardization From solid, continue
Week 5	Lab 5: Preparation & Standardization From liquid
Week 6	Lab 6: Preparation & Standardization From liquid, continue
Week 7	Lab 7: Titration of Sodium Carbonate with Hydrochloric acid (Acid – Base Titration)
Week 8	Lab 8: Titration of Sodium Hydroxide with Hydrochloric acid (Acid – Base Titration)
Week 9	Lab 9: Titration of Mixture with Hydrochloric acid (Acid – Base Titration)
Week 10	Lab 10: Determine the concentration of a given base using a standard acid
Week 11	Lab 11: Determine the concentration of a given acid using a standard base
Week 12	Lab 12: Qualitative analysis
Week 13	Lab 13: pH determinations of acid and base
Week 14	Lab 14: pH determinations of salts
Week 15	Lab 15: pH dilution

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Derivatives and Integral TECK101
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The aims of teaching and learning mathematics are to encourage and enable students to:

1-Understanding Fundamental Concepts: Develop a conceptual understanding of key principles and concepts in mathematics.

2- recognize that mathematics permeates the world around us

3-appreciate the usefulness, power and beauty of mathematics

4- enjoy mathematics and develop patience and persistence when solving problems

5- understand and be able to use the language, symbols and notation of mathematics

6- develop mathematical curiosity and use inductive and deductive reasoning when solving problems

7- become confident in using mathematics to analyze and solve problems both in school and in real-life situations

8- develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics

9- develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others

10-develop a critical appreciation of the use of information and communication technology in mathematics

11- Appreciate the international dimension of mathematics and its multicultural and historical perspectives.

12- Applying Mathematical Techniques: Gain proficiency in using mathematical tools and techniques, such as vector algebra, trigonometry, calculus, and differential equations, to analyze and solve problems in mathematics.

10. Course outcomes and teaching, learning and evaluation methods

1- Describe the elementary special functions (e.g. exponential, log and trigonometric functions) which arise in engineering.
2- Practice the skills obtained from differential and integral calculus to deal with models in engineering

3-Mathematical Proficiency: Apply mathematical techniques, including vector algebra, calculus, and differential equations, to analyze and solve problems in engineering

4- Problem-Solving Skills: Develop the ability to apply mathematical tools to solve a wide range of problems, both theoretical and practical, involving various real-world scenarios.

5- Communication Skills: Effectively communicate concepts, analysis, and problem-solving strategies through oral and written means, using appropriate scientific terminology and mathematical representations.
6- Cooperative learning approaches: This involves students learning collaboratively in small groups. Student-centred learning acts as a catalyst to students identifying what learning techniques work best for them, as well as what their strengths and weaknesses are in a particular topic.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure

Week	Material Covered
1	● Module 1: Functions, Domain, range
2-3- 4	● Equation of the straight line, Trigonometric functions and their sketches, Domain, ● Range, Inverse of functions, Absolute value, limits, Limits, applications, Polar ● coordinates (general definition) Conic sections (general definition).
5	ulus
6-7-8	tion. Rates of change, Velocity and acceleration. uations, implicit functions, Logarithmic, hyperloic , and hyperbolic functions.

	ge and small changes. ints for functions of two variables
9	Mean and rms values Volumes of solids of revolution
10-11	● Integral Calculus ● Standard integration
12-13	● Some application of integration: area under and between curves.
12-15	•Integration using algebraic substitutions, trigonometric substitutions, hyperbolic •substitutions, and partial fractions. Integration by parts, Reduction formula, Double and triple integrals

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Engineering drawing TECK103
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The specific objectives of the course include:

1. Introducing the student to the importance of engineering drawing and its relationship to other engineering subjects.
2. Develop the student's mental abilities in drawing simple and complex shapes.
3. Expanding the horizons of the student's imagination of geometric shapes and identifying their components, parts, mechanics and their working principle
4. **Understanding Technical Drawings:** Familiarize students with the principles and standards of technical drawings used in engineering. Develop the ability to interpret and analyze engineering drawings.
5. **Proficiency in Drawing Techniques:** Develop skills in creating accurate and precise engineering drawings computer-aided design (CAD) software.
6. **Standardization and Design Guidelines:** Familiarize students with industry standards and design guidelines for engineering drawings.
7. **Collaboration and Communication Skills:** Promote effective communication through engineering drawings among team members, clients, and manufacturers. Enhance students' ability to interpret and contribute to technical documentation, such as design specifications and project proposals.

Overall, the aim of the course is to equip students with the foundational knowledge and practical skills necessary to produce clear, accurate, and professional engineering drawings that facilitate effective communication and collaboration within the field of the engineering.

10. Course outcomes and teaching, learning and evaluation methods

1. **Familiarity with AutoCAD software:** Students should gain practical experience with computer-aided design (CAD) software tools commonly used in drawing. They should be able to create, modify, and annotate engineering drawings digitally.
2. **Knowledge of Geometric Construction:** Ability to create precise geometric shapes and constructions using AutoCAD tools. Understanding of concepts like points, lines, angles, and circles in a digital environment. Capability to apply geometric principles to create accurate drawings and designs.
3. **Competence in generating and understanding diagrams:** Students should be able to create and interpret diagrams that illustrate the physical connections between the components, devices, and systems. They should understand how to document the configurations and communicate them effectively.
4. **Ability to document the designs effectively:** Students should develop skills in producing clear, accurate, and professional engineering drawings that effectively communicate design intent, dimensions, tolerances, and other relevant information to stakeholders such as engineers, technicians, and manufacturers.

Capability to Read Different the Maps: Understanding of schematic diagrams. Ability to interpret and analyze the maps to understand component connections. Proficiency in recognizing symbols, annotations, and conventions used in the maps.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1	Introduction to AutoCAD • Exploring the AutoCAD Interface and tools • Setting up the workspace and units • Understanding basic drawing and editing commands
Week 2	Geometric Construction Techniques (Part 1) • Introduction to 2D shapes in AutoCAD • Points and lines • construction line and circles
Week 3	Geometric Construction Techniques (Part 2) • Rectangle, ellipses, and polygons • Tangent, perpendicular, and parallel relationships
Week 4	Geometric Construction Techniques (modify commands) • copy, move, offset • trim, extend, rotate
Week 5	Geometric Construction Techniques (dimension and layer) • Dimensioning and annotations • Adding text • layers
Week 6	AutoCAD Project Work (Part 1) • Applying the learned concepts to a practical project • Designing and drawing complex 2-Dimension shapes.
Week 7	Mid-term Exam
Week 8	Introduction to Isometric Drawings • Introduction to isometric projection

	• Creating isometric views of objects
Week 9	Isometric Drawings Techniques • Isometric drawing techniques and shortcuts • Adding dimensions and annotations to isometric drawings
Week 10	• Principle of First Angle Projection
Week 11	• Principle of Third Angle Projection
Week 12	• The conclusion of a third projection from Two known locations.
Week 13	• Cutting theory- Shapes and lines of cuts by type of material.
Week 14	AutoCAD Project Work (Part 2) • Applying the learned concepts to a practical project • Designing and drawing a complex shape • Presenting and documenting the project in the lecture
Week 15	**Preparatory Week**
Week 16	**Final Exam**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Principles of Environmental Engineering TECK112
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The objectives of this course are to ensure that societal development and the use of water, land and air resources are sustainable. This goal is achieved by managing these resources so that environmental pollution and degradation is minimized.

The principles of Environmental engineer's study water, soil and air pollution problems, and develop technical solutions needed to solve, attenuate or control these problems in a manner that is compatible with legislative, economic, social and political concerns. Civil engineers are particularly involved in such activities as water supply and sewerage, management of surface water and groundwater quality, remediation of contaminated sites and solid waste management. The activities of such engineers include, but are not limited to, the planning, design, construction and operation of water and wastewater treatment facilities in municipalities and industries, modelling and analysis of surface water and groundwater quality, design of soil and remediation systems, planning for the disposal and reuse of wastewaters and sludges, and the collection, transport, processing, recovery and disposal of solid wastes according to accepted engineering practices.

10. Course outcomes and teaching, learning and evaluation methods

1-upon completion of this subject, students acquire knowledge and skills in applying engineering and design solutions to an environmental problem and communicate in professionally varied ways relevant to professional engineering practice

2-An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics.

3-An ability to communicate effectively with a range of audiences.

4-An ability to apply engineering design to produce solutions that meet specific needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
Week	**Material Covered**
1	Introduction to Engineering Calculations • Dimensions, Units, and Their Conversion.
2-6	Introduction to Engineering Calculations (process and Process variables). Mass and weight. volume, flow rate and rotation time. Moles, Density, and Concentration, Choosing a Basis, Mole fraction and Mass fraction. Temperature, and Pressure.
7-9	Process data representation and analysis
10-13	Interpolation and Extrapolation
14	Curve fitting
15	fitting line. information Analysis.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

Level One (Second Semester)

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Principles of Computer NTU 102
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The aim of this module is to provide students with a comprehensive understanding of the key concepts and principles of computer science. Through the study of topics such as history, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cybersecurity, students will gain a broad understanding of the field of computer science and how it has evolved over time.

10. Course outcomes and teaching, learning and evaluation methods

1) Describe the historical development of computer science and its impact on society.
2) Understand the various methods of data representation and manipulation.
3) Identify the components of a computer and their functions.
4) Design and implement algorithms for a range of problems.
5) Understand the principles of programming languages and apply them to develop software.
6) Understand the structure and functions of operating systems.
7) Identify and analyze a range of applications of computer science.
8) Understand the principles of internet and networking technologies.
9) Identify and analyze various cybersecurity threats and methods of prevention.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure

	Material Covered
Week 1	**Introduction**
Week (2-4)	**Module 1: Fundamentals of Computer** Method of operation, simple diagram of the components and units of the computer. Phase" computers and the development of computers and the data and information, Fields use of computers, Computer components, Types of Computers, Computer software, Devices of input and output.
Week (5-7)	**Module 2: Window Operating System:** Desktop, Mouse, my computer icons, close window, stand by. Folders Size and cascade, windows folder construction, choose file or folder find, file or folder copy-paste
Week (8-10)	**Module 3: Microsoft word** Introduction, create new file, setup new page, save the files. Coordinating the cells and the worksheet window, Editing the cells, Columns and table boarders and shading. Inserting graphic, text and entering formulas inside the program window. Printing and printing setup.
Week (11)	**Module 3: Microsoft Excel** Introduction, Menu and Toolbars, Coordinating the cells and worksheet window. Editing the cells, Operations of the calculating by using Microsoft Excel program. Drawing the charts by using Microsoft Excel program. Printing and printing options.
Week (12-15)	**Module 4: Microsoft Power point** Introduction. The creating for Power point slides, Using and modifying the design templates, Editing of the Power point cells, Inserting pictures, text and tables in the presentation slides. Printing and Printing setup to the power point slides.

(Weekly Lab. Syllabus)	
	Material Covered
Week (1-3)	Lab 1: Computer Operating System (e. g. Microsoft Windows)
Week (4-6)	Lab 2: Document Processing I (e. g. Microsoft Word)
Week (7-9)	Lab 3: Document Processing II (e. g. Microsoft Word)
Week (10, 11,12)	Lab 4: Data Processing I (e. g. Microsoft Excel)
Week (13)	Lab 5: Data Processing II (e. g. Microsoft Excel)
Week (14)	Lab 6: Presentation Slides I (e. g. Microsoft PowerPoint)
Week (15)	Lab 7: Presentation Slides II (e. g. Microsoft PowerPoint)

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Physics Engineering ENPE 104
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

Material balances are used widely in engineering and environmental analyses. For example, mass balance theory is used to design chemical reactors, to analyse alternative processes to produce chemicals, as well as to model pollution dispersion and other processes of physical systems. Closely related and complementary analysis techniques include the population balance, energy balance and the somewhat more complex entropy balance. These techniques are required for thorough design and analysis of systems such as the refrigeration cycle.

In environmental monitoring, the term budget calculations is used to describe mass balance equations where they are used to evaluate the monitoring data (comparing input and output, etc.). In biology, the dynamic energy budget theory for metabolic organisation makes explicit use of mass and energy balance**.**

10. Course outcomes and teaching, learning and evaluation methods

1-upon completion of this subject, students acquire knowledge and skills in applying engineering and design solutions to an environmental problem and communicate in professionally varied ways relevant to professional engineering practice 2-express the differences in pressures given as a head of a fluid to the equivalent pressure as a force per unit area 3-apply material balances on nonreactive single-unit processes 4-explain the meaning of batch, semibatch, continuous, transient and steady state processes. 5-sketch a flowchart and labels it. 6-identify a convenient basis of calculation. 7-calculate the unknown variables by solving material balances.
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
Week	**Material Covered**
1	• Material balance with a single material • Splitting single material flow streams
2-4	Complex processes with single material-flow stream
5-7	• Material balance with multiple materials • Mixing multiple-material flow stream
8-9	Separating multiple material flow stream
10-11	Material balane with reactor
12-15	-Reactions Zero-order reaction,first order reaction Consecutive reaction -Reactor Mixing model (batch reactors,plug flow,completely mixed flow

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Organic Chemistry ENPE 114
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. Understanding what is organic chemistry
2. This course deals with the basic concept of organic chemistry.
3. This is the basic subject for all organic base compounds.
4. Understanding different type of carbon base compounds.
5. The properties and the preparation of organic compounds.

10. Course outcomes and teaching, learning and evaluation methods

1. Summarize what is meant by organic chemistry.
2. Discuss the various types of organic compounds.
3. Understanding the properties and the importance of these compounds.
4. Understanding the preparation of these compounds from other available or alternative compounds.
5. Discuss the chemical reaction of these compounds.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1	Introduction (what is organic chemistry)
Week 2	Hybridization Of Carbon
Week 3	Chemical Bonding (Covalent Bond, Ionic Bond)
Week 4	Alkanes ((Paraffines)), Iupac Name Of Alkanes, Common Name Of Alkanes
Week 5	Properties Of Alkanes, Isomers
Week 6	Preparation Of Alkanes
Week 7	Reactions Of Alkanes, Combustion
Week 8	Alkenes, Iupac Name Of Alkenes, Common Name Of Alkene
Week 9	Properties, Preparation Of Alkene
Week 10	Reaction Of Alkene
Week 11	Substitution Reaction
Week 12	Alkynes, Nomenclature, Properties, Industrial Source
Week 13	Preparation Of Alkynes, Preparation Of Alkynes
Week 14	Tautamerism, Alicyclic Hydrocarbons, Preparation Of Cyclic Compounds, Reactions
Week 15	Aromatic Compounds, Nomenclature And Reactions Of Aromatic Compounds

(Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Introduction about the general safety of the lab
Week 2-3	Lab 2: Measuring of Melting Point and Boiling Point
Week 4-5	Lab 3: Solubility and Distillation
Week 6-7	Lab 4: Purification and Recrystallization
Week 8-9	Lab 5: Detection of Alkanes, Alkenes and Alkynes
Week 10-11	Lab 6: Detection of Aromatic Compounds
Week 12-15	Lab 7: Detection of Aromatic Compounds

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Arabic Language NTU 103
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. Developing writing skills: Enhancing Arabic writing skills by learning grammar rules and training in writing articles and participating in administrative correspondence and official letters correctly and effectively.
2. Developing reading skills: Enhancing Arabic reading skills by reading a variety of texts, including articles, news, technical and literary documents.
3. Enhancing oral and written expression: Developing students' ability to express themselves in Arabic orally and in writing in daily and professional situations.
4. Learning technical Arabic: Providing students with technical vocabulary and terms specific to the field of engineering that help them interact and communicate effectively in the engineering environment.
5. Enhancing linguistic and literary culture: Introducing students to Arabic literature and culture by reading distinguished literary works and discussing important cultural and linguistic issues.

10. Course outcomes and teaching, learning and evaluation methods

1. Writing Skills: The ability to write texts in Arabic correctly and understandably, including articles, letters and administrative correspondence. 2. Reading Skills: The ability to read and understand texts in Arabic from a variety of sources including engineering, literary and media materials. 3. Language Communication Skills: The ability to express clearly and effectively orally and in writing in Arabic in academic and professional settings. 4. Grammar Understanding: Understanding and using basic grammar rules in Arabic, including grammar and morphology. 5. Arabic Culture: Understanding the basics of Arabic culture and literature and identifying notable literary works and important cultural issues. 6. Technical Vocabulary: Acquiring technical vocabulary related to the field of engineering that enables students to communicate effectively within the engineering environment.
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1-2	• Introduction to the Arabic language and its history • The Arabic alphabet: letters and sounds • Definition of the Alif, Lam, Hamza and their types
Week 3-4	• Spelling and pronunciation • Spelling and pronunciation exercises
Week 5	• Basic writing rules • Practice writing letters and words correctly
Week 6	• Rules related to Alif, Lam and Hamza • Practical exercises on using Alif, Lam and Hamza
Week 7	Mid-term Exam
Week 8-9	• How to construct a correct sentence • Form a logical paragraph • Practice writing simple topics

Week 10-12	• Drafting administrative letters and official correspondence • Rules and formats for letters and emails • Practical exercises on writing official letters
Week 13-14	• Introduction to writing articles • Article structure and its components • Practical training on writing a simple article
Week 15	**Final Exam**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Engineering Mechanics ENPE 113
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. Understanding Fundamental Concepts: Develop a conceptual understanding of key principles and concepts in mechanics, such as Newton's laws of motion, forces, vectors, equilibrium, motion, and energy.

2. Applying Mathematical Techniques: Gain proficiency in using mathematical tools and techniques, such as vector algebra, trigonometry, calculus, and differential equations, to analyze and solve problems in mechanics.

3. Analyzing Motion and Forces: Learn how to analyze the motion of objects and the forces acting upon them, including linear and angular motion, velocity, acceleration, and the concept of inertia.

4. Newton's Laws of Motion: Understand and apply Newton's three laws of motion to describe the behavior of objects under the influence of forces, including the concepts of momentum, impulse, and conservation laws.

5. Conservation Principles: Learn about conservation principles, including the conservation of energy, linear momentum, and angular momentum, and apply them to analyze and predict the behavior of physical systems.

6. Understanding Simple Machines: Explore the principles and applications of simple machines, such as levers, pulleys, inclined planes, and gears, and their role in mechanical advantage, work, and efficiency.

7. Grasping Particle and Rigid Body Mechanics: Study the mechanics of particles and rigid bodies, including the concepts of center of mass, rotational motion, torque, angular momentum, and moment of inertia.

8. Problem-Solving Skills: Develop problem-solving skills by applying the principles and concepts of mechanics to solve a wide range of problems, both theoretical and practical, involving various real-world scenarios.

9. Experimental Methods and Data Analysis: Learn experimental techniques for measuring and analyzing mechanical phenomena, including the use of instruments, data collection, error analysis, and interpretation of experimental results.

10. Engineering Applications: Understand the application of mechanics principles in engineering and technology, including the design, analysis, and optimization of mechanical systems, structures, and machines.

10. Course outcomes and teaching, learning and evaluation methods

1. Conceptual Understanding: Demonstrate a solid understanding of fundamental concepts and principles in mechanics, including Newton's laws of motion, forces, motion, equilibrium, energy, and momentum.

2. Mathematical Proficiency: Apply mathematical techniques, including vector algebra, calculus, and differential equations, to analyze and solve problems in mechanics.

3. Problem-Solving Skills: Develop the ability to apply mechanics principles and mathematical tools to solve a wide range of problems, both theoretical and practical, involving various real-world scenarios.

4. Analysis of Motion: Analyze and describe the motion of objects, including linear and angular motion, velocity, acceleration, and the concept of inertia, using appropriate mathematical models and concepts.

5. Forces and Interactions: Understand the concept of forces and how they act on objects, including the ability to identify and analyze different types of forces, determine their magnitudes and directions, and assess their effects on the motion of objects.

6. Conservation Principles: Apply conservation principles, such as the conservation of energy, linear momentum, and angular momentum, to analyze and predict the behavior of physical systems.

7. Particle and Rigid Body Mechanics: Understand the mechanics of particles and rigid bodies, including the concepts of center of mass, rotational motion, torque, angular momentum, and moment of inertia.

8. Experimental Skills: Demonstrate competency in conducting experiments related to mechanics, including using appropriate instruments, collecting and analyzing data, and interpreting experimental results.

9. Engineering Applications: Apply mechanics principles in engineering and technological contexts, including the design, analysis, and optimization of mechanical systems, structures, and machines.

10. Critical Thinking and Scientific Reasoning: Develop critical thinking skills by evaluating and interpreting scientific information, making logical connections between concepts, and applying scientific reasoning to solve mechanics problems.

11. Communication Skills: Effectively communicate mechanics concepts, analysis, and problem-solving strategies through oral and written means, using appropriate scientific terminology and mathematical representations.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
Week	**Material Covered**
1-2	- Basic concepts. - Composition & Resolution of forces.
3- 4	Principle of moments. - Moment of a force about specified axis, moment of a couple.
5-6	Resultants. a-Resultant of two coplanar-concurrent forces. b-Resultant of more than two coplanar-concurrent forces.
8-9	Equilibrium a-Condition for the equilibrium of a particle, The free body diagram, Categories of equilibrium, Equations of equilibrium.
10-11	Friction. Limiting friction., Types of friction, Laws of friction
12	Centriods Center of gravity, Composite bodies, Resultant of general distributed force system, Fluid pressure
13	Moment of inertia. a-Moment of inertia of an area by integration. b-Parallel axis theorem for an area. • c-Moment of inertia for composite area
14	Introduction to strength of material Normal stress & strain, sign convention, shear stress & strain
15	Poisson's ratio & Thermal stress

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Engineering Workshops TECK 103
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1-Study Workshop Skills by explaining principles of all workshop skills.
2-Explain a basic information about turning, milling, casting, welding, and other skills.
3-Use all available possibilities in workshop to explain skills to students.

4-Explain workshop skills theoretically and experimentally.
5- Show pupils How to manufacture all spare part experimentally.

10. Course outcomes and teaching, learning and evaluation methods

A1- Enhancing the analytical and practical abilities of the students by giving a complete summary of all the skills in the engineering workshops, a theoretical explanation of all the skills in the engineering workshops, which are as follows: engineering measurements, welding, filing, lathing, plumbing, grinding, scraping, milling and electrical installations in addition to their application Practically on the machines and devices in the workshops.
B - The soft skills objectives of the course.
Study the basic principles of skills for engineering workshops.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1	Study the welding skill theoretically.
Week 2	Study the welding skill experimentally.
Week 3	Study the measurement skill theoretically.
Week 4	Study the measurement skill experimentally.
Week 5	Study the casting skill theoretically
Week 6	Study the casting skill experimentally.
Week 7	Study the turning skill theoretically.
Week 8	Study the turning skill experimentally
Week 9	Study the milling skill theoretically.
Week 10	Study the milling skill experimentally
Week 11	Study the carpentry skill theoretically.
Week 12	Study the carpentry skill experimentally
Week 13	Study car workshop skill theoretically.
Week 14	Study car workshop skill experimentally
Week 15	Study the car workshop skill experimentally

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Applications of Derivatives and Integral ENPE 115
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering

5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The aims of teaching and learning mathematics are to encourage and enable students to:

1-Understanding Fundamental Concepts: Develop a conceptual understanding of key principles and concepts in mathematics.

2- recognize that mathematics permeates the world around us

3-appreciate the usefulness, power and beauty of mathematics

4- enjoy mathematics and develop patience and persistence when solving problems

5- understand and be able to use the language, symbols and notation of mathematics

6- develop mathematical curiosity and use inductive and deductive reasoning when solving problems

7- become confident in using mathematics to analyse and solve problems both in school and in real-life situations

8- develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics

9- develop abstract, logical and critical thinking and the ability to reflect critically upon their work and the work of others

10-develop a critical appreciation of the use of information and communication technology in mathematics

11- appreciate the international dimension of mathematics and its multicultural and historical perspectives.

10. Course outcomes and teaching, learning and evaluation methods

One of the most important applications of the derivative is its use as a tool for finding the optimal (best) solutions to problems. Optimization problems abound in mathematics, physical science and engineering, business and economics, and biology and medicine. For example, what are the height and diameter of the cylinder of largest volume that can be inscribed in a given sphere? What are the dimensions of the strongest rectangular wooden beam that can be cut from a cylindrical log of given diameter? Based on production costs and sales revenue, how many items should a manufacturer produce to maximize profit? How much does the trachea (windpipe) contract to expel air at the maximum speed during a cough? What is the branching angle at which blood vessels minimize the energy loss due to friction as blood flows through the branches? In this chapter we use derivatives to find extreme values of functions, to determine and analyze the shapes of graphs, and to solve equations numerically. We also introduce the idea of recovering a function from its derivative. The key to many of these applications is the Mean Value Theorem, which paves the way to integral calculus.

11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
Week	**Material Covered**
1	**Introduction**
2	Extreme Values of Functions
3	The Mean Value Theorem
4	Monotonic Functions and the First Derivative Test
5	Concavity and Curve Sketching
6	Indeterminate Forms and L'Hôpital's Rule
7	Applied Optimization
8	Applied Optimization
9	Applied Optimization
10	Volumes Using Cross-Sections
11	Volumes Using Cylindrical Shells
12	Arc Length
13	Areas of Surfaces of Revolution
14	Work and Fluid Forces
15	Moments and Centers of Mass

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

Second Level (Third Semester)

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Baath Crimes NTU 200
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The objectives of this course include:

1. Understanding History:

Studying the crimes of the defunct Baath Party regime may be part of understanding the events of the modern history of the region and the countries affected by it.

2. Event Analysis:

Examining the events and developments that occurred during the Baath Party rule, with a focus on events that represent human rights violations and crimes.

3. Justice and Human Rights:

Understanding the concepts of human rights and justice, and how justice can be achieved in light of the crimes committed by the Baath Party regime.

4. Legal Studies:

Focusing on the legal aspects of these crimes, and how they can be addressed through the national legal system or international law.

5. Prevention and Education:

Searching for ways to avoid the recurrence of such crimes in the future, and raising awareness about the importance of human rights.

10. Course outcomes and teaching, learning and evaluation methods

1. Understanding History and Context:

Students' ability to understand and analyze the historical context of the Baath Party's rule and how crimes occurred during this period.

2. Critical Analysis:

The ability to critically analyze events and situations, and evaluate their impact on society and human rights.

3. Legal Knowledge:

Understanding the laws and regulations related to crimes associated with the Baath Party regime, and how to apply them to achieve justice.

4. Critical Thinking:

Developing critical thinking skills and in-depth analysis of events and phenomena related to the subject. 5. Human Rights Awareness: Spreading awareness about human rights and emphasizing their importance in preventing the recurrence of such crimes in the future. 6. Dealing with Information Sources: Developing research and analysis skills in using reliable sources to understand history and evaluate events. 7. Writing and Communication: Improving writing and expression skills on topics related to the crimes of the defunct Baath Party regime. 8. Ability to interact with sensitive content: Developing the ability to interact with sensitive topics appropriately and professionally. These outcomes can contribute to preparing students for a deeper understanding of the subject and applying the acquired knowledge in different contexts, whether in the academic field or in society in general.
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1-2	• Crimes of the Baath regime according to the Iraqi Supreme Criminal Court Law of 2005 AD • The concept of crimes and their divisions • Crimes of the Baath regime according to the documentation of the Iraqi Supreme Criminal Court Law of 2005 AD
Week 3-4	• Psychological and social crimes and their effects, and the most prominent violations of the Baathist regime in Iraq • Psychological crimes • Mechanisms of psychological crimes • Social crimes
Week 5-6	• Psychological and social crimes and their effects, and the most prominent violations of the Baathist regime in Iraq • The Baathist regime's position on religion • Violations of Iraqi laws • Human rights violations

	• Some decisions on political violations
Week 7	Mid-term exam
Week 8-9	• Environmental crimes of the Baath regime in Iraq • War and radioactive pollution and mine explosions • Destruction of cities and villages (scorched earth policy)
Week 10-12	• Environmental crimes of the Baath regime in Iraq • Draining the marshes • Destruction of palm groves, trees and crops
Week 13-14	• Mass graves crimes • Mass graves events committed by the Baathist regime in Iraq • Chronological classification of mass graves in Iraq for the period 1963-2003
Week 15	**Final Exam**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Computer Programming ENPE211
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. Understanding Visual Basic Environment: Become familiar with the Visual Basic development environment, including the Integrated Development Environment (IDE) and its various components, such as the Toolbox, Properties window, and Code Editor.

2. Basic Programming Concepts: Learn fundamental programming concepts, including variables, data types, operators, control structures (such as loops and conditional statements), procedures, functions, and event-driven programming.

3. User Interface Design: Learn how to design user-friendly interfaces using Visual Basic's drag-and-drop tools, controls, and layout features. Understand how to customize control properties, handle user input, and create visually appealing forms.

4. Data Manipulation and Storage: Learn how to work with data in Visual Basic, including variables, arrays, and collections. Understand how to store and retrieve data from files, databases, and other external sources.

5. Error Handling and Debugging: Explore techniques for handling errors and exceptions in Visual Basic applications. Learn how to use error handling mechanisms, such as try-catch blocks, and debug and troubleshoot applications using breakpoints, watch windows, and other debugging tools.

10. Course outcomes and teaching, learning and evaluation methods

1. Understand the Visual Basic development environment, including the IDE and its components, and navigate through the various tools and windows.

2. Demonstrate a solid understanding of fundamental programming concepts, such as variables, data types, operators, control structures, procedures, functions, and event-driven programming.

3. Design and create user-friendly interfaces using Visual Basic's drag-and-drop tools, controls, and layout features, and customize control properties to enhance the visual appeal and functionality of forms.

4. Utilize a variety of GUI controls and customize their properties to create interactive and responsive interfaces. Implement user input validation and handle various user interactions effectively.

5. Demonstrate problem-solving and critical thinking skills in designing, implementing, and debugging Visual Basic applications.

6. Work effectively both independently and in teams, collaborating on projects, sharing code, and contributing to the development of Visual Basic applications.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1-2	• Software Engineering Introduction, Structural and Functional Modeling, Software Design and Construction
Week 3-4	• Flowchart Introduction, Symbols, Types of flowcharts, Exercise.
Week 5-6	• Introduction to Visual studio. Introduction to Visual studio. Platform, Environment, Menu Bar, Toolbars, Tool Box, Project explorer, Properties window, Form designer, Form layout
Week 7	Mid-term exam
Week 8-9	Toolbox and objects: Graphical User Interface, Command Buttons, Label, text box, check box, option, list box, Timer
Week 10-12	Constants, Variable and Procedures Constants and Variable, Arrays, Arithmetic operators, Expressions - Events, Properties, Methods - Procedures and Functions - Menus at Design time and run time
Week 13-14	Condition statement: If-Then, Select case. Loop statement: For-Next, Do-while, Do-Loop While, Exit Loop. Exit and stop statement
Week 15	Mashed edit control - Chart controls - Rich text box - Slider - Tabbed Dialog - Multiple forms - common dialog control.

(Weekly Lab. Syllabus)	
	Material Covered
Week 1-2-3	Introduction to Visual studio. Introduction to Visual studio. Platform, Environment, Menu Bar, Toolbars, Tool Box, Project explorer, Properties window, Form designer, Form layout
Week 4-5-6	Toolbox and objects: Graphical User Interface, Command Buttons, Label, text box, check box, option, list box, Timer
Week 7-8-9	Constants, Variable and Procedures Constants and Variable, Arrays, Arithmetic operators, Expressions - Events, Properties, Methods - Procedures and Functions - Menus at Design time and run time
Week 10-11-12	Condition statement: If-Then, Select case. Loop statement: For-Next, Do-while, Do-Loop While, Exit Loop. Exit and stop statement
Week 13-14-15	Debugging, Error Handling, Mashed edit control - Chart controls - Rich text box - Slider - Tabbed Dialog - Multiple forms - common dialog control.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan

1- Developing curricula appropriate to human rights developments
2- Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Differential Equations** TECK 200
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

- To equip students with the knowledge and understanding of mathematical concepts, notation and techniques relevant to mechanical engineering.
- To develop skills and confidence in mathematical modelling and problem solving.

To support students in understanding mathematical aspects of other modules.

10. Course outcomes and teaching, learning and evaluation methods

1. Use vectors to represent three-dimensional space, including points, lines and planes and find intersections among these.
2. Differentiate and integrate vectors in the context of dynamics problems and understand scalar and vector products and their use in mechanics and dynamics.
3. Integrate and differentiate functions using a range of techniques and relate derivatives and integrals to engineering applications such as rates of change, maxima and minima, areas, volumes, averages, flow rates, work, centres of mass, etc.
4. Sketch (freehand) basic and composite functions, recognising limiting behaviours and discontinuities.
5. Create mathematical models of engineering systems described by first order ordinary differential equations, and solve the equations analytically and via Euler's method.
6. Differentiate and integrate functions of more than one variable.

7. Understand the formation of matrices, their associated algebra, their use in the solution of simultaneous equations and in graphical transformations, and the concepts of eigenvalues and eigenvectors.
8. Understand, manipulate and plot complex numbers and functions in various forms, find complex solutions of equations, and appreciate the links between exponential, trigonometric and hyperbolic functions.
9. Present data effectively using a variety of techniques.
10. Calculate important statistical measures of central tendency and dispersion.
11. Understand the concept of correlation and regression, calculate the regression coefficient and determine regression lines via the least squares technique.
12. Understand the basic concepts of probability, including conditional probability and independence.

Skills outcomes

- Mathematical modelling and problem-solving skills
- Ability to apply mathematics to represent, analyse and design engineering systems.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
Week 1	Ordinary Differential Equations (ODEs)
Week 2	First-Order ODEs
Week 3	First-Order ODEs
Week 4	First-Order ODEs
Week 5	First-Order ODEs
Week 6	First-Order ODEs
Weeks 7	First-Order ODEs
Weeks 8	Mid-Term Exam
Week 9	Second-Order Linear ODEs
Week 10	Second-Order Linear ODEs
Week 11	Second-Order Linear ODEs

Week 12	Second-Order Linear ODEs
Week 13	Higher order linear equation
Week 14	Higher Order Linear ODEs
Week 15	Higher Order Linear ODEs

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan

1- Developing curricula appropriate to human rights developments
2- Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Environmental Chemistry
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. To develop problem solving skills and understanding of environmental chemistry through the application of different techniques.
2. To understand the different element cycle in relationship with the environmental problems and their impact on environmental pollution.
3. This course deals with the air, water and soil pollution trace element and pesticide.
4. This course deals with the subject of climate change and global warming.
5. To understand the causes of acid rain and its relationship with the aerosol types.
6. The core deals with the evaluation and choses the solution for all above subject.

10. Course outcomes and teaching, learning and evaluation methods

Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.

1. Thinking about the minimizing the air, water and soil pollution
2. Evaluation and give the solution thorough the understand of elements and gases cycle and their impact on the environment pollution
3. The possibility of measuring and evaluation the impact of the three types of pollution through learning to use different techniques.
4. Learning to evaluate and discuss the results obtained from the results of different analyzes of environmental pollution.
5. Learning to evaluating the environmental impact and writing technical reports for the various projects that established by investment the natural resources or industrial project.
6. Providing solutions for old projects established previously for purpose of reducing the environmental impact of pollutants resulting from industrial waste.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure

	Material Covered
Week 1	The properties of each atmosphere layers. The introduction to air pollution, air content gases, distribution and its impact, which enhancement with other man-made and natural production the environmental pollution.
Week 2	The study of some elements and gases cycles (Carbon, Nitrogen, Sulphur and phosphor) in details which has impact on environmental pollution
Week 3	Continue.
Week 4	Continue
Week 5	Detail study of ozone advantages and disadvantages, with all chemical formula of ozone distraction causes subject,
Week 6	Aerosol definition and classification, the enhancement each type in air

	pollution so how can minimize their impact on environmental pollution
Week 7	Continue.
Week 8	Photochemical reaction definition, and classification Properties of each type and the differences between the two types The relationship between the aerosol and photochemical reaction within the environmental pollution subject.
Week 9	Continue.
Week 10	Acid rain definition, and causes Study the types of gases causes the acid rain Study the gases cycle that's causes the acid rain. Minimizing methods of acid rain impact on environment
Week 11	Continue.
Week 12	Study the global warming theory and definition Causes of global warming and its impact on environment The method of reducing the global warming impact on environment
Week 13	Climate change definition and causes The relationship between global warming and climate change
Week 14	Trace and major elements, the differences between them. Water pollution by trace element The component of soil, ideal section of soil layers Soil pollution through trace element.
Week 15	Pesticide types and classification according to their uses. The impact of pesticide on the environment, and the ways to reduce this impact.
Week 16	**A comprehensive review of all subject in the curriculum.**

(Weekly Lab. Syllabus)	
	Material Covered
Week 1,2	learning the student technical report writhing in addition to see the all equipment and apparatus existed in the environmental chemistry lab.
Week 3,4	measurement the Ph of different solution were collected from different site, through three methods like using litmus paper, portable Ph meter and using

	fixed type Ph meter and discuss the results within the technical report
Week 5,6	Determine salt concentration in different samples of water using EC method with the formula of transformation between EC and salinity measurement. Discuss the results within the technical report.
Week 7,8	Determine the turbidity of different samples using turbidity meter and discuss the reasons of different results obtained through writing technical report.
Week 9,10	Determine the concentration of major element within the different water samples, discuss the different results in a technical report.
Week 11,12	Determine the concentration of trace element within the different water samples, discuss the different results in a technical report.
Week 13,14,15	Field trip to collect and measure all above properties, and the evaluate the result with discussion in technical report.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Environmental Geology
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. To develop problem solving skills and understanding of environmental Geology through the application of different techniques.
2. To understand the relationship with the Geological problems as a natural problem and their impact on human life through the environmental pollution.
3. This course deals with the five essential factors which the environmental geology builds on,
4. This course deals with the subject of the earth layers' division, the properties of each layer in addition to the weathering and erosion processes impact
5. To build scientific knowledge about minerals and rocks and their types in the nature, so understand their impacts on human life and environment hazards
6. The core deals with the earthquakes causes on the based-on plate tectonic theory and study their hazards impact on human life, hence chose the solution for this subject.
7. Study the rivers and streams and the classification basin of river
8. Study the causes of rivers flooding and their impact on human live, and attempt to put solution.

10. Course outcomes and teaching, learning and evaluation methods

Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.

1- Thinking about the environmental geology and the roles that can play in human live
2- Knowledge about the interaction between the five fundamentals basic of environmental geology and behavior of human
3- To build Knowledge about the earth component and layers.
4- Learn the rock cycle in the nature and the rocks type, and the that mineral which it is composed, study the impact of minerals and rocks impact on human live
5- Learning about the volcanos and its impact on human live.
6- Learning about the earthquake and its causes, hence evaluation of its damage and impacts on human live.

Study the river and stream basins, learning about type of rivers and their impact on human live through flooding and attempt to put solution against this problem.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1	The introduction to the environmental geology, philosophy and fundamental concepts
Week 2	The study Five fundamental concepts – Population growth – Sustainability – System and change – Hazardous Earth processes – Scientific knowledge and values - other concepts in environmental geology – Finite resources, health, obligation to future
Week 3	Continue.
Week 4	Continue.
Week 5	Continue.
Week 6	Detail study of earth structure and layers
Week 7	Continue.
Week 8	Definition and classification of weathering and erosion. Study the factors that control each process and study the impact of these two processes on human environment supported by applied examples
Week 9	Continue.
Week 10	Study of Volcanic Origin and types, Volcanic Features Volcanic Alert or Warning, Forecasting Volcanic Activity Volcanic Hazards and Impact Risks,
Week 11	Continue.
Week 12	Definition and classification of minerals and rocks on the basis of chemical and mineralogical composition, the lecture also contain the rock cycle and rock types. Study the uses and impact of minerals on human health and environment.
Week 13	Continue.
Week 14	Plate tectonic theory, Plate Boundary and Earthquakes,
Week 15	Causes for Earthquakes, Earthquake Processes Seismic Waves, Intraplate Earthquakes, Earthquake Magnitude Scale Earthquake Intensity Scale, Effects and impacts of Earthquakes, Earthquake Prediction
Week 16	**A comprehensive review of all subject in the curriculum.**

(Weekly Lab. Syllabus)	
	Material Covered
Week 1,2	learning the student technical report writhing in addition to see the all equipment and apparatus existed in the environmental geology lab.
Week 3,4	Studying and viewing hand specimens of different minerals, studying their different physical and chemical properties, and comparing their hardness in comparison with standard minerals for measurement according to the Mohs scale of mineral hardness.
Week 5,6	Studying rocks and classifying them on the basis of how they are formed and where they are located, as well as classifying them on the basis of the type of minerals that make them up
Week 7,8	Identify the characteristics of contour lines and their importance in drawing contour maps, which help explain many topographical phenomena, as well as the possibility of making calculations and measurements from these maps.
Week 9,10	Drawing simple contour maps, interpreting the topographical phenomena resulting from drawing the map, and writing a technical report for the map that resulted from the drawing.
Week 11,12	Drawing complex contour maps, interpreting the topographical phenomena resulting from drawing the map, and writing a technical report for the map that resulted from the drawing.
Week 13,14,15	Learn how to make calculations and measurements from contour maps, such as how to measure inclination and slope, identify the difference between them through the result, and finally write a technical report on the subject.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Fluid Mechanics ENPE212
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. Understanding the fundamental of fluid properties and its behavior. Basic concepts of fluid, physical properties, fluid behavior (liquids, gases, blood and plasma) at rest and motion. Fluid mechanics has a wide range of applications in Engineering, biological systems, and in astrophysics.
2. Studying pressures, their types, effects, and transmission in fluids and their applications to knowing measurement of pressure at different conditions as industrial processes require the system to operate under specific pressures. In addition to safety considerations.
3. Studying the static hydraulic forces on surfaces is to understand the principles and mechanisms of fluid pressure and flow, and its effect on structures and materials that come in contact with fluid. This understanding is essential in designing structures such as dams, bridges, ships, and offshore platforms that are exposed to water pressure. It is also important in the design and operation of hydraulic systems, where pressure and fluid flow play a critical role in the functionality of the system. By studying the static hydraulic forces on surfaces, engineers can develop better designs of these structures and systems that are safe, efficient, and durable.
4. Also understanding the fundamental of fluid turbulence and flow, collect more information about flow in pipe and losses through pipe, also collect more information about flow in open channel considering the best hydraulic section and specific energy.
5. The objective of calculating dynamics and kinematics of fluid motion is to understand and predict the behavior of fluids in motion. Dynamics deals with the study of the forces and their effects on the motion of fluids, while kinematics deals with the study of the motion itself without considering the forces that cause it.

10. Course outcomes and teaching, learning and evaluation methods

1. Understand the fundamental principles and concepts of fluid mechanics.
2. Apply mathematical and physical concepts to solve fluid mechanics problems.
3. Analyze and interpret data related to fluid mechanics.
4. Perform experiments and analyze experimental results related to fluid mechanics.
5. Understand the behavior of fluids in different flow regimes.
6. Analyze the effect of external forces on fluid flow.
7. Understand the principles of fluid dynamics and their applications in various fields.
8. Analyze the performance of different types of fluid systems and their components.
9. Understand the inter-relationship between fluid mechanics and other related fields such as thermodynamics, heat transfer, and materials science. Appropriate scientific terminology and mathematical representations.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure

Week	Material Covered
1-2	• Fundamental of fluid mechanics, Introduction, Fluid properties (Mass density, Weight density, Relative density, Specific volume, Viscosity, Compressibility and Surface tension).
3-4	Principle of static fluids and general equation. • Pressure Measurement, Pascal' s Law, Absolute and Gauge pressure.
5-6	• Hydrostatic Force on Surface (Horizontally Immersed Surface, Vertically Immersed Surface, Inclined Immersed Surface, Curved Immersed Surface.
7	• Buoyancy and Floatation
8-9	Fluid Kinematic and Fluid Dynamic Types of Fluid Flow, Continuity Equation, Bernoulli' s Equation
10	Measurement of Flow Rate (Venturi meter, Orifice, free jet, pitot tube)
11-12	• Laminar and Turbulence flow (between Parallel Plates and Through Circular Pipes)
13-14	Friction losses in pipe flow, Pipe Connecting, Miner losses, Branching
15	Flow in Open Channel

(Weekly Lab. Syllabus)

Week	Material Covered
1	Introduction in Fluid Mechanics Laboratory.

2	Description of Laboratory Equipment
3	Experiment of Fluid density
4	Experiment of Viscosity
5	Experiment of Manometer
6	Experiment of (Calibration of pressure gauge) Borden gauge
7	Experiment of Centre of pressure and hydrostatic force on a submerged body (Hydrostatic bench)
8	Experiment of Calibration of flow meter(Rota meter)
9	Experiment of Calibration of venturi meter
10	Experiment of Calibration of Orifice meter
11	Experiment of straight pipe
12	Experiment of Load losses for an elbow 90o
13	Experiment of Load losses for an elbow 45o
14	Review Week before Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	Surveying ENPE213
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The objective of surveying is to familiarize the student with the basic topics in surveying science by collecting and interpreting information related to land and its geography, and using that information in effective planning and management. Finally, preparing the student to be able to apply projects using surveying equipment.

10. Course outcomes and teaching, learning and evaluation methods

1. Know the basics topics in surveying.
2. Apply projects using surveying equipment.
3. Apply the laws and methods that he learned to benefit from them practically in engineering projects.
4. Acquire the skill to think in an engineering way when calculating areas.Use the acquired and learned information in effective planning and management.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure

Week	Material Covered
1-2	**Basic concepts of surveying:** • Definition, Classifications of Surveying, Kinds of Surveying, Principles of Surveying plotting, Basic measurements. • Units of measurements, Locating position, Scale.
3- 4-5	**Distance measurement:** • Equipment used for distance measurement, Measurement of distance, Measurement of distance by tape or chain, Kinds of errors, Source of errors. • Correction For tape measurement, Correction for absolute length, Correction for temperature, Correction for Pull “tension”, Correction for Slope, Correction for Sage, Correction For (M.S.L). • Obstacles in Surveying, Main obstacles in chaining of line.
6	**Conception of Magnetic Bearing:** Whole Circle Bearing (WCB), Reduced Bearing (RB), Problems on obstacles in chaining
7-8-9	**Leveling:** • Terms used in Leveling, Equipment used in leveling**,** Use of Levels • Rise and fall Method.

	• Height of collimation Method.
10-11-12	**Cross-sections:** • Grade line, Cut and Fill, Drawing Profiles • Calculate of cross section area • Calculate of volume
13	**Traverse:** Computation of latitude and departure
14	**Curves:** Circular curves, Setting out curves, Compound and reverse curves
15	**Underground Surveying:** Optical methods – Mechanical methods – Line and level

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
1- Developing curricula appropriate to human rights developments **2-** Dividing the article into two parts, the first related to human rights and the second to democracy.

Second Level (fourth semester)

Module 20: Professional Ethics NTU201

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Professional Ethics NTU201**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

With the rapid developments in various aspects of life, new problems arise that graduates of technical colleges have not encountered before. Some of these problems have an ethical dimension that is difficult for graduates to handle. This course aims to introduce students at the Middle Technical University to professional ethics according to their technical specialization, and to equip them with ethical principles that will strengthen their commitment to these principles. This will enable them to solve ethical problems they may face in their future professional careers after graduation.

10. Course outcomes and teaching, learning and evaluation methods

This course will enable all students to understand the principles of ethical analysis and to think critically about various professional situations they may encounter, allowing them to respond in the most ethically appropriate manner after graduation. Additionally, this course will assist technical colleges and institutes in obtaining academic accreditation from specialized global accreditation bodies by incorporating professional ethics as part of their curricula.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
	Material Covered
Week 1,2	Unit (1) – Ethics
Week 3,4	Unit (2) – Work and Profession
Week 5,6	Unit (3) – Professional Ethics
Week 7	Unit (4) – Values and Professional Ethics
Week 8	Unit (5) – Types of Unethical Behavior in the Profession
Week 9	Unit (6) – Methods and Techniques for Reinforcing Professional Ethics
Week 10	Unit (7) – Ethics of the Engineering Profession
Week 11,12	Unit (8) – Code of Ethics for the Engineering Profession by the Arab Engineers Union
Week 13,14,15	Unit (9) – Ethics of Engineers in Education and Continuous Training
Week 16	Preparatory week before the Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Professional Ethics course development plan includes defining clear learning objectives, integrating practical tools like case studies and role-playing, and aligning with global accreditation standards and ethical codes, such as the Arab Engineers Union's. The plan ensures interactive teaching, regular assessments, and continuous improvement through feedback and faculty training, culminating in a preparatory review week before the final exam.

Module 21: English Language

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**English Language TECK202**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The course aims to develop advanced skills in reading, writing, speaking, and listening for the chemical and oil engineering industry. It focuses on analyzing technical texts, producing clear reports, delivering presentations, and professional communication strategies. Emphasis is placed on technical vocabulary, intercultural communication, and proper grammar, alongside interpreting figures and charts effectively.

10. Course outcomes and teaching, learning and evaluation methods

1) Read and understand technical texts and research papers in the chemical and oil engineering field.
2) Write clear and structured technical reports, proposals, and documentation.
3) Deliver effective presentations and speeches on technical topics.
4) Communicate professionally in oral and written forms within professional settings.
5) Use specialized vocabulary and terminology specific to chemical
6) and oil engineering.
7) Listen and comprehend technical lectures, presentations, and discussions.
8) .Adapt to cross-cultural communication in the industry.
9) .Apply industry-specific communication strategies.
10) 9Students will identify and produce grammatical structures.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure

	Material Covered
Week 1,2	Technical Reading and Comprehension
Week 3,4	Technical Writing and Documentation
Week 5,6	Presentations and Public Speaking in the Chemical and Oil Engineering Field
Week 7	Professional Communication and Email Etiquette
Week 8	Specialized Vocabulary and Terminology.
Week 9	Listening and Comprehension in Technical Contexts
Week 10	Cross-Cultural Communication in the Chemical and Oil Engineering Field
Week 11,12	Industry-Specific Communication Strategies
Week 13,14,15	English Grammar
Week 16	Preparatory week before the Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The course enhances technical English skills through structured weekly units on reading, writing, presentations, vocabulary, and grammar. It incorporates practical methods, regular assessments, and a final review week for exam preparation.

Module 23: Micro-Organism Techniques ENPE218

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Micro-Organism Techniques ENPE218**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) The objectives of studying this module are to make the students to acquaint students with basic concepts of microbial diversity and how the microbe concept emerged

2) To help you become familiar with the basic microbial structure and study the comparative characteristics of prokaryotes and eukaryotes

3) Know general bacteriology and microbial aspects pertinent to bacteria, fungi, and algae

4) To be Aware of historical developments and their applications as technology Cognizant of the contribution of various pioneers of microbiology Aware of the diversity of microorganisms

5) Impact of microbes on Earth Atmosphere, health, and technology development Recognise the scope of microbiology in all spheres of life and the industrial sector Ways to classify the living system

6) Inculcate the ability to apply the process of science Demonstrate ability to formulate hypotheses and design experiments based on the scientific method.

7) Analyse and interpret results from a variety of microbiological methods and apply these methods to analogous situations.

8) Demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures Understand the basic microbial practices

10. Course outcomes and teaching, learning and evaluation methods

1) Know general bacteriology and introduce microbial techniques for isolation of pure cultures of bacteria, fungi, algae and virus

2) Demonstrate theory and practical skills in handling microbial culture

3) Know various bacteria based on nutritional needs.

4) understand various physical and chemical means of sterilization

5) Discern knowledge about sterility assessment of sterilizing agents

6) 6- Able to demonstrate basic biochemical characteristics of bacteria

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)

Week	Material Covered
1	Fundamental of Microbiology(micro biology in our live)
2-3- 4	Structure and function of cell constituents Modern developments in microbiology Naming and classifying microorganisms and the diversity of microorganisms
5	Microbes and human welfare and human disease
6-7-8	Pathogens and indicator organisms Microbiology and microorganisms in environment I Aquatic microbiology and ecology
9-11	Microbiological examination Bioassays tests for toxicity evaluation Environmental factors that influence Microbes
12-13	Ecological associations among microorganisms Microbial metabolism Microbial growth
14-15	Control of microbial growth Applied microbiology and environment Microbiology and cycle of the elementsConstrained minimzer fmincon

13. Course Structure (Practical)

	Material Covered
Week 1,2	Microbiology Aseptic Techniques/ Sterilization/ Sanitization
Week 3,4,5	Culturing Techniques/ Types of Culture Media
Week 6,7.8	Staining Techniques in Microbiology
Week 9,10,11	Isolation Techniques in Microbiology
Week 12, 13,14,15	Identification of Pathogen

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The course development plan includes studying microbial diversity, prokaryote and eukaryote structures, and classification systems. It emphasizes hands-on skills in microscopy, staining, and microbiological methods, alongside applying scientific processes to analyze and interpret experimental results.

Module 24: Ecology ENPE219

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Ecology ENPE219**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) Demonstrate a broad understanding of the processes that shape the distribution and abundance of organisms from the micro-habitat to the globe.

2) Recognize that the distribution of organisms is a product of positive and negative interactions within and across trophic levels, including competition, mutualism, predation, and parasitism.

3) Analyze interactions within the context of specific habitats and judge how the habitat shapes the distribution and abundance of species. Key factors that influence the habitat include climate, energy input, spatial/temporal complexity, and resource availability.

4) Evaluate the relationships among ecological interactions, habitat context, and the evolution of organism form and function.

5) Judge how organism function, habitat context and interactions within and across trophic levels influence the flow of energy and the movement and recycling of matter in communities and ecosystems.

6) Judge how ecological processes across all scales are affected by human activities, and apply basic ecological principles to meet societal resource management and conservation goals.

7) Distinguish how the evolution of organism form and function influences ecological interactions and habitat tolerance and judge how ecological processes in turn shape the evolution of organism form and function.

10. Course outcomes and teaching, learning and evaluation methods

At the end of the course, the students are able to:

1) Gain experience developing ecological hypotheses and designing observational and experimental studies in field and laboratory settings.

2) Gain experience with modeling, data collection techniques, and statistical analysis used to test ecological hypotheses.

3) Synthesize information from the primary scientific literature; logically interpret the results of original research in the context of established ecological knowledge.

4) Practice written and oral communication skills necessary to communicate research findings and interpretations to policy makers, scientists, stake holders and the general public.

11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)

week	Material Covered
1	Introduction in Ecology
2-3- 4	Concept of an Ecosystem ,types of ecosystem, nature ecosystem, characteristics of ecosystem structure and function of an ecosystem Environmental factors ,moisture , air movement ,day lightin
5	Social issues and the environment, sustainable development
6-7-8	Energy and mass flow in ecosystem ,the ecological pyramid Productivity , limiting factors Biochemical cycles ,hydrogen cycle, Oxygen cycle, Nitrogen cycle ,Carbon cycle
9-11	Biodiversity for ,types of Biodiversity Factors affecting endangered specie Ecological population
12-13	Effects of population growth ,population explosion Relationship between organisms community interaction survival
14-15	Environment protection act ,air act ,water act ,forest Act

13. Course Structure (Practical)

	Material Covered
Week 1,2	Soil texture / Soil structure
Week 3,4,5	Soil color/ Soil pH
Week 6,7.8	Soil carbon
Week 9,10,11	Soil water/ Soil fertility
Week 12, 13,14,15	Soil sodality

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The course development plan for Ecology includes studying the distribution and abundance of organisms, ecological interactions, and habitat influences. It emphasizes the flow of energy, matter recycling, and the impact of human activities while integrating ecological principles for conservation and resource management. Evolutionary perspectives on organism form, function, and ecological processes are also explored.

Module 25: Hydrology ENPE215

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Hydrology ENPE215**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) To develop problem solving skills and understanding of hydrology through the application of different techniques.

2) To understand the hydrological cycle component and the interaction among these components, so the problems as a natural problem that impact on the hydrological cycle.

3) This course deals with the using different equipment in measuring the surface water and ground water as a main two parts of hydrology subject

4) This course deals with the subject of the two main case of ground water steady state and non-steady state, with the calculation and solving some problem

5) The course deals with the subject of the surface runoff and the influent, effluent phenomena.

6) Study the rivers and streams and the classification basin of river

7) The course deals with the subject of the aquifer and springs classification.

10. Course outcomes and teaching, learning and evaluation methods

1) Thinking hydrological cycle and the factors that impact on like weather and evaporation **2)** Knowledge about the interaction between surface and ground water **3)** To build Knowledge about the methods of calculation of well production **4)** Learn the drawing and making tables of well logs. **5)** Learning Using various types of devices to measure depths, occasions, flow velocity, and calculating productivity for adults. This is not about flood calculation methods. **6)** Learning how to write technical report.
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)

	Material Covered
Week 1	The introduction to the hydrology, philosophy and fundamental concepts
Week 2	Study the hydrological cycle and the factors that control and have impact on
Week 3	Continue.
Week 4	Study the surface water, included the classification of rivers, the component of river basin, and classification of streams.
Week 5	Study the total runoff and precipitation
Week 6	Calculation the water budget or water balance
Week 7	Continue.
Week 8	Study the ground water definition and classification of ground water aquifers Study the geological materials of each type of aquifers.
Week 9	Study and classification of the well types, seepages and springs.
Week 10	Calculation the Recharge and Discharge on the base of various factors
Week 11	Continue.
Week 12	Solving problems and examples in the case of steady state and non-steady state
Week 13	Continue.
Week 14	GROUNDWATER INVESTIGATION Groundwater, although cannot be seen on the earth's surface, a variety of techniques can provide information concerning its occurrence and, under certain conditions, even its quality from surface and sub-surface locations. The objectives of groundwater investigations are varied and may include □ definition of recharge and discharge areas

	□ definition of water bearing units □ definition of location, extent and interrelationship of aquifers □ establishment of physical parameters of aquifers e.g. transmissivity and storage coefficient □ estimation of total sub surface storage capacity □ establishment of geologic factors which affect quality of groundwater □ determination of location, probable depth of drilling and yield from wells. □ determination of contribution of groundwater to streamflow
Week 15	Learning the methods of ground water investigation include. □ geological mapping □ test drilling, sampling and logging □ pumping tests (aquifer tests) □ geophysical o surface (electrical resistivity, seismic, etc) o subsurface (geophysical well logging) □ aerial photographical o black and white o color o infra-red o radar imagery □ geochemical and geothermal and can involve □ tracer techniques □ systems analysis, mathematical modelling and computer applications □ water balance studies □ intensive irrigation and water management
Week 16	A comprehensive review of all subject in the curriculum **.**

13. Course Structure (Practical)

	Material Covered
Week 1	Lab 1: learning the student the name and watch the all equipment and apparatus existed in the hydrology lab.
Week 2	Lab 2: teaching the student how to operate the equipment and apparatus existed in the hydrology lab.
Week 3	Lab 3: Continue.
Week 4	Lab 4 Field trip to using equipment and apparatus like current meter and obtain data from around stream.
Week 5	Drawing curve and charts, and interpret the obtained data.
Week 6	Using the Eco sounder to detect the depth of saturated zone and to learn the student to measure the well production.
Week 7	Lab 7 . Learn how to make calculations and measurements than order the result as well log emphases with writing technical report.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Hydrology course development plan focuses on understanding the hydrological cycle, surface water, and groundwater systems through problem-solving and measurement techniques. It covers groundwater states, surface runoff phenomena, river basin classification, and aquifer and spring systems, integrating calculations and practical applications.

Module 26: Fluid Mechanics II ENPE213

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Fluid Mechanics II ENPE213**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

Fluid flow is the study of the behavior of liquids and gases, particularly the forces that they produce.

The purpose of this course is to teach the fundamentals of engineering fluid mechanics in a very general manner so that the students understand the way that forces are produced and transmitted by fluids that are, first, essentially at rest and, second, in motion. This will allow us to apply the physical principles behind some of the most common applications of fluid mechanics in engineering. Most of these principles should be familiar – conservation of energy, Newton's laws of motion – and so the subject concentrates on their application to liquids.

10. Course outcomes and teaching, learning and evaluation methods

By the end of this course, the students should be able to:

1) recognize some fluid properties and types of flow;
2) understand the transmission of pressure in liquids and its application to hydraulics
3) use a manometer to calculate pressures
4) calculate hydrostatic forces on plane and curved submerged surfaces;
5) understand Archimedes' principle and buoyancy
6) employ the concept of continuity of flow
7) define viscosity
8) calculate pressure drops in pipe flow

9) use Bernoulli's equation to measure flow rate and velocity **10)** Apply the momentum principle to liquids in jets and pipes **11)** Define the operation principles of the different types of flow measurement, and solve problems in fluid flow through flow measurement devices with applications for steady and unsteady flow. **12)** Demonstrate knowledge of compressible fluid flows, with differences of equations using depending on compressible flow conditions, sonic (sub)(super)sonic flow, conversion*diversion nozzle, and types of gas pumping devices. **13)** Provide the ability to estimate the energy (power) consumption for liquid mixing equipment and to design it by predicting necessary fluid parameters of full-scale projects by performing simple model experiments. **14)** 4) Provide the ability to estimate the terminal falling velocity and description drag coefficient for flow through packed columns and pressure drop calculation for fixed and fluidized beds and transport of particles... **15)** Share ideas and work in a team in an efficient and effective manner under controlled supervision or independently.
11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)

	Material Covered
Week 1-3	Dimensional Analysis
Week 4	Fluid Statics
Week 5	Fluid Dynamics, Newtonian's Incompressible Fluid: Fluid kinematics
Week 6	Continuity equation, types of flow
Week 7	Fluid dynamics
Week 8	Bernoulli's and Euler's equation
Week 9	flow through pipes
Week 10	Modified Energy and Losses, friction factor
Week 11	Head loss due to friction, fitting, contraction, expansion
Week 12	Pumps
Week 13	Flow Measurements
Week 14	Flow of Compressible Fluid
Week 14	Liquid Mixing
Week 15	Flow of Fluid through Granular Bed and Packed Columns

Week 16	**Final Exam**

13. Course Structure (Practical)

	Material Covered
Week 1	Density, specific gravity Measurements Viscosity Measurement using the Stocks method Viscosity Measurement using Capillary Viscometer
Week 2	Pressure measurement Devices (Manometers)
Week 3	Calibration of Bourdon Gage Pressure
Week 4	Determination of center pressure
Week 5	Reynolds Number Determination
Week 6	Fluid Flow Measurements Using Traditional Method
Week 7	Measuring the Velocity and Pressure Distribution around the Bend in the Rectangular Duct
Week 8	Single-Stage Centrifugal Pump
Week 9	Calibration of Rotameter
Week 10	Fluid flow measurements using Venturi-meter
Week 11	Fluid flow measurements using Orifice-meter
Week 12	Fluid flow measurements using Nozzle-meter
Week 13	Airflow velocity measurements
Week 14	Determination of Centre of Pressure and Hydro-static Force on Plane surface
Week 15	Flow over the rectangular weir and V-notch
Week 16	**Final Exam**

	Material Covered
Week 1	Density, specific gravity Measurements Viscosity Measurement using the Stocks method Viscosity Measurement using Capillary Viscometer
Week 2	Pressure measurement Devices (Manometers)
Week 3	Calibration of Bourdon Gage Pressure
Week 4	Determination of center pressure

Week 5	Reynolds Number Determination
Week 6	Fluid Flow Measurements Using Traditional Method
Week 7	Measuring the Velocity and Pressure Distribution around the Bend in the Rectangular Duct
Week 8	Single-Stage Centrifugal Pump
Week 9	Calibration of Rotameter
Week 10	Fluid flow measurements using Venturi-meter
Week 11	Fluid flow measurements using Orifice-meter
Week 12	Fluid flow measurements using Nozzle-meter
Week 13	Airflow velocity measurements
Week 14	Determination of Centre of Pressure and Hydro-static Force on Plane surface
Week 15	Flow over the rectangular weir and V-notch
Week 16	**Final Exam**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Fluid Flow course development plan focuses on understanding fluid properties, behavior, and dynamics through theoretical and practical approaches. It includes studying fluid statics, flow types, pressure measurements, and equations of motion, alongside applications in pipe flow, pumps, and real-world engineering systems.

Module 27: Strength of materials ENPE220

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Strength of materials ENPE220**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) 1.Understand the theory of friction and its practical applications, particularly friction on inclined planes.

2) 2. Enable students to determine the centroid and center of gravity of various objects and structures.

3) 3. Provide students with the ability to calculate and interpret moment of inertia values for different shapes and axis configurations.

4) 4.introduce students to the concepts of stress and strain, as well as stress-strain diagrams.

5) Familiarize students with the proportional limits, elastic limit, stiffness elasticity, plasticity, hardness, and working stress of materials. Students learn to determine the safe operating limits of materials and structures, ensuring they can withstand applied loads without experiencing excessive deformation or failure.

6) Provide students with a fundamental understanding of hook's law, which describes the linear relationship between stress and strain in elastic materials.

7) Introduce students to the concept of poisson ratio, volumetric stress, bulk modulus, and composite stresses

8) Educate students about the effects of temperature variations on materials and structures.

9) 9. To enable students to analyze the internal forces and moments in beams, particularly shear and bending moments

10. Course outcomes and teaching, learning and evaluation methods

1) Understand the theory of friction and its practical applications, particularly on inclined planes.

2) Determine the centroid and center of gravity of various objects and structures.

3) Analyze equilibrium and calculate resultant forces.

4) Calculate and interpret moment of inertia values for different shapes and axis configurations.

5) Analyze the rotational behavior of objects and systems.

6) Interpret stress-strain diagrams and analyze the mechanical behavior of materials.

7) Identify and define proportional limits, elastic limit, stiffness elasticity, plasticity, hardness, and working stress.

8) Determine the safe operating limits of materials and structures.

9) Apply Hook's Law to analyze the linear relationship between stress and strain in elastic materials.

10) Understand the concept of Poisson Ratio, volumetric stress, bulk modulus, and composite stresses.

11) Analyze the effects of temperature variations on materials and structures.

12) Consider thermal stress and thermal expansion coefficients in design.

13) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
	Material Covered
Week 1,2	Friction
Week 3,4	Centroid and Center of Gravity
Week 5,6	Moment of Inertia (Second moment of the axis)
Week 7	Introduction Force in Rigid Bodies
Week 8	Proportional Limits
Week 9,10	Hook ’s Law
Week 11,12	Poisson Ratio, Composite Stresses
Week 13,14	Thermal Stress
Week 15	Shear and Bending Moments in Beam
Week 16	Preparatory week before the Final Exam

13. Course Structure (Practical)	
	Material Covered
Week 1	Tensile Test.
Week 2	Compression Test
Week 3	Hardness Test.
Week 4	Impact Test
Week 5	Torsion Test
Week 6	Wear Test Solve algebraic equations symbolically and numerically
Week7	Bending Test
Week 8	Shear Test
Week 9	Creep Test
Week 10	Fatigue Test

Week 11	Microscopy of Metals samples
Week 12	Microscopy of Alloys samples
Week 13	Tensile Test of composite materials
Week 14	Impact Test of composite materials
Week 15	Bending Test of composite materials
Week 16	Preparatory week before the Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Strength of Materials course development plan focuses on understanding the behavior of materials under various loads, including tension, compression, shear, and torsion. It covers stress-strain relationships, beam bending, deflection analysis, and failure theories, integrating practical problem-solving and real-world engineering applications.

Level Three (Fifth Semester)

Module 28: English Language III NTU300

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**English Language III NTU300**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course The student will acquire English tensed, grammers as well as how to use the vocabulary for forming the sentences, solving the problems and short conversation.
10. Course outcomes and teaching, learning and evaluation methods
1) Ability to understand and use complex vocabulary and grammar structures **2)** Proficiency in reading and comprehending advanced texts **3)** Effective communication skills in both written and spoken English **4)** Critical thinking and analytical skills for interpreting and evaluating information **5)** Cultural awareness and sensitivity when communicating with people from diverse backgrounds **6)** Ability to write clear and concise reports, essays, and other professional documents **7)** Fluency in academic English for higher education or research purposes **8)** Confidence in participating in debates, discussions, and presentations in English **9)** Proficiency in using technology to enhance language learning and communication **10)** Understanding of the nuances of English language usage in different contexts and situations.
14) 11. Evaluation methods
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	Material Covered
1	Unit One: Introduction To The English Language.
2	Unit Two : Survey Of English Literature.
3	Unit Three: Tenses.
4	Unit Four: Grammars.
5	Unit Five : Semantics.
6	Unit Six : English Language In The Communication.
7	Unit Seven : Creative Writing.
8	Unit Eight : Creative Reading.
9	Unit Nine : Sentences Formation.
10	Unit Ten : Circuit Analysis In English Language.
11	Unit Eleven : Circuit Problems In English Language.
12	Unit Twelve : Flowchart Formation In English Language.
13	Unit Thirteen : Block Diagram Formation In English Language.
14	Unit Fourteen : Conversation.
15	Final Examination.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
This course focuses on advanced English skills, including vocabulary, grammar, reading comprehension, and effective communication in professional and academic contexts. It enhances critical thinking, cultural awareness, and proficiency in using technology for language learning. Participants gain fluency for diverse scenarios through interactive sessions and practical assignments.

Numerical and engineering analyses TECK300

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Numerical and engineering analyses TECK300**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) The objectives of studying this module are to make the students familiarize with the ways of solving complicated mathematical problems numerically.

2) To help you become familiar with MATLAB and other convenient numerical software such as Microsoft Excel and with simple programming.

3) Obtaining numerical solutions to problems of mathematics.

4) Describing and understanding of the several errors and approximation in numerical methods.

5) The understanding of several available Solutions of Equations in One Variable.

6) The explaining and understanding of the several available methods to solve the simultaneous equations.

7) The studying of Curve Fitting and Interpolation.

10. Course outcomes and teaching, learning and evaluation methods

Students can expect to achieve upon completing a Numerical analysis:

Course Outcomes: At the end of course, the students are able to:

1) Solve PSS with variable separation method by Fourier series.

2) Solve ODE through Laplace Transform.

3) Solve systems of linear equations and diagonalizable square matrices.

4) Finding root of nonlinear equations, systems of equations, integration and differentiation

5) Determine Error estimation associated with numerical method.

6) describe numerical methods used in problems of Ordinary and Partial differential equations and Optimization,

15) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))
12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)

week	Material Covered
1	**Revision Ordinary Differential Equations** • First & Second orders, Simultaneous differential Equations
2-3- 4	**Fourier Series(3 weeks)** Introduction to Fourier Series Fourier Series for periodic functions 2π, Fourier Series for periodic functions over range 2π Even and odd function and half-range Fourier series. Fourier Series over any range Application of solving differential equations, periodically forced oscillation and Resonance. The Complex or exponential form of Fourier series.
5	**Laplace Transformation** • Introduction, Properties of Laplace Transform:
6-7-8	Laplace Transform of Functions The Initial and Final Value Theorms Inverse Laplace Transform, Inverse Laplace Transform using Partial Equation Solution of Differential Equations and Simultaneous Equations • Application of solving differential equations, heat transfer • **Errors & Data Uncertainly** • Round-off and Truncation Errors, Blunders, Model Errors, and Data Uncertainly
9-11	**Direct Methods**: Matrix Operations, The Matrix inverse, Gaussian Elimination, Pivoting, Backward error analysis, conditioning **Indirect Methods**: Jacob's Methods and Gauss-Seidel Method
12-14	**Roots Finding of non-Linear Equations** Graphical Methods, Bisection Method, False Position Method Newton-Raphson Method
15	**.** Modified Newton-Raphson method for multiple roots. Application

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
his course equips students with skills to solve complex mathematical problems using numerical methods, MATLAB, and Excel. It covers error analysis, solving equations, curve fitting, and interpolation, emphasizing practical applications in engineering. Hands-on labs and projects enhance problem-solving and software proficiency.

Water Pollution ENPE310

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Water Pollution ENPE310**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

Knowing the types and characteristics of water and how to deal with it. The module also aims to identify water sources and the most significant pollutants that may be present, as well as to evaluate water quality by comparing it with established standards. The course also covers the design of water treatment systems.

10. Course outcomes and teaching, learning and evaluation methods

1) Understand the basic concepts of water pollution.
2) Identify the sources of water.
3) Learn how to design water treatment plant units.
4) Understand the key operational concepts of water treatment plant units, while also exploring the environment, its basic components, types, and the reasons for the emergence of environmental engineering in recent years.
5) Define the role of the environmental engineer in solving water pollution problems.
6) Identify the major forms of water pollution, their primary causes, and engineering solutions to address them.
7) Design treatment units for various forms of pollution, using appropriate design criteria for each type of unit.

16) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Introduction - - on water
Week 2	Characteristics of water
Week 3	Overview of the characteristics of water and wastewater.
Week 4	- Identify the ideal or typical properties of water
Week 5	An overview of sampling methods and examination methods.
Week 6	method of analysis of water
Week 7	- Exam
Week 8	- Learn about the method of colorimetric analysis of water. - Learn about the methods of analysis by which electrodes are used
Week 9	Quality of water
Week 10	- Identify the types of viruses that cause diseases.
Week 11	- Identify diseases related to water pollution.
Week 12	Concept of aerobic biological oxidation
Week 13	Nature of organic matter, Biochemical reactions
Week 14	Nature of biological growth
Week 15	Concept of anaerobic biological oxidation
Week 16	**final Exam**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The course focuses on understanding water pollution, its sources, causes, and types, while equipping students with skills to design water treatment units using engineering principles. It emphasizes operational concepts, the environmental engineer’s role, and solutions to address various pollution forms. Practical applications and design criteria are integral to the curriculum.

Module 31: Soil Pollution and Remediation ENPE311

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Soil Pollution and Remediation ENPE311**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and Practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) Describe the nature of soil problems encountered in civil engineering and provide an overview of soil behavior.
2) Explain the nature of soil, particularly the transmission of stresses between soil particles.
3) Focus primarily on the behavior of dry soil, as many aspects of soil behavior can be understood by studying soil interactions without the presence of water.
4) Based on points 1 and 2, address the treatment of soils where pore water is either stationary or flowing under steady conditions.
5) Consider more complex scenarios in soil mechanics, where pore pressures are influenced by applied loads, causing pore water to flow under transient conditions.
6) In the practical component, introduce testing procedures for determining soil properties to be used in the design of civil engineering projects.

10. Course outcomes and teaching, learning and evaluation methods

At the end of the course, students will:

1) Acquire fundamental knowledge about soil structure, behavior, physical properties, and classification.
2) Understand water flow through porous media in both one-dimensional and two-dimensional contexts.
3) Gain sufficient knowledge to calculate seepage losses, seepage pressure, seepage force, uplift pressure, factor of safety, pore water pressure, head, normal stress, and effective stress under and behind structures.

17) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
	Material Covered
Week 1-2	Basic Characteristic of Soil
Week 2-4	Flow of Water and Stress in Soil
Week 5-6	Ground water
Week 6-8	Groundwater Contamination and Soil
Week 8-10	Contaminant Transport Mechanisms and fate Processes
Week 10-15	Remediation processes
Week 16	Final Exam

13. Course Structure (Practical)	
	Material Covered
Week 1	Lab 1: water content
Week 2	Lab 2: sieve analysis
Week 3	Lab 3: Hydrometer test
Week 4	Lab 4: Atterberg limits
Week 5	Lab 5: specific gravity
Week 6	Lab 6: compaction test

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The course focuses on understanding soil structure, behavior, and physical properties, with an emphasis on water flow through porous media. Students will learn to calculate key soil-related parameters such as seepage losses, pressure, and stress. Practical applications include analyzing soil behavior under various conditions for civil engineering projects.

Module 32: Environmental Thermodynamic ENPE318

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Environmental Thermodynamic ENPE318**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and Practacal) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) This course deals with the basic concept of thermodynamic principle.

2) Understanding energy and its transformation: Thermodynamics deals with the study of energy and its conversion from one form to another. By studying thermodynamics, engineers gain a fundamental understanding of how energy behaves and can be manipulated.

3) To understand type of material which deals with thermodynamic processes.

4) To understand close system and open system exists in system.

5) Analyzing and optimizing energy systems: Engineers use thermodynamics to analyze and optimize the performance of energy systems, such as power plants, engines systems. They can determine the efficiency, energy transfer rates, and overall performance of these systems, leading to improvements in design and operation.

6) Designing and improving energy-related devices: Thermodynamics provides engineers with the knowledge necessary to design and improve energy-related devices, including combustion engines, turbines, heat exchangers, and renewable energy systems. By understanding the principles of thermodynamics, engineers can enhance the efficiency, reliability, and sustainability of these devices

10. Course outcomes and teaching, learning and evaluation methods

1) Understand basic thermodynamic concepts, including system types, properties, and energy changes (kinetic, potential, enthalpy, internal energy).

2) Apply the first law of thermodynamics to both closed and open systems, including real-world devices like turbines and heat exchangers.

3) Judge the properties of pure substances using property diagrams and tables.

4) Assess thermodynamic applications using the second law, calculating thermal efficiency and performance for heat engines, refrigerators, and heat pumps.

5) Develop practical skills in thermodynamics through experiments, data collection, and problem-solving techniques.

18) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Introductory Concepts and Definitions
Week 2	Definition of energy – kinetic & potential energies –work – power flow & internal energy – enthalpy- energy diagram
Week 3	Definition of state – property, process – property diagrams -1st law of thermo dynamic, (P- V) diagram.
Week 4	Ideal gases – ideal gasses laws (boyle , Charles , Gaylosic), gas constant – Avogadro law specific heat at constant volume &pressure
Week 5	Particular closed system processes – constant volume , constant pressure and constant temperature process.
Week 6	Particular closed system processes – adiabatic and polytrophic processes
Week 7	Open flow system application of open flow system
Week 8	Steam ,steam formation, the (p,v) phase diagram
Week 9	Dryness fraction ,liquid line ,steam line ,wet steam
Week 10	Calculation of steam ,steam table
Week 11	Steam process with drawing each processes on (P-V)diagram
Week 12	Second law of thermodynamic –heat engine heat pump
Week 13	Statement of 2nd law of thermodynamic (Kelvin, Planck & Clausius statement)
Week 14	Carnot cycle - reversed Carnot cycle
Week 15	Reversible &i Reversible processes
Week 16	Final exam

13. Course Structure (Practical)	
Week	**Material Covered**
Week 1	Lab 1: Introduction to BOURDON gauge.
Week 2	Lab 2: calibration of BOURDON gauge.
Week 3	Lab 3: Learning about the different types of manometer.
Week 4	Lab 4: learning how to read and handle with the different types of manometer.
Week 5	Lab 5: type of temperature gauges
Week 6	Lab 6: learning about volume, mass and density gauges and how to convert between them.
Week 7	Lab 7: set saturated liquid, saturated vapor and boiling temperature in various pressure.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
This course teaches thermodynamic principles and their applications in environmental systems, focusing on energy efficiency, renewable energy, and sustainability. Students will analyze thermodynamic cycles, evaluate the environmental impact of energy processes, and apply these concepts to real-world environmental challenges. Practical labs and case studies enhance problem-solving and critical thinking skills.

Module 33: Air pollution and control ENPE312

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Air pollution and control ENPE312**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical and practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) Define atmospheric components, types of air pollutants, and their effects to help reduce pollution impact.
2) Learn about machines and devices used to measure air pollutants.
3) Conduct experiments related to air pollution and its effects.
4) Identify the harmful environmental effects caused by air pollution.
5) Learn procedures and methods for reducing and controlling pollution.

10. Course outcomes and teaching, learning and evaluation methods

1) Introduce the environment, its basic components and types, and the reasons for the emergence of this branch of engineering in recent years.
2) Define the role of the environmental engineer in solving environmental problems.
3) Identify the most important forms of air pollution, their main causes, and methods for controlling them.
4) Enhance students' ability to distinguish and develop cognitive awareness in diagnosing general theories and principles in the study.
5) Plan for conducting scientific experiments using modern scientific tools and equipment.

19) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
1	Introduction to air pollution
2- 3- 4	Sources and Classification of atmospheric pollutants - Ozone Pollution- Acid Raines
5-6	Indoor and outdoor air pollutants
7	Particulates and gases pollutants
8	Health and ecological impact
9-10-11	Dispersion of Pollutants (Meteorological aspects of Air Pollution Dispersion - Lapse rate - Dispersion characteristics of stack plumes)
12-13	Characteristics of stack plumes (diffusion models, effective stack heights, and spatial concentration distribution)
14-15	Air pollution and Global Climate

13. Course Structure (Practical)	
Week	**Material Covered**
Week 1	Lab 1: **Identifying types of pollution and its sources**
Week 2	Lab 2: **Identifying lab tools and devices**
Week 3	Lab 3: **Indoor Air Pollution using indoor air quality tester**
Week 4	Lab 4: **Measuring ionizing radiation using Geiger Counter**
Week 5	Lab 5: **Drawing curves using Geiger Counter**
Week 6	Lab 6: **Estimating accuracy of counting (radiation pollution)**
Week 7	Lab 7: **Air Quality Standards**
Week 8	Lab 8: **Measurement Units**
Week 9	Lab 9: **Noise Pollution (Sound level meter)**
Week 10	Lab 10: **Outdoor Air Pollution using portable multi gas detector (Gray wolf sensing)**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The course focuses on understanding air pollution, its causes, and its environmental impacts, with an emphasis on measurement techniques and control strategies. Students will learn the role of environmental engineers in mitigating pollution and gain practical skills through experiments and case studies. The course also covers modern tools and equipment used in air quality monitoring and control.

Level Three (Sixth Semester)

Numerical analysis TECK301

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Numerical analysis TECK301**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1) Familiarize students with methods for solving complex mathematical problems numerically.
2) Help students become proficient in using MATLAB, Microsoft Excel, and basic programming for numerical analysis.
3) Obtain numerical solutions for various mathematical problems.
4) Understand errors and approximations in numerical methods.
5) Gain an understanding of solutions for equations in one variable.
6) Learn methods for solving simultaneous equations.
7) Study curve fitting and interpolation techniques.

10. Course outcomes and teaching, learning and evaluation methods

At the end of the course, students will be able to:

1. Solve Partial Differential Equations (PDEs) using the variable separation method with Fourier series.
2. Solve Ordinary Differential Equations (ODEs) using the Laplace Transform.
3. Solve systems of linear equations and diagonalize square matrices.
4. Find the roots of nonlinear equations, solve systems of equations, and perform integration and differentiation.
5. Estimate errors associated with numerical methods.
6. Describe numerical methods used for solving Ordinary and Partial Differential Equations (ODEs and PDEs) and optimization problems.

11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
1-3	Interpolation and Curve Fitting. Polynomial Interpolation-Newton and Neville's Methods, Interpolation with Cubic Spline Linear Regressions, Fitting a Straight Line Polynomial, Multiple linear, and non-linear Regressions • Parabolic Regression, Regression with Power Series Approximations
4-6	Numerical Solution of Differentiation and Integration Numerical Differentiation: Derivatives estimation, Richardson Extrapolation, Newtown forward formula and Sterling formula Numerical Integration: Trapezoid Rule, Simpson's Rule Compound Numerical Integration Error in Numerical Integration
7	Numerical Solution of Ordinary Differential Equations Euler's Method, Modified Euler's method
8-10	Linear multistep methods, One-step methods Runge-Kutta methods, Milne's method Error estimation and adaptively, Stiffness
11-13	Numerical Solution of Partial Differential Equations BVPs for 2nd order elliptic Partial Differential Equations The five-point discretization of the Palladian Finite element methods Difference methods for the heat equation and hyperbolic equations Hyperbolic conservation laws
14	Numerical Optimization Local method for un constrained optimization problems. The simplex method, Gradient methods and Newton line search method Trusts-region Newton method. Un constrained minimzer fminimum
15	. Lagrange multipliers and Kuhn-Tucker conditions Constrained minimzer fmincon

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Numerical Analysis course focuses on solving complex mathematical problems using numerical methods, including MATLAB and Excel for implementation. Students will learn techniques for solving equations, systems of linear equations, differential equations, and optimization problems. Practical applications and error estimation will be emphasized through hands-on exercises and projects.

Hydraulic ENPE317

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Hydraulic ENPE317**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

This course requires knowledge of open-channel, closed-conduit, and hydraulic machine flow principles. It also necessitates an understanding of the interaction between these elements and their impact on overall plant (site) hydraulics. Head can either be derived from elevation differences (gravity) or converted from mechanical energy using hydraulic machinery. The distribution of flows using open channels or closed conduits is critical for proper hydraulic loading and process performance.

10. Course outcomes and teaching, learning and evaluation methods

1) Interpret and analyze data related to flow in water treatment plants (WTP).
2) Apply fundamental flow theories to each component of water treatment plants.
3) Formulate the elementary principles of flow in pipe systems, including conservation laws, head losses in pipes, pipe series, and sludge flow.
4) Understand the basics of flow measurement and hydraulic control points.
5) Understand the basics of process design for treatment plants.

20) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	General introduction, dimensional analysis, units.
Week 2	Review of flow in pipes (pipes in series, parallel, and equivalent pipe).
Week 3	Introduction to pumps and pump curves.
Week 4	Pumps in series and parallel
Week 5	Open channels flow and channel geometry properties
Week 6	Critical flow and specific energy
Week 7	Critical flow and specific energy
Week 8	**Midterm Exam** + Flow measurement instruments
Week 9	Flow measurement and hydraulics control points (weir)
Week 10	Flow measurement and hydraulics control points (Venturi meter, Parshall flume)
Week 11	Hydraulics Analysis of multiport diffuser
Week 12	Hydraulics Design of multiport diffuser
Week 13	Comprehensive Design Case for Water Treatment Plants.
Week 14	Comprehensive Design Case for Water Treatment Plants.
Week 15	**Review Week before Final Exam**
Week 16	**Final Exam**

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
he Hydraulics course focuses on fluid mechanics and hydraulic systems, teaching students to analyze and design open-channel, closed-conduit, and hydraulic machine flows. It emphasizes practical applications, including water treatment and distribution system design, and includes hands-on experiments and case studies. By the end of the course, students will be proficient in flow measurement, system optimization, and understanding the impact of hydraulics on water processes.

Level Four (Seventh Semester)

Engineering Project I TECK401

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Engineering Project I TECK401**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (Practical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The project engineering aims: -

- Analyse an opportunity both technologically and commercially
- Research and design a technologically and commercially appropriate solution
- Summarise and articulate the proposed solution in written form
- Summarise and articulate the proposed solution in oral form

To carry out and articulate the output from literature reviews and evidence-based research activities.

10. Course outcomes and teaching, learning and evaluation methods

On successful completion of the course students will be able to:

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilising a systems approach.
4. Conduct an engineering project.
5. Communicate with engineers and the community at large in written an oral forms.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer.

21) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
Week	**Material Covered**
1	• This Course Will Be Conducted Largely As An Individual Or Small Group Project Under The Direct Supervision Of A Member Of Academic Staff.
2-3- 4-5	• The Specific Project Topic Undertaken Will Reflect The Common Interests And Expertise Of The Student(S) And Supervisor. Students Will Be Required To: • Perform A Literature Search To Review Current Knowledge And Developments In The Chosen Technical Area;
6-7-8-9-10	• Undertake Detailed Technical Work In The Chosen Area Using One Or More Of: • Theoretical Studies • Computer Simulations • Hardware Construction;
11-12-13	• Produce Progress Reports Or Maintain A Professional Journal To Establish Work Completed, And To Schedule Additional Work Within The Time Frame Specified For The Project; Deliver A Seminar On The General Area Of Work Being Undertaken And Specific Contributions To That Field;
14-15	• Prepare A Formal Report Describing The Work Undertaken And Results Obtained So Far; And • Present The Work In A Forum Involving Poster Presentations And Demonstrations Of Operational Hardware And Software.

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Project Engineering course focuses on analyzing opportunities, designing solutions, and effectively communicating outcomes. Students will develop technical expertise, problem-solving skills, and the ability to conduct and present engineering projects using a systems approach. The course emphasizes professional skills through research, design, and evidence-based practices.

Waste Solid Management ENPE410

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Waste Solid Management ENPE410**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

Objectives:

1. Define the types of solid waste to manage them using engineering approaches.
2. Provide experience in analyzing pollution problems.
3. Sustain environmental resources through proper waste management operations, such as the 4Rs (Reduce, Reuse, Recycle, Recover).
4. Identify the essential methods for waste collection, storage, processing, and disposal.
5. Design collection routes, sanitary landfills, and incinerators.

10. Course outcomes and teaching, learning and evaluation methods

Course Outcomes:

On completing this course, students will:

1. Understand the basic concepts of solid waste management.
2. Comprehend the collection services and systems for solid waste.
3. Analyze collection systems of solid wastes.
4. Gain familiarity with onsite storage and processing of solid wastes.
5. Understand the types of solid waste collection systems.
6. Become familiar with solid waste quantities and their analysis.
7. Learn the principles behind generation rates of solid wastes.
8. Understand the basics of solid waste processing techniques.
9. Learn the design principles of landfills.
10. Select appropriate landfilling methods and operations.
11. Become familiar with mechanical volume reduction, compaction equipment, and their purposes.
12. Understand screening, separation techniques, drying, and dewatering processes.
13. Learn about solid waste filling plans, types of waste, and ocean disposal methods.
14. Understand the principles of materials processing and recovery systems.

22) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Waste generation, Functional Elements, Source and Types of Solid Wastes
Week 2	Composition of Municipal Solid Wastes and Compositing.
Week 3	Collection System, Equipment and Labor Requirements.
Week 4	Transfer operation, Onsite Processing of Solid Wastes
Week 5	Purposes of Processing, Mechanical Volume Reduction, Selection of Compaction Equipment.
Week 6	Chemical Volume Reduction, Mechanical Size Reduction, Size Reduction Equipment.
Week 7	Midterm Exam
Week 8	Component Separation, Hand sorting, Air Separation, Magnetic Separation.
Week 9	Screening, Other Separation Techniques, Drying and Dewatering, Materials Processing and Recovery Systems.
Week 10	Recovery of Chemical Conversion Products, Recovery of Biological Conversion Products.
Week 11	Recovery of Energy from Conversion Products.
Week 12	Disposal of Solid Wastes and Residual Matter, Site selection, Land filling Methods and Operations.
Week 13	Reactions Occurring in Completed Landfills, Gas and Leachate, Movement and Control.
Week 14	Design of Landfills, Land Requirements, Landfill Operation Plan.
Week 15	Solid Waste filling Plan, Types of Wastes, Ocean Disposal of Solid Wastes.
Week 16	Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Solid Waste Management course focuses on waste classification, collection, processing, and disposal, emphasizing sustainable practices like the 4Rs. Students will learn to design waste systems, analyze environmental impacts, and propose engineering solutions through practical applications and case studies.

Waste water Pollution Control ENPE412

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Waste water Pollution Control ENPE412**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

Objectives:

1. Identify the types and characteristics of wastewater and understand methods for managing it.
2. Explain the concepts and importance of wastewater treatment.
3. Provide detailed knowledge of various wastewater treatment methods.
4. Describe the steps in preliminary and primary treatment processes.
5. Determine reaction rates relevant to wastewater treatment.
6. Understand and apply design criteria for treatment units.
7. Gain hands-on experience through experimental lab work.

10. Course outcomes and teaching, learning and evaluation methods

Course Outcomes:

By the end of the course, students will be able to:

1. Apply conceptual techniques for wastewater treatment.
2. Understand and implement the design procedures for treatment units.
3. Build and analyze mathematical models related to wastewater processes.
4. Identify the sources of wastewater generation and apply scientific principles in its management.
5. Determine common applications of wastewater treatment in real-world scenarios.
6. Utilize modern techniques and mechanical methods in wastewater treatment.
7. Calculate and apply advanced treatment methods using contemporary mechanical systems.

23) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
1	Introduction of treatment sludge and its sources
2	Application methods for treatment and disposal of sewage sludge
3	Calculation of the amount of treatment sludge
4	Sludge thickening
5	Design examples for sludge thickening
6	Sludge stabilization
7	Anaerobic sludge stabilization and design examples
8	Aerobic sludge stabilization, design criteria and examples
9	Composting
10	Sludge conditioning process, removal of sludge water
11	Final disposal methods
12	Final disposal methods
13	Final disposal methods
14	Final disposal methods
15	Equipment used in sludge treatment, definition of legal legislation

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Wastewater Pollution Control course focuses on understanding wastewater characteristics, treatment processes, and modern techniques for pollution management. Students will learn to design treatment units, analyze mathematical models, and apply advanced mechanical systems to ensure effective wastewater treatment and environmental protection.

Control Systems and Instrumentations ENPE413

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Control Systems and Instrumentations ENPE413**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

Objectives:

1. Develop problem-solving skills and system control techniques.
2. Understand the basic concepts of energy and material balance.
3. Learn the applications of Laplace Transforms.
4. Comprehend various system responses and their types.
5. Build foundational knowledge for controlling different systems.
6. Understand block diagrams and their use in control systems.
7. Analyze frequency response and design systems based on it.

10. Course outcomes and teaching, learning and evaluation methods

Course Outcomes:

By the end of the course, students will be able to:

1. Analyze system responses of different orders.
2. Analyze and interpret closed-loop block diagrams.
3. Design controllers for closed-loop systems.
4. Tune controllers using methods such as Bode stability criteria and dynamic error criteria.
5. Evaluate the stability of designed closed-loop systems.

24) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	Material Covered
Week 1	Introduction to Process Control,
Weeks 2-3	Linear Open-Loop Systems: Response of First-Order systems
Week 4-5	Linear Open-Loop System
Week 6-7	Response of First-Order Systems in Series
Week 8	Higher-Order Systems: Second-Order and Transportation Lag
Week 9	Linear Closed Loop System: The Control System
Week 10	Block Diagram of Reactor Control System
Week 11	Stability
Week 12	Root Locus
Week 13	Frequency Response
Week 14	Control System Design by Frequency Response
Week 15	Control Valves
Week 16	Preparatory week before the final Exam

13. Course Structure (Theory)	
Week	Material Covered
Week 1	Using MATLAB in Laplace Transforms, inversion of Laplace Transforms
Week 2	Partial Fractions in Laplace Transforms using MATLAB
Week 3	Using MATLAB to Obtain the Response of a First-Order System to a Step Function
Week 4	Using MATLAB to Generate the Impulse Response to a First-Order System
Week 5	Sinusoidal Response of a First-Order System Using MATLAB
Week 6 and 7	Using MATLAB/Simulink to Determine the Step Response of the Manometer
Week 8	Using MATLAB to Determine the Roots of a Polynomial
Week 9	Construct a root locus diagram for a system using MATLAB
Week 10	MATLAB Solution on Bode diagram using Simulink

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Control Systems course focuses on understanding system dynamics, analyzing responses, and designing controllers for closed-loop systems. Students will learn techniques like Laplace Transforms, block diagram analysis, and frequency response methods to design, tune, and evaluate system stability for practical engineering applications.

Level Four (Eighth Semester)

Engineering Economy TECK402

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Engineering Economy TECK402**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

The aim of the Economic course is to equip students with the essential economic principles and techniques to analyze and evaluate engineering projects, make informed decisions, and assess the financial feasibility of projects. Students will develop skills in cost analysis, investment evaluation, and risk management to address economic challenges in engineering practice.

10. Course outcomes and teaching, learning and evaluation methods

By the end of the course, students will be able to:

1. Demonstrate understanding of fundamental economic principles such as supply and demand, cost analysis, and time value of money.
2. Apply cost analysis techniques to engineering projects, including evaluating initial investments, operating costs, and revenues.
3. Use time value of money concepts to calculate present and future values, and perform discounted cash flow analysis.
4. Evaluate investment opportunities using techniques like NPV, IRR, and payback period analysis.
5. Assess and manage risks in engineering projects using methods like sensitivity analysis and decision trees.
6. Compare and evaluate alternatives based on economic criteria such as cost, benefits, and sustainability.
7. Apply engineering economics principles to real-world engineering projects, making sound economic decisions.

25) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Introduction to Engineering Economics • Overview of engineering economics • Importance of economic analysis in engineering decision-making
Week 2	Supply and Demand • Supply • demand • supply and demand in electronics and control engineering
Week 3	Cost • Types of costs: fixed costs, variable costs, direct costs, indirect costs • Break-even analysis
Week 4	Interest and Interest Rate • Simple interest • Compound interest • Interest rate
Week 5&6	Time Value of Money • Future value, present value, and compounding • Cash flow diagrams and time diagrams
Week 7	Mid-term Exam
Week 8	Evaluation of engineering project • Evaluation procedure • Evaluation approach
Week 9	Comparison of Alternative • Comparison procedures • Alternative
Week 10&11	Inflation and Deprecation • Inflation • Deprecation • Taxes
Week 12	Replacement Analysis
Week 13	Real-World Applications and Case Studies • Analysis of case studies and real-world examples • Application of economic analysis techniques to engineering projects
Week 14	Group projects
Week 15	Preparatory Week
Week 16	Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Economic course focuses on applying fundamental economic principles to engineering projects, including cost analysis, time value of money, and risk management. Students will learn investment appraisal techniques, evaluate financial feasibility, and assess alternatives to make informed, economically sound decisions. The course aims to prepare students for real-

world economic challenges in engineering.

Water Distribution and Sewage ENPE414

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Water Distribution and Sewage ENPE414**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024
9. Aims of the Course The objective of this course is to introduce students to the properties of wastewater, examine the details of wastewater collection, design network systems, and prepare an applied project.	
10. Course outcomes and teaching, learning and evaluation methods	
Upon successful completion of this course, students will be able to: **1.** Define wastewater characteristics. **2.** Define wastewater collection systems. **3.** Design and report on wastewater sewage systems. **4.** Design and report on stormwater sewer systems. **5.** Solve wastewater collection network problems and complete an applied project.	
26) 11. Evaluation methods	
((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))	
12. Teaching and learning methods	
((Theoretical lectures / seminars / debate work between students))	

13. Course Structure (Theory)	
Week	**Material Covered**
1	Introduction to wastewater network engineering
2	Wastewater types, characteristics, analysis of wastewater quality parameters (BOD, suspended solids, nitrogen groups, phosphorus groups, coliform bacteria, etc.)
3	The need for wastewater collection systems, urban wastewater treatment, wastewater disposal, applications
4	Sewer systems types, disadvantages of combined sewer systems, hydraulics of wastewater collection systems, flow in fully and partially filled pipes, applications
5	Elements of wastewater network systems, collection of used water, application
6	Calculation of channel systems, application
7	Standards in the design of wastewater collection systems, design examples of wastewater collection systems
8	Flow characteristics, occupancy rates of wastewater channels, application
9	Velocity and slope limits in wastewater channels, amount of groundwater leaking into channels, application
10	Determination of wastewater flow from industry, different situations in passing channel sections
11	Finding the flow rates that will be the basis for the calculation of wastewater channels, application
12	Construction of wastewater collection networks, cost calculations, application
13	Examples design
14	Examples design
15	Examples design

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Water Distribution and Sewage course focuses on the principles of wastewater and stormwater collection, design of sewage systems, and hydraulics of water flow. Students will learn to analyze wastewater characteristics, design efficient water distribution networks, and implement practical projects for sewage systems. The course prepares students to design and manage sustainable water and sewage systems.

Environmental Impact Assessment ENPE415

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Environmental Impact Assessment ENPE415**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

1. To introduce students to the principles and practices of Environmental Impact Assessment (EIA).
2. To equip students with the skills to evaluate the environmental, social, and economic impacts of engineering projects.
3. To teach students how to apply EIA methodologies in project planning and decision-making.
4. To provide knowledge on environmental regulations, laws, and the role of EIA in sustainable development.
5. To develop students' ability to assess and mitigate negative environmental impacts of proposed projects.

10. Course outcomes and teaching, learning and evaluation methods

1. Demonstrate an understanding of the principles and objectives of Environmental Impact Assessment.
2. Identify and assess the environmental, social, and economic impacts of engineering projects.
3. Apply EIA methodologies and techniques to evaluate potential environmental impacts.
4. Critically analyze and interpret environmental laws and regulations related to EIA.
5. Prepare and present EIA reports for various engineering projects, proposing mitigation measures where necessary.
6. Develop the skills to make informed decisions about environmental sustainability in project planning.

27) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Introduction to the course, assessment.
Week 2	Tools for assess environmental impact:
Week 3	Environmental Impact Assessment for air and noise
Week 4	Environmental Impact Assessment for water quantity and quality
Week 5	Environmental Impact Assessment for biological: terrestrial ecology.
Week 6	Environmental Impact Assessment for biological.
Week 7	Environmental Law •
Week 8	Legislation of Environmental and pollution • Air pollution and Legislative control
Week 9	Midterm Exam
Week 10	Noise pollution Legislative control • Land use
Week 11	Legislation on pollution of solid wastes and resources recovery • Mechanisms of controllingNon –• Hazardous wastes
Week 12	Legislation on pollution of pesticides and toxic substance •
Week 13	Energy •
Week 14	International Environmental Law
Week 15	International Legislation to prevent reduce and control pollution of marine environment • International agreements on control pollution • Pollution from land , vessels ,atmosphere ,dumping
Week 15	Un Environmental organizations
Week 16	Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Environmental Impact Assessment (EIA) course focuses on understanding the principles and practices of evaluating the environmental consequences of engineering projects. Students will learn to apply EIA methodologies, analyze planning laws, and assess the social, economic, and environmental impacts of development activities. The course prepares students to critically engage with environmental regulations and make informed decisions in project planning and management.

Environmental Legislation ENPE416

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Environmental Legislation ENPE416**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

6. To introduce students to the principles and practices of Environmental Impact Assessment (EIA).
7. To equip students with the skills to evaluate the environmental, social, and economic impacts of engineering projects.
8. To teach students how to apply EIA methodologies in project planning and decision-making.
9. To provide knowledge on environmental regulations, laws, and the role of EIA in sustainable development.
10. To develop students' ability to assess and mitigate negative environmental impacts of proposed projects.

10. Course outcomes and teaching, learning and evaluation methods

7. Demonstrate an understanding of the principles and objectives of Environmental Impact Assessment.
8. Identify and assess the environmental, social, and economic impacts of engineering projects.
9. Apply EIA methodologies and techniques to evaluate potential environmental impacts.
10. Critically analyze and interpret environmental laws and regulations related to EIA.
11. Prepare and present EIA reports for various engineering projects, proposing mitigation measures where necessary.
12. Develop the skills to make informed decisions about environmental sustainability in project planning.

28) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Introduction to the course, assessment.
Week 2	Tools for assess environmental impact:
Week 3	Environmental Impact Assessment for air and noise
Week 4	Environmental Impact Assessment for water quantity and quality
Week 5	Environmental Impact Assessment for biological: terrestrial ecology.
Week 6	Environmental Impact Assessment for biological.
Week 7	Environmental Law •
Week 8	Legislation of Environmental and pollution • Air pollution and Legislative control
Week 9	Midterm Exam
Week 10	Noise pollution Legislative control • Land use
Week 11	Legislation on pollution of solid wastes and resources recovery • Mechanisms of controllingNon –• Hazardous wastes
Week 12	Legislation on pollution of pesticides and toxic substance •
Week 13	Energy •
Week 14	International Environmental Law
Week 15	International Legislation to prevent reduce and control pollution of marine environment • International agreements on control pollution • Pollution from land , vessels ,atmosphere ,dumping
Week 15	Un Environmental organizations
Week 16	Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Environmental Impact Assessment (EIA) course focuses on understanding the principles and practices of evaluating the environmental consequences of engineering projects. Students will learn to apply EIA methodologies, analyze planning laws, and assess the social, economic, and environmental impacts of development activities. The course prepares students to critically engage with environmental regulations and make informed decisions in project planning and management.

Risk Management ENPE417

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Risk Management ENPE417**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

9. Aims of the Course

- Understanding **Basic Concepts of Industrial Safety**: Students learn the principles of industrial safety, including methods of prevention, risk control, and safety in design and operation.
- Environmental **Risk Assessment**: Students explore how to identify and evaluate environmental risks in industrial processes, manage hazardous materials, and address biological, mechanical, physical, and electrical hazards.
- Design **and Implementation of Safety Procedures**: Students are trained to design and implement safety protocols to control risks and ensure the safety of workers and the environment in industrial settings, focusing on human engineering.
- Reducing **Risks in Laboratories and Warehouses**: Students learn techniques for minimizing risks in laboratory and warehouse environments.
- Compliance **with Laws and Regulations**: Students understand the legal requirements related to industrial safety and learn how to ensure compliance with safety standards.
- Fire **Safety**: Students are taught methods for fire prevention and extinguishing fires.

10. Course outcomes and teaching, learning and evaluation methods

1) **Knowledge of Safety Principles**: Demonstrate an understanding of fundamental occupational safety principles, including objectives and classification of safety standards.
2) **Understanding Hazard Types**: Recognize biological, mechanical, physical, and electrical hazards and pollutants.
3) **Hazard Control and Investigation**: Learn to control workplace hazards, conduct accident investigations, and implement personal protection measures, with a focus on ergonomics.
4) **Safety in Laboratories and Warehouses**: Understand the safety protocols for working in laboratories and warehouses.
5) **Occupational Health Program**: Familiarize with the ISO 45000 standards and develop knowledge of occupational health programs.
6) **Fire Chemistry**: Understand the chemical processes involved in fires and methods of fire prevention and extinguishing.

29) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods
((Theoretical lectures / seminars / debate work between students))

13. Course Structure (Theory)	
Week	**Material Covered**
Week 1	Introduction to Fundamentals of Occupational Safety • Overview of Fundamentals of Occupational Safety • Importance of Occupational health and safety professions.
Week 2,3	Classification of occupational safety • Industrial toxicology demand • Gases, vapors, and solvents. • Particulates. • Thermal radiation.
Week 4	HAZARD. • Biological • Electrical • Mechanical • Noise pollution
Week5	A field visit
Week 6	Control of Hazard in work place, Accident. • Personal protection in work place. • Ergonomic (Human engineering).
Week 7	Mid-term Exam
Week 8,9	The Safety Of Working In Laboratories • The Safety Of Working And Warehouses. • Work Enviroment(Human Relationship). • Industrial Psychology
Week 10,11	Occupational Health Program, Iso45000 Sysrem Requirements & Operations.
Week 12	A field visit - Chemist of fire • What is fire Types of Energy.
Week 13	Real-World Applications and Case Studies • Analysis of case studies and real-world examples • Application of Safety health techniques to engineering projects
Week 14	Group projects
Week 15	Preparatory Week
Week 16	Final Exam

14. Infrastructure	
Required reading	Available in free education and institute library
Main references (sources)	Available in free education and institute library
B - Electronic references, Internet sites...	Internet

15. Course development plan
The Risk Management course aims to provide students with the tools to identify, assess, and mitigate risks in various industries. It focuses on understanding risk analysis techniques, risk assessment frameworks, and the development of strategies to manage and minimize potential threats. The course will also cover regulatory compliance and the role of risk management in

decision-making and organizational success.

Sludge Treatment ENPE419

1. Teaching Institution	Ministry of Higher Education and Scientific Research / Northern Technical University
2. University/ Department	Technical Engineering College-Kirkuk/ Environment and Pollution Techniques Engineering Department
3. Course title/code	**Sludge Treatment ENPE419**
4. Programme (s) to which it contributes	Bachelor Of Technical Engineering
5. Modes of Attendance offered	* Weekly lesson schedule (theoretical) * Scientific discussions, seminars, other activities
6. Semester/Year	modules
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	7 / 1 / 2024

8. Aims of the Course

The objective of this course is to investigation of treatment and disposal alternatives of sludge obtained from different sources, defining and designing suitable processes and processes for the treatment of domestic wastewater treatment plant sludge.

After this course, the student could determine the sources, quantities and properties of sludge, sludge treatment systems, sludge promotion, thickening, anaerobic digestion, aerobic digestion, other stabilization methods, conditioning, dewatering: mechanical dewatering techniques, sludge drying beds and lagoons, heat drying, composting, disinfection, incineration, and delivery of sludge to the field, evaluation of sludge, final removal.

10. Course outcomes and teaching, learning and evaluation methods

Course Learning Outcomes: Upon successful completion of this course, students will be able to:

1- Defines the pollutant properties and treatment targets of the sludge.
2- Compares different treatment methods and creates flow charts.
3- Selects different processes and processes used for sludge treatment and uses design criteria.
4- Solves design examples for different sludge treatment units.

Identifies and compares different processes and processes used for final evaluation purposes.

30) 11. Evaluation methods

((Oral tests / written tests / weekly reports / daily attendance / participation and interaction in lectures / semester and final exams))

12. Teaching and learning methods

((Theoretical lectures / seminars / debate work between students))

13. Course Structure	
week	**Material Covered**
1	**Introduction of treatment sludge and its sources**
2	**Application methods for treatment and disposal of sewage sludge**
3	**Calculation of the amount of treatment sludge**
4	**Sludge thickening**
5	**Design examples for sludge thickening**
6	**Sludge stabilization**
7	**Anaerobic sludge stabilization and design examples**
8	**Aerobic sludge stabilization, design criteria and examples**
9	**Composting**
10	**Sludge conditioning process, removal of sludge water**
11	**Final disposal methods**
12	**Final disposal methods**
13	**Final disposal methods**
14	**Final disposal methods**
15	**Equipment used in sludge treatment, definition of legal legislation**

14. Infrastructure	
Required reading	**Available in free education and institute library**
Main references (sources)	**Available in free education and institute library**
B - Electronic references, Internet sites...	**Internet**

15. Course development plan
Sludge Treatment course aims to provide students with the tools to identify, assess, and mitigate risks in various industries. It focuses on understanding risk analysis techniques, risk assessment frameworks, and the development of strategies to manage and minimize potential threats. The course will also cover regulatory compliance and the role of risk management in decision-making and organizational success.