

Al-Muthanna University

جامعة المثنى



First Cycle – Bachelor's Degree (B.Sc.) – Chemical Engineering

بكالوريوس - هندسة كيميائية (الدورة الأولى)



Table of Contents

1. Overview
2. Undergraduate Modules 2023-2024
3. Contact

1. Overview

This catalogue is about the courses (modules) given by the program of Chemical Engineering to gain the Bachelor of Science degree. The program delivers (٤٧) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامة

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج الهندسة الكيميائية للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (٤٧) مادة دراسية، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
ENG111	Mathematics I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	88
Description			
Module Name: Mathematics I			
Module Description:			
The Mathematics course promotes mathematical skills and knowledge, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving world-real problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities.			

Module 2

Code	Course/Module Title	ECTS	Semester
CHE112	Physics	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	88
Description			
This course involved Introduction to physics and physical quantities, including: introduction to atomic physics; oscillatory motion , to understand volt Newton's Laws of Motion, first law, second law-acceleration, force and mass ,third law , in addition to describe moving fluids and continuity principle; Static fluids and Pascal's law ,flow and Poiseuille's equation.			

Module 3

Code	Course/Module Title	ECTS	Semester
CHE113	Chemical Eng. Principle I	7	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	113
Description			
Module Name: principles of chemical engineering Module Description: principles of chemical engineering module is offered for chemical engineering students to build their ability of controlling systems of chemical engineering manufacturing processes, by teaching them the main strategies of materials and energy balance calculations for open and closed systems that include recycle, bypass and purge in steady state and unsteady state processes, with or without chemical reactions, in batch, semi-batch and continues processes. However the module designed to learn wide range of basic calculations of units, operating with units, dimensions, mole, density, concentration, and pressure, ideal and real gas. The module provides an explanation of basic concepts supported by intensive mathematical problems for the purpose of exercising students to expand their awareness to find solutions to these problems.			

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Module 4

Code	Course/Module Title	ECTS	Semester
ENG114	Engineering drawing	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	2	47	53
Description			
Module Name: Engineering Drawing Module Description: A drawing is a graphic representation of an object, or a part of it, and is the result of creative thought by an engineer or technician. When one person sketches a rough map in giving direction to another, this is graphic communication. Graphic communication involves using visual materials to relate ideas. Drawings, photographs, slides, transparencies, and sketches are all forms of graphic communication. Any medium that uses a graphic image to aid in conveying a message, instructions, or an idea is involved in graphic communication. Technically, it can be defined as “a graphic representation of an idea, a concept or an entity which actually or potentially exists in life. The drawing itself is a way of communicating all necessary information about an abstract, such as an idea or concept or a graphic representation of some real entity, such as a machine part, house or tools.			

Module 5

Code	Course/Module Title	ECTS	Semester
UNI115	Computer Science	4	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	3	62	38
Description			
Module Name: Computer Science Module Description: Programming is one of the important subjects that every engineer must learn its basics, to be familiar with the structure of the program, how it works, how the user deals with the program interface, and how to receive the required outputs. The second stage teaches Visual Basic and MATLAB, starting from the basics to advanced programming and drawing functions.			

Module 6

Code	Course/Module Title	ECTS	Semester
UNI116	Arabic Language	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	43
Description			
تتضمن هذه المادة تمكين الطالب من كتابة التقارير باللغة العربية بشكل صحيح وتجنب الأخطاء اللغوية والاملائية والاسلوبية. تطوير قدرة النطق الفصيح لدى الطالب للتمكن من التواصل بحرفية خلال العمل. توسعة فهم الأدب العربي لانماء اساليب الكتابة في العربية. توسعة القدرة على التعبير وطرح الافكار بلغة عربية رصينة.			

Module 7

Code	Course/Module Title	ECTS	Semester
ENG121	Mathematics II	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	88
Description			
Module Name: Mathematics II Module Description: The Mathematics course promotes mathematical skills and knowledge, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving world-real problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities.			

Module 8

Code	Course/Module Title	ECTS	Semester
CHE122	Chemistry	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Organic chemistry This course was designed in a way such that you learn that organic chemistry is that A science directly related to chemical engineering concerned with the study of all organic compounds, their chemical and physical properties, methods of preparation and their interactions. the organic compounds are classified and each compound is studied in detail starting with the aliphatic compounds and what they include of alkanes, alkynes and alkynes, the properties of			

each one of them, their composition, formula, method of naming, methods of preparation and their chemical interactions.

Then study the ring compounds to understand the difference between the open chain compounds and the cyclic compounds and the difference in their physical properties, methods of preparation and the nature of their interactions.

Then a study of aromatic compounds to make it clear to us their difference from aliphatic compounds through their properties, interactions and methods of preparation.

Then study the rest of the organic compounds such as alcohols, alkyl halides, aldehydes, ketones, and carboxylic acids, and identify them in detail in terms of composition, chemical formula, naming method, physical properties, preparation methods, and chemical reactions.

Analytical chemistry studies and uses instruments and methods to separate, identify, and quantify matter. In practice, separation, identification or quantification may constitute the entire analysis or be combined with another method. Separation isolates analytes. Qualitative analysis identifies analytes, while quantitative analysis determines the numerical amount or concentration.

Analytical chemistry consists of classical, wet chemical methods and modern, instrumental methods. Classical qualitative methods use separations such as precipitation, extraction, and distillation. Identification may be based on differences in color, odor, melting point, boiling point, solubility, radioactivity or reactivity. Classical quantitative analysis uses mass or volume changes to quantify amount. Instrumental methods may be used to separate samples using chromatography, electrophoresis or field flow fractionation. Then qualitative and quantitative analysis can be performed, often with the same instrument and may use light interaction, heat interaction, electric fields or magnetic fields. Often the same instrument can separate, identify and quantify an analytic. Analytical chemistry is also focused on improvements in experimental design, chemometrics, and the creation of new measurement tools. Analytical chemistry has broad applications to medicine, science, and engineering.

Module 9

Code	Course/Module Title	ECTS	Semester
CHE123	Chemical Eng. Principle II	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

3	1	62	113
Description			
Module Name: Chemical Eng. Principle II Module Description: principles of chemical engineering module is offered for chemical engineering students to build their ability of controlling systems of chemical engineering manufacturing processes, by teaching them the main strategies of materials and energy balance calculations for open and closed systems that include recycle, bypass and purge in steady state and unsteady state processes, with or without chemical reactions, in batch, semi-batch and continues processes. However the module designed to learn wide range of basic calculations of units, operating with units, dimensions, mole, density, concentration, and pressure, ideal and real gas. The module provides an explanation of basic concepts supported by intensive mathematical problems for the purpose of exercising students to expand their awareness to find solutions to these problems.			

Module 10

Code	Course/Module Title	ECTS	Semester
UNI124	Human Rights and Democracy	3	2

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	43
Description			
A comprehensive and focused definition of human rights, starting from the roots of their inception and the developments witnessed by these human rights throughout the ages and human societies, and the contribution of heavenly laws, religions and civilizations in providing them with values and ideals through different eras. A statement of the international recognition of these rights by international organizations, foremost of which is the United Nations, and then the regional recognition in various parts of the world. The role of non-governmental organizations concerned with human rights and the state's humanitarian law, the objectives of these organizations, their means of work, and their role in the development of respect and protection for human rights. Practical guarantees for human rights at the national level in national constitutions and legislation represented by constitutional and judicial guarantees, then political guarantees, in addition to the role played by national organizations concerned with human rights in defending and protecting these rights.			

Module 11

Code	Course/Module Title	ECTS	Semester
UNI125	English Language I	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	68
Description			
The English course promotes language skills and knowledge, effectiveness in developing Proficiency in grammar, listening, speaking and writing. Students must develop and exercise their second language abilities. Language Proficiency Development: The aim is to enhance students' overall language proficiency in English. The module aims to help students build a solid foundation in grammar, vocabulary, and pronunciation. 2. Communication Skills: The aim is to develop students' ability to communicate effectively in various			

everyday situations and academic contexts.

3. Vocabulary Expansion: The aim is to expand students' vocabulary range. The module focuses on introducing and reinforcing new words, idioms, and expressions commonly used in spoken and written English.

4. Grammar Mastery: The aim is to reinforce and expand students' understanding of English grammar structures. The module aims to provide systematic grammar instruction, practice, and application in authentic contexts.

Module 12

Code	Course/Module Title	ECTS	Semester
ENG126	Workshops	4	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	2	47	53
Description			
The Workshops Module provides students with a comprehensive understanding of essential skills and knowledge needed in the workshops. The module covers a wide range of topics, including industrial safety protocols to ensure a safe working environment. Students learn the proper manner of writing engineering technical reports to effectively communicate their findings and observations. Practical workshops are conducted in lathe, casting welding, MEP (Mechanical, Electrical, Plumbing), carpentry, and milling, allowing students to gain hands-on experience and develop skills specific to each workshop. Through a combination of theoretical instruction, practical exercises, and real-world projects, students acquire the necessary expertise to excel in mechanical workshop practices while prioritizing safety and effective communication.			

Module 13

Code	Course/Module Title	ECTS	Semester
CHE211	Engineering Mathematics I	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	38

Description
Module Name: Math I & II Module Description: The Mathematics course promotes mathematical skills and knowledge, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving world-real problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities.

Module 14

Code	Course/Module Title	ECTS	Semester
CHE212	Fluid Flow I	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Module Name: Fluid Flow I Module Description: Fluid flow is generally the motion of a fluid that is subjected to different unbalanced forces. It is mainly a part of fluid mechanics and fluid flow generally deals with the dynamics of the fluid. The motion of the fluid continues till different unbalanced forces are applied to the fluid. To study the behavior of materials that act as fluids, it is useful to define a number of important fluid properties, which include density, specific weight, specific gravity, and viscosity. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving fluid flow problems and consider that in your graduation work. The course covers the concept of fluid flow, physical properties of fluid, dimensional analysis methods, barometer and piezometer devices, types of manometers, types of flow, understand the flow			

visualization and understand the methods of describing fluid motion.

Module 15

Code	Course/Module Title	ECTS	Semester
CEH213	Physical chemistry I	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73

Description

Module Name: Physical Chemistry I

Module Description:

In this module, the students will learn the basic concepts including units and dimensions, basic definitions of physical chemistry, the first law which introduce closed system, open system, isochoric system, adiabatic system, constant pressure process, isothermal process, and second law of thermodynamics which introduces entropy (its calculations and basic principles and concepts) and its related concepts like spontaneity and spontaneous and on spontaneous reactions. Application of first law of thermodynamics to open systems also introduced. At the end of the course, the students will learn how to analyze and solve the problems related to physical chemistry concepts mathematically and

experimentally and able to connect and discuss verbally these concepts.

Module 16

Code	Course/Module Title	ECTS	Semester
CHE214	Chemical Eng. Principle III	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	88
Description			
Module Name: principles of chemical engineering Module Description: principles of chemical engineering module is offered for chemical engineering students to build their ability of controlling systems of chemical engineering manufacturing processes, by teaching them the main strategies of materials and energy balance calculations for open and closed systems that include recycle, bypass and purge in steady state and unsteady state processes, with or without chemical reactions, in batch, semi-batch and continues processes. However the module designed to learn wide range of basic calculations of units, operating with units, dimensions, mole, density, concentration, and pressure, ideal and real gas. The			

module provides an explanation of basic concepts supported by intensive mathematical problems for the purpose of exercising students to expand their awareness to find solutions to these problems.

Module 17

Code	Course/Module Title	ECTS	Semester
ENG215	Engineering Statistics	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	47	53
Description			
The course involved definition of the basic concepts in statistics and knowledge of the tools and methods used in the descriptive statistics represented in the collecting data methods , the questionnaire , tabular and graphical presentation of data. In addition, the ability to make the necessary calculations to arrive at the various metrics that highlight the basic characteristics of the phenomenon, such as measures of central tendency, as well as measures of dispersion and understand the ideas of probability and the basic probability distributions including discrete and continuous, simple regression and coloration – time series(general trend equation) – index number			

Module 18

Code	Course/Module Title	ECTS	Semester
CHE 216	Pollution	4	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	68
Description			
Module Name: Pollution Module Description: Pollution environment is the module by which the students will learn how to understand, describe, and solve the problems of pollution environment. This include basic concept of engineering activity concerned with the Identifying the environment in general. Study the layers of the atmosphere and the importance of each one of them And identify the types of			

natural and industrial pollution and all kinds And expanding to define the types of air pollution and all its pollutants and methods of treatment by dry and wet methods and the method of filter fabric and electrical precipitators. Choosing the appropriate method for each pollutant

Then the topic of water pollution and all its pollutants, explaining the effect of each one of them, classifying water pollutants according to their seriousness, then methods for treating them using the R or system method, the ultraviolet radiation method, and the ozone treatment method.

Then he raised the issue of alternative energy as a solution to address pollution and enumerated its types and benefits, then expanded on the topics of solar radiation, wind energy and water energy, and the benefits and disadvantages of each one of them.

Module 19

Code	Course/Module Title	ECTS	Semester
CHE 221	Engineering Mathematics II	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	63
Description			
Module Name: Math II Module Description: The Mathematics course promotes mathematical skills and knowledge, effectiveness in developing proficiency in analytical reasoning, and utility in modeling and solving world-real problems. To responsibly live within and participate in the transformation of a rapidly changing, complex, and interdependent society, students must develop and unceasingly exercise their analytical abilities.			

Module 20

Code	Course/Module Title	ECTS	Semester
CHE 222	Fluid Flow II	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Module Name: Fluid Flow II Module Description: Fluid flow is generally the motion of a fluid that is subjected to different unbalanced forces. It is mainly a part of fluid mechanics and fluid flow generally deals with the dynamics of the fluid. The motion of the fluid continues till different unbalanced forces are applied to the fluid. To study the behavior of materials that act as fluids, it is useful to define a number of important fluid properties, which include density, specific weight, specific gravity, and viscosity. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving fluid flow problems and consider that in your graduation work. The course covers general energy equation, fluid flow in pipes, piping networks, turbo machinery, Pump Performance, turbines.			

Module 21

Code	Course/Module Title	ECTS	Semester
CHE 223	Physical chemistry II	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Module Name: Physical Chemistry I I Module Description: In this module, the students will learn the basic concepts including units and dimensions, basic definitions of physical chemistry, the first law which introduce closed system, open system, isochoric system, adiabatic system, constant pressure process, isothermal process, and second law of thermodynamics which introduces entropy (its calculations and basic principles and concepts) and its related concepts like spontaneity and spontaneous and on spontaneous reactions. Application of first law of thermodynamics to			

open systems also introduced. At the end of the course, the students will learn how to analyze and solve the problems related to physical chemistry concepts mathematically and experimentally and able to connect and discuss verbally these concepts.

Module 22

Code	Course/Module Title	ECTS	Semester
UNI224	Computer Programming	4	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
1	3	62	38
Description			
Module Name: Computer Programming Module Description: Programming is one of the important subjects that every engineer must learn its basics, to be familiar with the structure of the program, how it works, how the user deals with the program interface, and how to receive the required outputs. The second stage teaches Visual Basic and MATLAB, starting from the basics to advanced programming and drawing functions.			

Module 23

Code	Course/Module Title	ECTS	Semester
CHE 225	Properties of materials	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	47	78
Description			
Module Name: Statistics Module Description: This module is provided knowledge of how to summarise and analyse data, to provide an insight into the concepts of probability and stochastic independence, understanding of statistical methodologies for testing hypotheses, and to provide skills in using statistical software. The content of this module is universal and applicable around the world. It includes			

international examples with real statistical data. This module requires students to have at least a Grade B in A-Level Mathematics (or equivalent). This module is not available to maths students. Knowledge of statistics is essential for any business or economics student, so this module provides students with a valuable theoretical and practical understanding of the subject, as well as weekly assignments that enable them to work consistently with continuity and discipline.

Module 24

Code	Course/Module Title	ECTS	Semester
UNI226	English Language II	4	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	68
Description			
Module Name: English Language Module Description: The English course promotes language skills and knowledge, effectiveness in developing proficiency in grammar, listening, speaking and writing. Students must develop and exercise their second language abilities. Demonstrate improved listening skills by understanding main ideas, specific details, and implicit information. Display enhanced reading skills by comprehending and analyzing a range of texts, such as articles, reports, short stories, and excerpts from academic texts. Identify main ideas, supporting details, and implied meanings while building vocabulary and reading fluency. Expand vocabulary knowledge by acquiring new words, expressions, and idiomatic phrases related to various topics. Apply vocabulary in context and demonstrate an understanding of word meanings, synonyms, antonyms, and collocations. Grammar Competence: Develop grammatical accuracy and fluency by understanding and using a range of grammatical structures and tenses appropriately. Apply grammar rules in speaking and writing to convey meaning accurately.			

Module 25

Code	Course/Module Title	ECTS	Semester
CHE 311	Engineering analysis	3	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	1	47	28
Description			
Module Name : Engineering Analysis Module Description: Engineering analysis Means a summary of scientific and/or engineering principles and facts that support a conclusion made by a manufacturer, with respect to compliance with the provisions of this part. The Engineering analysis introduces those areas of mathematics which are most important to practical problem-solving in engineering, this course pays attention to ordinary and partial differential equations, systems of linear, and non-linear equations, and it also emphasizes solution of Simultaneous differential equations. Laplace transformation for solving engineering problems, special functions, and formulation of chemical engineering problems are also covered thoroughly.			

Module 26

Code	Course/Module Title	ECTS	Semester
CHE 312	Mass transfer I	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	88
Description			
Module Name: Mass transfer operations Module Description: Mass transfer operation is the module by which the students will learn how to understand, describe, analyze, and design mass transfer operations. This includes basic concepts, diffusion, modes of diffusion, and calculations of diffusivity, mass transfer theories, and mass transfer coefficient. Liquid-gas operations (absorption) will also be studied in which a comprehensive understanding of this operation will be introduced including packed column and tray columns. Solid-liquid extraction (leaching) is also introduced and the equilibrium data, number of stages and complete calculations of this operation will be comprehensively studied. At the end of this course, the student will be familiar with these operations.			

Module 27

Code	Course/Module Title	ECTS	Semester
CHE 313	Heat transfer I	6	5

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Module Name: Heat Transfer I Module Description: This course was designed in a way such that you learn that Heat Transfer is that engineering activity concerned with the exploitation of conducting methods and it is applications on a commercial scale. Its goal is the successful to present the basic principles and equations of heat transfer, show numerous and diverse real-world engineering examples to help students develop the intuition they need to correctly apply heat transfer principles in engineering, develop an intuitive understanding of heat transfer by emphasizing the physics and physical arguments. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving heat transfer problems and consider that in your graduation work.			

Module 28

Code	Course/Module Title	ECTS	Semester
CHE314	Industrial management	3	5

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	43
Description			
Preparing qualified engineers in the field of industrial management for facilities and factories of chemical to keep pace with contemporary developments and meet the requirements of the country's scientific and economic development plans. Develop their skills in planning, analysis, design, operation and calculate the net profit and cost use of modern techniques and software for the chemical industrial institutions. Improving their understanding of professional ethics, sustainability and occupational safety that allows them to be influential engineers in society by finding solutions to industrial facilities problems.			

Module 29

Code	Course/Module Title	ECTS	Semester
CHE 315	Reactor design I	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	88

Description
Module Name: Chemical Reactor Design I Module Description: The Chemical industry is a branch of the industry that produces highly value-added chemicals from a variety of natural resources used as basic raw materials. Therefore the design and operation of chemical reactors as ways and means of realizing the chemical reaction, are so important that they may be said to be the key technology of the chemical industry while the efficient separation process ensured the savings in any process. This topic was designed in a way such that you learn that Chemical reaction engineering is that engineering activity concerned with the exploitation of chemical reactions on a commercial scale. Its goal is the successful design and operation of chemical reactors, and probably more than any other activity it sets chemical engineering apart as a distinct branch of the engineering profession. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving reactor design problems and consider that in your graduation work.

Module 30

Code	Course/Module Title	ECTS	Semester
CHE 316	Thermodynamic I	6	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

3	1	62	88
Description			
Module Name: Thermodynamic I Module Description Thermodynamics is a branch of science that deals with heat, work and temperature, and their relation to energy, radiation and physical properties of matter. To be specific, it explains how thermal energy is converted to or from other forms of energy and how matter is affected by this process. The laws of thermodynamics only apply when a system is in equilibrium or moves from one equilibrium state to another. Also description of any thermodynamic system employs the four laws of thermodynamics that form an axiomatic basis. The first law specifies that energy can be transferred between physical systems as heat, as work, and with transfer of matter. The second law defines the existence of a quantity called entropy, that describes the direction, thermodynamically, that a system can evolve and quantifies the state of order of a system and that can be used to quantify the useful work that can be extracted from the system. In thermodynamics, interactions between large ensembles of objects are studied and categorized. Central to this are the concepts of the thermodynamic system and its surroundings. A system is composed of particles, whose average motions define its properties, and those properties are in turn related to one another through equations of state. Properties can be combined to express internal energy and thermodynamic potentials, which are useful for determining conditions for equilibrium and spontaneous processes.			

Module 31

Code	Course/Module Title	ECTS	Semester
CHE321	Numerical methods	5	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	63
Description			
Module Name : Numerical Methods Module Description: Numerical methods are techniques by which mathematical problems are Formulated so that they can be solved with arithmetic and logical operations. Because digital computers excel at performing such operations, numerical methods are sometimes referred to as computer mathematics. In the pre-computer era, the time and drudgery of implementing such calculations seriously limited their practical use. However, with the advent of fast, inexpensive digital computers, the role of numerical methods in engineering and scientific problem solving has exploded. Numerical methods should be a part of every engineer's and Scientist's basic education. Just as we all must have solid foundations in the other areas of Mathematics and science, we should also have a fundamental understanding of numerical methods. In particular, we should have a solid appreciation of both their capabilities and their limitations.			

Module 32

Code	Course/Module Title	ECTS	Semester
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CHE322	Mass transfer II	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	63
Description			
Module Name: Mass transfer operations II Module Description: Mass transfer operation is the module by which the students will learn how to understand, describe, analyze, and design mass transfer operations. This includes basic concepts, Liquid-liquid extraction, equilibrium data for ternary system, single-stage calculations, multistage calculations. Distillation will be covered, and this includes simple distillation, single stage flash distillation, multistage Distillation, calculation of number of stages by McCabe-thiele method, Lewis Sorel method, multiple feed, multiple side stream, and multicomponent distillation. Humidification and crystallization will be covered in this course At the end of this course, the student will be familiar with these operations.			

Module 33

Code	Course/Module Title	ECTS	Semester
CHE 323	Heat transfer II	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	48
Description			
Module Name: Heat Transfer Module Description: This course was designed in a way such that you learn that Heat Transfer is that engineering activity concerned with the exploitation of conducting methods and it is applications on a commercial scale. Its goal is the successful to present the basic principles and equations of heat transfer, show numerous and diverse real-world engineering examples to help students develop the intuition they need to correctly apply heat transfer principles in engineering, develop an intuitive understanding of heat transfer by emphasizing the physics and physical arguments. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving heat transfer problems and consider that in your graduation work.			

Module34

Code	Course/Module Title	ECTS	Semester
CHE 324	Reactor design II	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	63
Description			
Module Name: Chemical Reactor Design II Module Description: The Chemical industry is a branch of the industry that produces highly value-added chemicals from a variety of natural resources used as basic raw materials. Therefore the design and operation of chemical reactors as ways and means of realizing the chemical reaction, are so important that they may be said to be the key technology of the chemical industry while the efficient separation process ensured the savings in any process. This topic was designed in a way such that you learn that Chemical reaction engineering is that engineering activity concerned with the exploitation of chemical reactions on a commercial scale. Its goal is the successful design and operation of chemical reactors, and probably more than any other activity it sets chemical engineering apart as a distinct branch of the engineering profession. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving reactor design problems and consider that in your graduation work.			

Module 35

Code	Course/Module Title	ECTS	Semester
CHE 325	Thermodynamic II	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	63
Description			
Module Name: Thermodynamic			
Module Description			
Thermodynamics is a branch of science that deals with heat, work and temperature, and their relation to energy, radiation and physical properties of matter. To be specific, it explains how thermal energy is converted to or from other forms of energy and how matter is affected by this process. The laws of thermodynamics only apply when a system is in equilibrium or moves from one equilibrium state to another.			
Also description of any thermodynamic system employs the four laws of thermodynamics that form an axiomatic basis. The first law specifies that energy can be transferred between physical systems as heat, as work, and with transfer of matter. The second law defines the existence of a quantity called entropy, that describes the direction, thermodynamically, that a system can evolve and quantifies the state of order of a system and that can be used to quantify the useful work that can be extracted from the system.			
In thermodynamics, interactions between large ensembles of objects are studied and categorized. Central to this are the concepts of the thermodynamic system and its surroundings. A system is composed of particles, whose average motions define its properties, and those properties are in turn related to one another through equations of state. Properties can be combined to express internal energy and thermodynamic potentials, which are useful for determining conditions for equilibrium and spontaneous processes.			

Module 36

Code	Course/Module Title	ECTS	Semester
CHE 326	Equipment design I	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	63
Description			
Module Name: Equipment Design Module Description: This course specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. Before undertaking this module, the student should have undertaken the following subjects: Basic Principles of chemical engineering I and II, Mathematics I and II, Fluid flow, Physical chemistry, Thermodynamics, Heat transfer, Mass transfer, Strength of materials. This module will prepare students to be able to read and understand chemical engineering plants drawing and they should have the necessary skills to design equipment such as process and pressure vessels, gas-liquid and gas-solid separators,.....etc.			

Module 37

Code	Course/Module Title	ECTS	Semester
CHE 411	Unit operation I	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Module Name: Unit Operations I Module Description Unit operations only deal with physical changes of the materials involved in the process. They are equipment's which cause the materials to undergo physical changes. The physical changes are carried out for variety of purposes. Generally unit operations steps are carried out before subjecting the materials to chemical reactions so that chemical reactions happen smoothly. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving units' operations problems and consider that in your graduation work. The course covers Boundary layer, Momentum Transfer, Heat Transfer, and Mass Transfer, Packed			

column, Fluidization and liquid mixing.

Module 38

Code	Course/Module Title	ECTS	Semester
CHE 412	Process control I	6	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73

Description

Module Name: Processes control

Module Description:

In recent years the performance requirements for process plants have become increasingly difficult to satisfy. Stronger competition, tougher environmental and safety regulations, and rapidly changing economic conditions have been key factors. Consequently, product quality specifications have been tightened and increased emphasis has been placed on more profitable plant operation. The subject of processes control is concerned with how to achieve these goals. In large-scale, integrated processing plants such as oil refineries or ethylene plants, thousands of process variables such as compositions, temperatures, and pressures are measured and must be controlled. Thus, it is important for chemical engineers to have an understanding of both the theory and practice of process control.

Module 39

Code	Course/Module Title	ECTS	Semester
CHE 413	Equipment design II	5	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	62	63

Description

Module Name: Equipment Design

Module Description:

This course specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. Before undertaking this module, the student should have undertaken the following subjects: Basic Principles of chemical engineering I and II, Mathematics I and II, Fluid flow, Physical chemistry, Thermodynamics, Heat transfer, Mass transfer, Strength of materials. This module

will prepare students to be able to read and understand chemical engineering plants drawing and they should have the necessary skills to design equipment such as process and pressure vessels, gas-liquid and gas-solid separators,.....etc.

Module 40

Code	Course/Module Title	ECTS	Semester
CHE 414	Computer application	4	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	38

Description

Module Name: Computer Applications in Chemical Engineering

Module Description:

This course was designed in such a way that you learn the computer application of chemical engineering and the use of simulation programs. His goal is to use computers and simulation software to make calculations for chemical engineering, from mass and energy balance calculations to equipment design and control. This course will introduce you to the basics of the field and how to obtain additional information as you need it in your career. It will also give you a good opportunity to understand problem-solving methods and consider them in your graduate work.

Module 41

Code	Course/Module Title	ECTS	Semester
ENG415	Engineering Project I	5	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	93

Description

Process appreciation; Preliminary process flow diagrams; Initial material and energy balances; Presentation in week 5 and an initial report. Final process flow diagram and revised material and energy balances, including any revisions that may ensue from the oral presentations and/or possible plant, Chemical Engineering Design: (i) Specification of all plant items including a statement of duty, a preliminary recommendation of type of equipment, an estimate of services required and materials of construction. (ii) Complete design calculations on specified items of equipment. (iii) Approximated design calculations on specified equipment items. Special Task (5 weeks): each student will complete one special task allocated by the tutor. (a) An engineering flow diagram. (b) Plant layout drawings. (c) Capital and manufacturing cost estimates. (d) Plant commissioning and normal plant operation. (e) Mechanical engineering design of one plant item. (f) Process integration study. Group work on hazard and operability study (1 week): This study of a section of the plant specified by the tutor may lead to

proposals for modifying the flow sheet and/or procedures for the commissioning and normal operations

Module 42

Code	Course/Module Title	ECTS	Semester
CHE416	Petroleum refining I	4	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	38
Description			
The English course promotes language skills and knowledge, effectiveness in developing proficiency in grammar, listening, speaking and writing. Students must develop and exercise their second language abilities.			

Module 43

Code	Course/Module Title	ECTS	Semester
CHE421	Unit operation II	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
Unit operations only deal with physical changes of the materials involved in the process. They are equipment's which cause the materials to undergo physical changes. The physical changes are carried out for variety of purposes. Generally unit operations steps are carried out			

before subjecting the materials to chemical reactions so that chemical reactions happen smoothly. This course will give the basics of the field and how to obtain additional information as you require it in your careers and will give you good opportunity to understand the methods of solving units' operations problems and consider that in your graduation work. The course covers Separation Techniques, Packed column, Fluidization, Sedimentation process, and Filtration processes and Centrifugal processes.

Module 44

Code	Course/Module Title	ECTS	Semester
CHE 422	Process control II	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	77	73
Description			
In recent years the performance requirements for process plants have become increasingly difficult to satisfy. Stronger competition, tougher environmental and safety regulations, and rapidly changing economic conditions have been key factors. Consequently, product quality specifications have been tightened and increased emphasis has been placed on more profitable plant operation. The subject of processes control is concerned with how to achieve these goals. In large-scale, integrated processing plants such as oil refineries or ethylene plants, thousands of process variables such as compositions, temperatures, and pressures are measured and must be controlled. Thus, it is important for chemical engineers to have an understanding of both the theory and practice of process control.			

Module 45

Code	Course/Module Title	ECTS	Semester
CHE423	Petroleum refining II	4	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	62	38

Description
Petroleum provides the largest fraction of primary energy supply in the world. Transportation of people and goods in many parts of the world depend almost completely on petroleum fuels, such as gasoline, jet fuel, diesel fuel, and marine fuel. Apart from the fuels, materials that are necessary for operating the combustion engines of cars, trucks, planes, and trains also come from petroleum. These materials include lubricating oils (motor oils), greases, tires on the wheels of the vehicles, and asphalt to pave the roads for smooth rides in transportation vehicles. All petroleum fuels and many materials are produced by processing of crude oil in petroleum refineries. Petroleum refineries also supply feedstock to the petrochemicals and chemical industry for producing all consumer goods from rubber and plastics (polymers) to cosmetics and medicine. This course addresses the physical and chemical processes to convert crude oil into desired products with an outlook from present to future.

Module 46

Code	Course/Module Title	ECTS	Semester
CHE424	Chemical and Petrochemical Industries	4	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	68
Description			
Petrochemicals are the chemical products obtained from petroleum by refining. Some chemical compounds made from petroleum are also obtained from other fossil fuels, such as coal or natural gas, or renewable sources such as maize, palm fruit or sugar cane. The two most common petrochemical classes are olefins (including ethylene and propylene) and aromatics (including benzene, toluene and xylene isomers). While the industrial chemists work to develop and manufacture products and processes that will increase their company's sales and profits. Most chemists work in industry. Products manufactured by the chemical industry fall into three categories: basic chemicals, specialty chemicals, and consumer chemicals			

Module 47

Code	Course/Module Title	ECTS	Semester
ENG425	Engineering Project II	8	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2		32	168
Description			
Process appreciation; Preliminary process flow diagrams; Initial material and energy balances; Presentation in week 5 and an initial report. Final process flow diagram and revised material and energy balances, including any revisions that may ensue from the oral presentations and/or possible plant, Chemical Engineering Design: (i) Specification of all plant items including a statement of duty, a preliminary recommendation of type of equipment, an estimate of services required and materials of construction. (ii) Complete design calculations on specified items of equipment. (iii) Approximated design calculations on specified equipment items. Special Task (5 weeks): each student will complete one special task allocated by the tutor. (a) An engineering flow diagram. (b) Plant layout drawings. (c) Capital and manufacturing cost estimates. (d) Plant commissioning and normal plant operation. (e) Mechanical engineering design of one plant item. (f) Process integration study. Group work on hazard and operability study (1 week): This study of a section of the plant specified by the tutor may lead to proposals for modifying the flow sheet and/or procedures for the commissioning and normal operations.			

Module 48

Code	Course/Module Title	ECTS	Semester
UNI426	Ethics	2	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		32	18
Description			
This Module explores the importance of ethics to society . It is designed to be used by lecturers to help their students understand the concept of society – sometimes defined as humankind as a whole, sometimes in relation to a particular place – and to investigate the ways in which ethical approaches can be applied to increase our understanding of society, and ultimately our attempts to improve it. It also aims to illustrate that ethics is part of the fabric of any dimension of society. Particular attention is given to the concepts of justice and fairness. Articulate and defend a preferred position on the relationship between ethics and society while appreciating its limitations			

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