Republic of Iraq Ministry of higher education & scientific research Supervision and scientific evaluation directorate

Quality assurance and academic accreditation

Academic Program Specification Form For The Academic

University : Northern Technical University
College: Eng. Technical College/ Mosul
Department of Chemical and Petroleum Industries Techniques Engineering
Date of form completion:

Dean`s Name	Dean`s Assistant for Scientific Affairs	Head of Department
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Date: / /	Date: 24 / 3 / 2024	Date: 24 / 3 / 2024
Signature	Signature	Signature

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Date: 2024 / 3 / 24

Signature

Ministry Of Higher Education & Scientific Research Republic of Iraq
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Academic Program Specification from the Academic

2024

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**.**

Template for Programme Specification

University Name: Northern Technical University
College/Institute: Eng. Technical College/ Mosul
Scientific Department: Chemical and Petroleum Industries Technologies Engineering
Academic Program Name: Bachelor's degree in Eng. Technical College/ Mosul - Department of of Chemical and Petroleum Industries Technologies Engineering
Final Degree Name: Bachelor in Technical Engineering
Study System: Bologna System
Description Preparation Date: 7/3/2024
File Completion Date: 7/3/2024

Dr. Huda Abdulrazzaq
Head of Department
Signature:
Date:

Dean`s Assistant for Scientific Affairs
Signature:
Date:

Quality Assurance and University performance manager
Signature
Date: / /

Dr. Majid
Dean
Signature:
Date: / /

1. Program Vision

The academic program in Chemical and Petroleum Industries Technologies Engineering provides graduates with qualification during the bachelor's degree period through its strengths, which extend over four years of university study. This enables them to build knowledge qualifying them for a Bachelor's degree in Chemical and Petroleum Industries Technologies Engineering at the college and university level. This is achieved through designing, studying, analyzing, and approving recommendations, as well as making decisions related to work, components, and devices, using modern technologies.

2. The program's message:

The Department of Chemical and Petroleum Industries Technologies Engineering seeks excellence in teaching and research aspects to prepare Chemical and Petroleum Industries Engineering engineers for their participation in industries, academic institutions, research institutions, and community service according to national and international standards. This is derived from the main objectives of the Chemical and Petroleum Industries Engineering Department, which include:

- Instilling conceptual knowledge in the field of chemical engineering.
- Transferring problem-solving and analytical skills in contemporary processes.
- Accelerating the provision of state-of-the-art laboratory facilities to provide practical knowledge.
- Designing and developing environmentally friendly sustainable technologies with the assistance of computational skills.
- Facilitating the ability to learn, innovate, and communicate about technological developments for the benefit of humanity.
- Disseminating knowledge related to intellectual property rights, ethics, professionalism, entrepreneurship, and their impact on society.

3. Program Objectives:

A. Knowledge and Understanding

1. Graduates will have a strong foundation in engineering, sciences, and current practices of chemical and petroleum industries' technology. They will have experience in solving structured and unstructured problems using both traditional and innovative solutions.
2. Graduates will have the ability to effectively describe problems, analyze data, develop potential solutions, evaluate these solutions, and present results using their verbal, written, and electronic skills.
3. Graduates will have an understanding of the ethical and professional responsibilities of an engineer, and the impact of engineering solutions on society and the global environment.

B. Subject-specific skil

1. Transfer of problem-solving and analytical skills in contemporary operations.
2. Accelerating the provision of state-of-the-art laboratory facilities to deliver practical knowledge.
3. Designing and developing sustainable and environmentally friendly techniques with the assistance of computational skills.
4. Facilitating the ability to learn, innovate, and communicate with technological advancements for the benefit of humanity.
5. Disseminating knowledge related to intellectual property rights, ethics, professionalism, entrepreneurship, and their impact on society.

C. Emotional and Values Objectives:

1. Graduates will have a strong foundation in engineering, sciences, current chemical and petroleum industries technology practices, and engineering practices. They will possess experience in solving organized and unorganized problems using traditional and innovative solutions.
2. Graduates will be able to effectively describe the problem, analyze data, develop potential solutions, evaluate these solutions, and present the results using their oral, written, and electronic skills.
3. Graduates will understand the ethical and professional responsibilities of an engineer and the impact of engineering solutions on society and the global environment.

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				
College Requirements				
Department Requirements				
Summer Training				
Others				

- Notes may include whether the course is mandatory or elective.

7. Program Description

Year/ Level	Course or Module Coode	Course or Module Title	Credit Hours	Credit Hours
First	Morning section Evening section	First stage – Morning First stage - Evening	750 750	750 750
Second	Morning section	Second stage – Morning Second stage - Evening	750 750	750 750
Third	Evening section	Third stage – Morning Third stage - Evening	750 750	750 750
Fourth	Morning section	Fourth stage – Morning Fourth stage - Evening	750 750	750 750

8. Expected Learning Outcomes for the Program

Knowledge:

Keeping up with the development and communication of everything new or useful and adapting it.

Skills

1. Teamwork skills.
2. Computer and internet skills.
3. Communication skills such as English language and presentation.
4. Leadership skills and responsibility management.
5. Self-learning and lifelong learning skills.

Values:

Developing students' abilities to share ideas.

9. Teaching and Learning Strategies:

1. Detailed explanation of scientific material to students.
2. Involving students in solving mathematical problems.
3. Discussion and dialogue about vocabulary related to the subject.
4. Summer and professional training.
5. Laboratories.
6. Scientific films and videos (online and in-person).
7. Blended learning.
8. Graduation projects.

10. Assessment Methods:

Conducting daily, midterm, and final exams, submitting weekly reports, and completing classroom and homework assignments.

11. Faculty Members

Faculty Member

Faculty Member	Specialization		Special Requirements/Skills (if any)	Total Staffing	
	General	Specific		Permanent	Part time
Dr.. Hoda Abdel Razzaq Younis	Chemistry Sciences			Permanent	
Dr.. Ali Younis Hamed	Chemistry Sciences			Permanent	
Dr. Rafi Rushdi Muhammad	Chemical Engineering			Permanent	
Dr.. Asmaa Bakr Nayef	Chemistry Sciences			Permanent	
Dr.. Haider Ismail Ibrahim	Chemical Engineering			Permanent	
Dr. Sarah Rashid Ghayeb	Chemical Engineering			Permanent	
Azzam Essam Abdel Karim				Permanent	
Heba Abdul Karim Saleh	Computer Engineering			Permanent	
Sondos Falah Muhammad				Permanent	
Karam Salah El-Din Sharif Muhammad	Chemistry Sciences			Permanent	
Mahmoud Khalil Selim	Chemistry Sciences			Permanent	

Professional Development
Guidance for New Faculty Members
Professional development for faculty members:
1. Inside training courses. 2. External training courses. 3. Scientific research. 4. Study circles and scientific seminars. 5. Self-education.

12. **Admission criteria**
- High school section - Occupational school - The average degree

13.Key sources of information about the programme
1. Book andTextbook **2.** Scientific catalogues **3.** Scientific research and publishing paper **4.** Internet

14.Program Development Plan
Utilizing new concepts and electronic devices for presenting information and issues.

Program Skills Matrix															
Required Learning Outcomes from the Program															
values				Skills				Knowledge				Core or support	Name	Code	Year/ Level First
C4	C3	C2	C1	B4	B3	B1	B1	A4	A3	A2	1A				
												Core	Democracy and Human Rights	NTU100	Second Third
												Support	English Language	NTU101	
												core	Engineering Mathematics	TECO201	Fourth Year/ Level
												support	Fluid Mechanics	TECO200	
												core	Mass Transfer	TECO300	First Second
												support	Engineering Analysis	TEMO300	
												core	Research Methodology	NTU400	Third
												support	Corrosion Engineering	TECO405	

- **Please put a checkmark in the boxes corresponding to individual learning outcomes from the program subject to evaluation.**

Course Description Template

1. Human Rights and Democracy
The core ideas and concepts of democracy and human rights are examined in this subject. Students will learn about issues including equality, social justice, and civil liberties. The goal of the module is to help students comprehend the value of democracy and human rights in society.
2. English Language
Define special knowledge and basic concepts in the English language, and review words, terms, and phrases commonly utilized, along with practical everyday language that students need. Explore the fundamental principles of grammar used in the English language, such as questions and answers, negatives, tail questions, singular and plural forms, numbers, nouns, pronouns, and the verbs 'to be,' 'to have,' and 'to do.' Additionally, cover adjectives, regular and irregular verbs, the usage of 'so' and 'neither,' adverbs, degrees of comparison, conjunctions, interjections, and types of letters (S) with general exercises.
3. Engineering Drawing
The Engineering Drawing course is designed to provide students with the fundamental knowledge and skills required to create accurate technical drawings commonly used in engineering and design fields. The course focuses on developing proficiency in reading, interpreting, and creating engineering drawings using industry-standard practices and techniques. Additionally, it includes an introduction to AutoCAD 2D software for engineering drawing.
4. Principles of Chemical Engineering
The objective of this course is to teach students the fundamental knowledge of chemical engineering and its application in solving material balances of chemical processes. Material balance is an essential tool in chemical engineering as it helps engineers optimize processes, identify sources of inefficiency, minimize waste generation, and ensure compliance with environmental regulations. It finds applications in various industries, including petroleum refining, chemical production, food processing, and wastewater treatment, among others, to maintain efficient and sustainable operations. The course will cover concepts ranging from basics such as units and dimensions and stoichiometry to the simultaneous application of material balances with and without chemical reactions for single and multi-processes.

5. Mathematics
This module provides an introduction to functions, limits, special functions, derivatives, the chain rule, and their applications. It also introduces integral calculus and various methods of integration. Students will learn how to calculate derivatives and integrals of functions, along with their applications in fields such as physics, engineering, and economics. The module aims to develop students' analytical and problem-solving skills.
6. Electrical Principles
The Electrical Principles course is designed to provide students with a foundational understanding of electrical concepts, principles, and applications. It covers the fundamental principles of electricity and electrical circuits, laying the groundwork for further study and practical application in electrical engineering and related fields. The course covers basic electrical engineering topics in detail, including examples and explanations of direct current circuits, AC circuit network calculations, standards and conventions, Ohm's law, resistance, resistivity, electromagnetism, generators, alternating current, transformers, motors, and instrumentation.
7. General Chemistry
The General Chemistry course provides students with a comprehensive understanding of the fundamental principles and concepts of chemistry. It serves as an introduction to the study of matter, including its properties, composition, transformations, and interactions. The course aims to develop students' critical thinking, problem-solving, and laboratory skills in the field of chemistry. It covers the fundamentals of atoms, molecules, quantitative analysis, environmental chemistry, transition metal chemistry, and spectroscopic techniques, which are extensively used in other chemical engineering courses.
8. Computer Principles
The Fundamentals of Computer Science course is designed to provide a comprehensive introduction to the key concepts and principles of computing. Its aim is to equip students with the fundamental knowledge and skills necessary to understand and engage with the world of computers and technology. The course will combine theoretical knowledge with practical exercises and projects to reinforce understanding and application. Students will gain hands-on experience with programming languages, development tools, and software applications relevant to the topics covered.

9. Engineering Mechanics &Strength of Materials
The course covers the principles of statics, including the results of a force system, equilibrium of a force system, moment of a force, friction, centroid and center of gravity, moment of inertia, analysis of internal forces, strain, stress-strain diagram, Hook's law, shearing deformation, Poisson's ratio, volumetric strain, thin-walled cylinders, thermal stress, and shear and bending moment in beams.
10. Workshop
The Workshop course provides students with practical knowledge and skills related to various workshop processes and technologies commonly used in the manufacturing, construction, and engineering industries. Its aim is to develop hands-on skills, safety awareness, and an understanding of different tools, machines, and materials used in workshop settings. The course includes practical demonstrations, hands-on workshops, and projects to provide students with real-world experience. Emphasis is placed on safety precautions, proper use of tools and equipment, and adherence to industry standards throughout the course.
11. Fluid Flow
Define fluid properties, stresses in fluids at rest and in motion, and types of fluid flows. Discuss the application of Newton's law of viscosity and the dimensional analysis method. Derive and define the governing equations of fluid flow, including the continuity, energy, and momentum equations, based on the principles of mass, energy, and momentum conservation. Define the terms of Bernoulli's equation, including major and minor losses, as well as the required energy for flow. Explain the different types of fluid pumping devices, their characteristics, and how to select the appropriate type and size for a given fluid pumping application. Lastly, discuss the calculations for pressure drop in these systems.
12. Technical English
Define special knowledge and basic concepts in the English language, including a review of phonetics and spelling with words and sounds that require attention in understanding their meaning and pronunciation. Discuss fundamental principles of grammar utilized in the English language, such as the use of prefixes (un-, im-, in-, and dis-), the distinction between since and for, and the usage of definite and indefinite articles. Explain the different verb tenses (simple, continuous, and perfect) in the present, past, and future. Discuss punctuation rules, active and passive voice, direct and indirect speech, finite and non-finite verbs, and the analysis and types of sentences. Additionally, provide an accurate description of the nature of vocabularies and idioms used by chemical engineers, which are essential for

students in their academic and professional careers. This will be achieved through the application of two reading passages focusing on the work of chemical engineers in factories, as well as the equipment, tools, and materials they utilize.

13. Engineering Mathematics

The Engineering Mathematics course is designed to provide students with a solid mathematical foundation and equip them with the necessary tools and techniques to solve engineering problems. The course covers a wide range of mathematical concepts and their applications in engineering fields, emphasizing both theoretical understanding and practical problem-solving skills. Topics covered include the evaluation of double and triple integrals, definite integrals and their applications for finding areas, polar coordinates, vector analysis, determinants, and matrices. Through this course, students will develop the skills needed to apply these mathematical concepts to various chemical engineering applications in the future.

14. Physical Chemistry

The Physical Chemistry course provides students with a comprehensive understanding of the principles and theories that govern the behavior of matter and chemical systems at the molecular and atomic levels. By combining concepts from physics and chemistry, this course explores the fundamental principles underlying chemical reactions, molecular structure, and the physical properties of substances. It covers the fundamentals of atoms and molecules, quantitative analysis, environmental chemistry, transition metal chemistry, and spectroscopic techniques, all of which are highly relevant to other chemical engineering courses.

15. Professional ethics

Will this curriculum enable all students to understand the principles of ethical analysis and to think about various professional situations they will encounter, and to make the optimal ethical decisions in those situations after they graduate? In addition, this curriculum will help colleges and technical institutes obtain academic accreditation from specialized international accreditation bodies by including professional ethics material in their courses.

16. Petroleum Chemistry

This course provides an introduction to organic compounds, their preparation, and reactions, including petroleum and heterocyclic compounds. It covers petroleum feedstock, refining processes, and products, as well as the properties of various petroleum fractions.

17. Computer Applications

The Computer Applications course provides an introduction to MATLAB, a powerful software tool used for programming, data analysis, and visualization in scientific and engineering fields. Through this course, students will gain a solid understanding of MATLAB programming, data analysis, and visualization techniques. They will learn how to develop algorithms, write MATLAB code, manipulate and analyze data, and create visualizations for various scientific and engineering applications. By the end of the course, students will have acquired the necessary skills to effectively utilize MATLAB for their computational and analytical needs.

18. Kinetics

The Kinetics course provides students with an in-depth understanding of chemical reaction rates and the factors that influence them. The course focuses on studying the speed at which chemical reactions occur and the mechanisms by which they proceed. It includes lectures, problem-solving exercises, laboratory experiments, and data analysis. Students will have the opportunity to apply kinetic principles to real-world chemical reactions, analyze reaction mechanisms, and make predictions about reaction rates based on experimental data. By the end of the course, students will have a solid understanding of kinetic principles and their applications in chemical reactions. They will be equipped with the skills to analyze reaction rates, determine rate laws, propose reaction mechanisms, and evaluate the factors influencing reaction kinetics.

19. Energy balance

The aims of the course are to introduce the concepts of energy balances in chemical processes, including calculations and applications, and to provide a deep understanding of the mechanisms involved in heat balance for closed and open systems, as well as steady and unsteady states. The course aims to provide students with a wide scope of knowledge and an improved understanding of energy balance. By the end of the course, students should be able to apply energy balance principles to solve engineering problems.

20. Petroleum fluid properties

The objective of this course is to understand the physical and chemical properties of petroleum specialty products, which are valuable but often overlooked fuels. The course aims to provide a detailed explanation of all the properties associated with these products.

21. Mass Transfer
This course covers diffusion and mass transfer in binary and multi-component systems, including topics such as molecular diffusion in fluids, convective mass transfer, mass transfer coefficients, mass transfer correlations, interphase mass transfer, and mass transfer theories. It also includes discussions on gas absorption, stripping, and distillation for both binary and multi-component mixtures. The course aims to provide students with the necessary concepts to design mass transfer equipment.
22. Heat Transfer
This course provides a comprehensive overview of heat transfer, covering topics such as modes of heat transfer, equations and analysis, hydrodynamics and thermal boundary layers, design procedures for heat transfer equipment, heat transfer in boiling and condensation processes, and furnace design. Students will gain a solid understanding of heat transfer principles and their practical application in engineering.
23. Industrial Safety
The Industrial Safety course provides students with a comprehensive understanding of safety principles, practices, and regulations in industrial settings. The course focuses on identifying and mitigating workplace hazards, promoting a safety culture, and ensuring the well-being of workers. It includes lectures, case studies, group discussions, and practical exercises. Students will have the opportunity to apply safety principles and techniques to real-world industrial scenarios, analyze safety risks, and develop strategies for creating a safer work environment.
24. Natural gas Engineering
The objective of this module is to familiarize students with various aspects of natural gas. It covers essential topics such as the properties of natural gas, its applications, and the operation of gas power plants. The module also explores the different steps involved in gas treatment, including the processing of sour and sweet gas, as well as natural gas recovery techniques. Additionally, students will gain an understanding of the natural gas industry, including aspects such as natural gas pipelines and storage facilities. By the end of this module, students will have a comprehensive knowledge of the fundamental concepts and processes related to natural gas.
25. Engineering Analysis
The Engineering Analysis course focuses on developing students' analytical and problem-solving skills in engineering. It covers mathematical and computational methods used in engineering disciplines, including mathematical modeling, data analysis, and problem-solving techniques. Students will learn how to apply these methods to solve complex

engineering problems, interpret and analyze data using statistical techniques, evaluate software tools, and design and conduct simulations and experiments. They will also gain proficiency in communicating analysis results through reports, presentations, and visualizations. By the end of the course, students will have a solid understanding of engineering analysis principles and the ability to apply mathematical and computational methods effectively in various engineering scenarios.

26. Chemical Engineering Thermodynamics

The course on chemical engineering thermodynamics covers a wide range of topics essential to understanding thermodynamic principles in chemical engineering. Students will delve into the study of volumetric properties of pure fluids, entropy, and second law analysis of engineering systems, as well as thermodynamic properties of fluids. The application of thermodynamics to flow processes is explored, along with the discussion of power cycles, refrigeration and liquefaction processes. Solution thermodynamics, including the theory and application, vapor/liquid equilibrium in binary and multi-component systems, and ideal and non-ideal solutions using Raoult's and modified Raoult's law, are also covered. Additionally, the course delves into the concepts of fugacity and fugacity coefficient definitions, chemical reaction equilibrium, and thermodynamic analysis of processes. By the end of the course, students will have a comprehensive understanding of the key principles and applications of thermodynamics in chemical engineering.

27. Reactor Design

The reactor design course focuses on providing students with the theoretical foundation and design principles necessary for designing chemical reactors. The course covers topics such as the fundamentals of reactor design, mass conservation equations, and the design of ideal reactors. Students will learn about isothermal reactors for homogeneous reactions and non-isothermal reactors, as well as multiple reactor systems. By studying these concepts, students will develop a solid understanding of reactor design principles and gain the skills needed to design and analyze chemical reactors for various applications.

28. Process Simulation

The objective of the process simulation course is to familiarize students with the concepts and techniques used in simulating chemical processes and plant design. The course aims to engage students in understanding the main components of plant design and teach them the procedures for designing different equipment using Aspen Hysys software. Through this course,

students will gain practical experience in using simulation software to model and analyze chemical processes, optimize process conditions, and evaluate equipment performance. By the end of the course, students will have acquired the skills and knowledge necessary to simulate and design chemical processes effectively, contributing to their future roles in the field of chemical engineering.

29. Unit Operation

The Unit Operations module provides students with a comprehensive understanding of the theory, design, and applications of various unit operations used in the chemical industry. Topics covered include drying, humidification, cooling towers, evaporation, crystallization, solid-liquid filtration, sedimentation, liquid-liquid extraction, leaching, and washing. Students will gain the necessary knowledge and skills to design and optimize these operations, contributing to the efficiency of chemical processes.

30. Instrumental of Chemical Analysis

The Instrumental Methods of Chemical Analysis course covers modern analytical techniques used in chemical analysis. Students learn about the principles, operations, and applications of various instrumental methods for both qualitative and quantitative analysis. The course focuses on equipping students with the skills to utilize advanced instruments and technologies for accurate and precise chemical measurements. By the end of the course, students will have a solid understanding of instrumental analysis and be able to apply their knowledge to solve analytical problems effectively.

31. Petroleum Refinery

The main objective of this module is to provide an overview of petroleum feedstock, refining processes, and the various products derived from it. It aims to familiarize learners with the properties of different petroleum fractions and the methods used for their separation and purification. Additionally, the module will cover the design principles of atmospheric and vacuum columns for petroleum fractionation. Furthermore, refinery processes will be discussed in terms of their objectives, feedstock, products, and the catalysts employed.

32. Equipment Design

The content of the equipment design course includes various aspects such as process planning, designing piping and pump networks, gas-gas separation techniques, solid handling methods, and heat and mass transfer equipment. This course aims to provide knowledge and skills related to

designing efficient and effective equipment for industrial processes. Students will learn about the principles and considerations involved in planning and designing processes, as well as the selection and sizing of piping systems and pumps. Additionally, the course covers the separation of gases, handling of solids, and the design of heat and mass transfer equipment.

33. Process Control

The aim of the process control course is two-fold. Firstly, it focuses on studying the dynamic characteristics of open-loop Chemical and Petroleum Refinery engineering processes. This involves formulating transfer functions and analyzing system responses in order to design and select appropriate closed-loop control schemes. The course provides insights into understanding the behavior of the system under different conditions and how it can be effectively controlled. Secondly, the course emphasizes the analysis of closed-loop Petroleum Refinery Engineering processes to design and select a control scheme that ensures stable operation of the plant. Students will learn techniques to maintain desired process conditions and optimize plant performance through effective control strategies.

34. Chemical Industries

The Chemical Industries course offers students a comprehensive overview of the chemical manufacturing sector, encompassing a wide range of industries involved in the production of chemicals and related products. The course emphasizes the study of processes, technologies, and economic considerations within chemical industries. Students will gain a deep understanding of the various aspects involved in the production, operation, and management of chemical manufacturing processes. Through this course, students will develop knowledge and skills that are essential for success in the chemical industry.

35. Research Methodology

The research methodology module is designed to equip students with the necessary knowledge and skills to conduct research in the field of engineering. It covers various aspects such as research methods, experimental design, data analysis techniques, and academic writing. The module aims to enhance students' research capabilities and prepare them for independent research projects. By the end of the module, students will have a solid understanding of the research process and will be equipped with the tools and techniques needed to plan, execute, analyze, and communicate their research effectively. This module plays a vital role in fostering research skills and promoting a culture of inquiry among engineering students.

36. Petrochemical
The Petrochemical course provides students with a comprehensive understanding of the petrochemical industry, focusing on the production, processing, and applications of petrochemicals. The course covers the key aspects of petrochemicals, including their sources, production processes, product portfolio, and industrial significance.
37. Corrosion Engineering
The course aims to achieve several objectives in the field of corrosion. It covers the definition of corrosion and familiarizes students with different forms of corrosion, as well as the significance of corrosion in terms of economics, environment, and safety. Additionally, students learn about basic electrochemistry and gain an understanding of electrochemical processes and concepts. The course also focuses on establishing corrosion rates and teaches principal corrosion control methods, such as designing for corrosion control, materials selection, modifying the environment, applying protective coatings, and utilizing cathodic and anodic protection. Students explore the mechanisms of corrosion reactions, including reduction and oxidation reactions, the galvanic series, polarization, and passivation. Lastly, the course emphasizes the development of corrosion protection processes. Overall, it provides students with a comprehensive understanding of corrosion and equips them with the necessary knowledge and skills to effectively address corrosion challenges.
38. Environmental pollution
The Environmental Pollution course covers the definitions and classification of pollutants emitted from petroleum refineries. It discusses air pollution sources, types, and control equipment, including settling chambers and cyclones. Water pollution sources, pollutants, and wastewater treatment methods are explored. The course also addresses solid waste classification and disposal methods. Overall, it provides a comprehensive understanding of pollution issues in refineries and their mitigation.
39. Engineering Economics
The Engineering Economic course focuses on the profitability and efficiency of chemical plant operations. It addresses considerations such as investment estimation, production costs, resource availability, market demand, and production efficiency. The course also explores the economic decisions related to what, how, for whom, and how much to produce. Overall, it provides essential insights into optimizing production processes to manufacture goods according to standard specifications while minimizing costs.

40. Graduation Project
The Graduation Project offers students the chance to apply their acquired knowledge and skills from their studies to a real-world engineering project. With the guidance of a faculty advisor, students will conceptualize, design, implement, and present a significant engineering project. The module aims to enhance students' practical skills, project management abilities, and prepare them for professional engineering practice.