Al Mustaqbal University
جامعة المستقبل

First Cycle – Bachelor's Degree (B.Sc.) – Fuel and Energy Techniques Engineering Department

بكالوريوس – هندسة تقنيات الوقود والطاقة (الدورة الأولى)

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1. Overview

This catalogue is about the courses (modules) given by the program of ***Fule and Energy Engineering Techniques*** to gain the Bachelor degree. The program delivers **(44)** Modules with **(7200)** total student workload hours and ***240 total ECTS***. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج **هندسة تقنيات الوقود والطاقة** للحصول على درجة البكالوريوس. يقدم البرنامج **(44)** مادة دراسية، مع **(7200)** إجمالي ساعات حمل الطالب ***و ٢٤٠ إجمالي وحدات أوروبية***. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Level-1 / Semester-1

Module 1

Code	Course/Module Title	ECTS	Semester
UOMU027011	Analytical Chemistry	7.00	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	5	116	59

Description

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

1. Introduction to Analytical Chemistry with a goal of teaching the reason for doing analytical
2. Chemistry and the basic steps of dealing with analytical issues present for a professional chemist.
3. Later the curriculum develops to learning the main units in regard to analytical chemistry and the relations between them and the ability to exchange them. Introducing students to the basic concepts related to descriptive analysis methods
4. Focusing on the method of sedimentation of elements in descriptive analytical chemistry and calculating their quantities

Module 2

Code	Course/Module Title	ECTS	Semester
UOMU027012	Mathematics-I	7.00	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	73	102

Description

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

1. Describe 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.

Module 3

Code	Course/Module Title	ECTS	Semester
UOMU027014	Engineering Drawing	5.00	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	59	66

Description

Course Outcomes: At the end of the course, students can:

Introduction in engineering drawing, engineering drawing applications, engineering process, analysis model to view and study the full and half Sections, conclusion of the third projection, Draw isometric and Oblique.

Module 4

Code	Course/Module Title	ECTS	Semester
UOMU027015	Computer Utilization 1	3.00	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	59	16
Description			
Course Outcomes: At the end of the course, students are able to: 1. Identify different types of computer hardware & software. 2. Give a student the skill in the use of computers and service applications.			

Module 5

Code	Course/Module Title	ECTS	Semester
UOMU027016	English -1	2.00	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	5
Description			
Define a special knowledge and basic concepts in the English language, review (words, terms and phrases commonly utilized)with practical everyday language that students need, the fundamental principles of grammar used in the English language such as question and answer, the negative, the tail questions, the singular and plural, the numbers, nouns, pronouns, the verb (to be, to have, and to do), adjectives, regular and irregular verbs, using so & neither, and adverbs, degrees of comparison, conjunctions and interjections, kinds of the letter (S) with general exercises. Also, an accurate description of the nature of vocabularies and idioms used by the chemical engineers and what the student needs in his/her academic and/or in his/her professional career by means of applying two reading passages focusing mainly on studying the chemical engineer work in the factories as well as equipment, tools and materials used.			

Module 6

Code	Course/Module Title	ECTS	Semester
UOMU027013	Workshops	6.00	1
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
	6	90	60
Description			
This course aims to cover the most important topics in learning The tools			

Level-1 / Semester-2

Module 7

Code	Course/Module Title	ECTS	Semester
	Principle of Chemical Engineering	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	73	137

Description

Course Outcomes: At the end of the course, students can:

1. To teach students fundamental knowledge of chemical engineering and application of this knowledge in the solving of material balances of chemical processes.
2. The course will cover concepts ranging from basics such as units and dimensions, and stoichiometry to the simultaneous application of material and energy balances with and without the occurrence of chemical reactions.
3. Behavior of ideal gases including the procedures for estimation of vapour pressure and heat of vaporization will be extensively covered

Module 8

Code	Course/Module Title	ECTS	Semester
	Engineering Mechanics	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	73	107

Description

Course Outcomes: At the end of the course, students can:

1. An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
2. An understanding of the analysis of distributed loads.
3. A knowledge of internal forces and moments in members.
4. An ability to calculate centroids and moments of inertia.
5. A knowledge of kinematic and kinetic analyses and energy and momentum methods for particles and systems of particles.
6. A knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies.A knowledge of kinematic and kinetic analyses and energy and momentum methods for particles and systems of particles.

A knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies

Module 9

Code	Course/Module Title	ECTS	Semester
	Mathematic 2	6	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	73	107

Description
To understand these concepts of applications and how to evaluate volumes, surface area , and to understand analytic geometry. 2- Provide practice at developing critical thinking skills, solving open ended problems and to work in teams. 3- Develop a deep understanding of issues related to the basic principles of polar coordinates, vector analysis, determinants, and how to solve problems in chemical engineering

Module 10

Code	Course/Module Title	ECTS	Semester
	Human Rights	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	15
Description			
The study of the human rights concept and history and its relationship to religions and the extent of his relationship with globalization and contemporary currents.			

Module 11

Code	Course/Module Title	ECTS	Semester
	Organic Chemistry	7	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	5	116	94
Description			

The student able to:

1. Understanding of the fundamentals of organic compounds.
2. Recognize the features of the Practical organic chemistry physical properties of liquid and solid organic compounds.
3. List the application of organic compounds.
4. Understanding of Hydrocarbon: alkanes, formulation-Hydrocarbons-saturated.

Module 12

Code	Course/Module Title	ECTS	Semester
	Arabic language	2	2
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	15
Description			
Build the floor drain – morphological units-defined types – Arabic syntax and its rules as: getting started and burners of nominal sentence: Muthana and addon, five names collection of masculine feminine collection Salem-Salem Express and estimated locally-installed names – in effect – the absolute effect effect which circumstance time – within the place and effect with built-reference names names names connected question names the names of the actual sentence/clause already past building – build do it – already present tense he pronouns-separate – connected – undercover			

Level-2 / Semester-3

Module 13

Code	Course/Module Title	ECTS	Semester
	Mass and Energy Balance	7	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
4	1	74	136
Description			
This course covers the basics of balance types such as Revision to Material Balances, Simultaneous Balances, Balances on Reactive Process, Balances on Transient Process ,and Balances **for-**plants-design that include important information's about Flow sheets, Balances for batch and continuous plants that students must be knowledge them.			

Module 14

Code	Course/Module Title	ECTS	Semester
	Thermodynamics 1	**6**	**3**
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	**4**	**74**	**106**
Description			
Course Outcomes: At the end of the course, students are able to: **1. To familiarize the students with basic concepts of the first and second laws of thermodynamics and their applications in engineering problems.** **2- Develop a practical ability to solve energy balance problems , minimum work.** **3- Students will demonstrate basic understanding of basics and definitions of thermodynamics and properties of pure substances.** **4-Describe the reversible and irreversible processes (macroscopic description of an ideal and real processes).**			

Module 15

Code	Course/Module Title	ECTS	Semester
	Physical Chemistry	6	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	5	102	78
Description			
Course Outcomes: At the end of the course, students are able to: 1. Explain how to derive rate of reaction equation based on elementary reaction, steady state approximation, and rate controlling step and experimental data. 2. Analyze the rate for serial, multiple & complex reactions. 3. Explain surface phenomena such as capillarity, adsorption, electrical double layer, electrode reactions.			

Module 16

Code	Course/Module Title	ECTS	Semester
	Mathmatics 3	5	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	59	91
Description			
Course Outcomes: This course introduces students to: Solve ordinary differential equations: apply Laplace transform to solve various systems of ordinary differential equations: Solve different types of partial differential equations. At the end of the course students should be able to apply these methods to tackle all kinds of problems that appear in chemical engineering			

Module 17

Code	Course/Module Title	ECTS	Semester
	Computer Utilization -2	4	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
1	3	59	61
Description			
To teach chemical engineering students how to write tiny structured programs in MATLAB and comprehend how user-written functions interact with numerical techniques routines.			

Module 18

Code	Course/Module Title	ECTS	Semester
	English Language -2	2	3
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	**45**	**15**
Description			
Define special knowledge and basic concepts in the English language, review phonetics and spelling with words and sounds that need attention in understanding the meaning and pronunciation, and the fundamental principles of grammar utilized in the English language, such as the use of the prefixes (un, im, in, and dis), the use of since & for, the definite and indefinite articles. As well as simple, continuous and perfect tenses (present, past, and future), punctuation, active voice and passive voice, direct and indirect speech, finite and non-finite verbs, analyses and kinds of sentences. Also, an accurate description of the nature of vocabularies and idioms used by the chemical engineers and what the student needs in his/her academic and/or in his/her professional career using applying two reading passages focus mainly on studying the chemical engineer work in the factories as well as equipment, tools and materials used			

Level-2 / Semester-4

Module 19

Code	Course/Module Title	ECTS	Semester
	Thermodynamics 2	6	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	106

Description

The course discuss the study of Power cycles; Refrigeration and liquefaction process; Theory and application of solution thermodynamics ;Vapor/liquid equilibrium in both: binary and multicomponents; Ideal and non-ideal solutions are discussed using Raoult's and modified Raoult's law; Fugacity and fugacity coefficient definitions; Chemical reaction equilibriumand Thermodynamic analysis of processes.

Module 20

Code	Course/Module Title	ECTS	Semester
	Oil Refining	7	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	4	102	108

Description

Course Outcomes: At the end of the course, students can:

1. know the fundamentals of petroleum refining, types of energy resources, fundamentals of crude oil treatment and natural gas processing, fundamentals and purposes of re-refining processes and properties of main oil products.
2. able to understand oral speech in the field of petroleum refining.
3. Able to prepare and deliver oral reports on professional topics (petroleum refining).

Module 21

Code	Course/Module Title	ECTS	Semester
	Properties of Engineering materials	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	73	47

Description

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

1. Explain the atomic structure and types of primary and secondary atomic and molecular bonding.
2. Explain the crystal structures and geometry and classify different classes of space lattices in crystalline solids.
3. Perform different types of mechanical testing for evaluation of mechanical properties of
4. Extract information of materials behavior from phase diagram.
5. Identify the structures, properties and applications of the main engineering materials (metals, alloys, polymers, ceramics and composites.
6. Explain corrosion mechanisms and types of corrosions and methods of corrosion prevention.

Module 22

Code	Course/Module Title	ECTS	Semester
	Engineering Statistic	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	75
Description			
Course Outcomes: At the end of the course, students are able to: 1. Identify modern concepts of statistics, emphasizing applications to quality engineering and improvement, process capability and control and reliability assessment. 2. Demonstrate the use of statistical software tools to solve problems. 3. Employ statistical methods to perform statistical quality control, design of experiments and reliability analysis.			

Module 23

Code	Course/Module Title	ECTS	Semester
	Environmental Pollution and Industrial Safety	4	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	75
Description			
Course Outcomes: At the end of the course, students are able to: **Definitions of pollutants emission from petroleum refinery.**Classification of air pollutants, Sources and type of air pollution, Particulate and air born particulate. Air pollution control equipment: types of equipment, Design of settling chamber and cyclones. Source of water, Utilization, and classification. Type of water pollutants and its effect, Wastewater treatment. Oxygen demanding wastewater: Dissolved Oxygen DO, BOD, Oxygen sage curve and the related equations.Classification of solid waste, the methods of disposal of the solid waste.			

Module 24

Code	Course/Module Title	ECTS	Semester
	Fluid Mechanics	5	4
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	3	87	63
Description			
Course Outcomes: At the end of the course, students are able to: 1. Explain basic concepts pertaining to fluid statics and dynamics. 2. Apply Bernoulli's equation. 3. Demonstrate standard pressure drop calculations for incompressible flow. 4. Explain working principles and features of basic piping accessories. 5. Employ basic design of fluid transfer system for incompressible flow.			

Level-3/ Semester-5

Module 25

Code	Course/Module Title	ECTS	Semester
	Heat Transfer 1	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	106
Description			
Course Outcomes: At the end of the course, students are able to: To introduce and develop an understanding the modes of heat Transfer (conduction, convection and radiation).Derive and discusses all types of equation in these modes of heat transfer. Analyze heat transfer rate data in different modes. Derive the necessary equations for hydrodynamics and thermal boundary layer. Provide practice at developing critical thinking skills, solving open ended problems and to work in teams			

Module 26

Code	Course/Module Title	ECTS	Semester
	Energy Resources	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	76
Description			
1. Students will learn how to use critical thinking skills in the areas of fuel, non-renewable energy sources, natural gas, and renewable energy sources: hydrogen energy, biomass energy, and nuclear energy impact on our natural resources. 2. Knowledge and highlighting of energy economics			

Module 27

Code	Course/Module Title	ECTS	Semester
	Internal Combustion Engines	6	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	106
Description			
Course Outcomes: At the end of the course, students can: 1. To present a problem oriented in-depth knowledge of Internal Combustion Engine. 2. To address the underlying concepts, methods and application of Internal Combustion Engine			

Module 28

Code	Course/Module Title	ECTS	Semester
	Engineering analysis	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	1	59	91
Description			
Course Outcomes: At the end of the course, students are able to: This course provides an integrated treatment of Vector Mechanics (Statics) and Linear Algebra. It also emphasizes computer-based matrix methods for solving engineering problems. Students will be expected to learn key principles of Statics and Linear Algebra and to demonstrate computer skills with vector and matrix manipulations.			

Module 29

Code	Course/Module Title	ECTS	Semester
	Mass transfer 1	5	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	106
Description			
The aims of the course are: 1. Understand the mass transfer theories. 2. Understand the diffusion, mass transfer coefficient, modes of diffusion. 3. Distillation process from fundamentals to industrial application. 4. Absorption process calculations for tray and packed towers 5.			

Module 30

Code	Course/Module Title	ECTS	Semester
	English Language-3	3	5
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	15
Description			
This course aims to develop students' knowledge, understanding and fluency in their use of the English language and to build their skills as effective communicators in daily activities and universal topics. Students improve their control of language by reading and viewing a range of texts, listening to various audios, practicing speaking, and discovering grammar that used in everyday activities; in addition to learning an intermediate skill of writing.			

Level-3/ Semester-6

Module 31

Code	Course/Module Title	ECTS	Semester
	Mass Transfer 2		6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	4	102	108

Description

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

1. Liquid –liquid extraction, principles, calculations.
2. Solid-liquid extraction process .principles to.
3. Drying process.
4. Evaporation process
5. Humidification process
6. Learning Outcomes, Teaching ,Learning and Assessment Method

Module 32

Code	Course/Module Title	ECTS	Semester
	Reactor Design 1	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	90

Description

Course Outcomes: Theory,design fundamentals and mass conservation equations for ideal reactors, isothermal reactors for homogeneous reactions, non-isothermal reactors, multiple reactor System.

This course aims to establish fundamental knowledge for the students in chemical reactor engineering. At the end of this course, students should be able to:

1. apply reaction kinetics principles in chemical reactor engineering.
2. identify and formulate problems in chemical reactor engineering and find appropriate solutions.
3. specify and size the most common industrial chemical reactors to achieve production goals for processes involving homogeneous reaction systems.

Module 33

Code	Course/Module Title	ECTS	Semester
	Power plant Engineering	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	73	77

Description

Course outcomes: At the end of the course, the students should be able to:

1. Give fundamental knowledge of construction and working of various types of thermal power plants i.e. steam turbine, gas turbine.
2. Apply the basic thermodynamics and fluid flow principles to different power generation methods
3. Analyze thermodynamic cycles of steam power plant and understand construction, working and significance of its various systems
4. Analyze thermodynamic cycles of gas turbine power plant and jet propulsion systems

Module 34

Code	Course/Module Title	ECTS	Semester
	Gas Technology	5	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	59	91

Description

Course outcomes: At the end of the course, the students should be able to:
1. This course covers natural gas types, storage properties, phase behaviour, chemical and physical properties, and gas compressor types such as rotary, jet, and reciprocating compressors.
2. Knowledge of methods of adsorption and absorption of particles, water and condensates, fixation and drying of gaseous fuels.
3.Know and describe liquefied gas (NGL) fractionation and liquefied petroleum gas (LPG) methods.
4. Solve Some problems associated with Natural Gas treatment and production. Hydrate control in gas production causes. Occurrence and control
5. Know the temperature separation law
6. How gas collection and transportation, pipeline design calculation and economy, gas flow in serious, parallel and zigzag pipelines
7. Methods of producing hydrogen

Module 35

Code	Course/Module Title	ECTS	Semester
	Numerical Methods	3	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	45

Description

Course Outcomes: At the end of the course, students are able to:
1. Solve PSS with variable separation method by Fourier series.
2. Solve Ordinary Differential Equations through Laplace transform.
3. Solve systems of linear equations and diagonalize square matrices.
4. Finding root of nonlinear equations, systems of equations, integration and differentiation.
5. Determine error estimation associated with numerical methods.
6. Describe numerical methods used in problems of ordinary differential equations, partial differential equations and optimization.

Module 36

Code	Course/Module Title	ECTS	Semester
	Heat Transfer 2	6	6
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	74	106

Description

Characterization the design procedures for different heat transfer equipments as heat exchanger. Discuss the heat transfer in boiling and condensation processes .Characterization the design procedures for furnace. Give a new knowledge in renewable energy systems. Provide practice at developing critical thinking skills, solving open ended problems and to work in teams.

at the end of the semester the student should be able to:-

1. Design heat exchanger equipments.
2. Define and solve problems in boiling and condensation heat transfer.
3. Design the furnace and understand the radiation heat transfer.
4. Solve problems in heat transfer applications.

Level-4 / Semester-7

Module 37

Code	Course/Module Title	ECTS	Semester
	Industrial Unit Operations	7	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
3	4	101	109
Description			
Course Outcomes: At the end of the course, students are able to: 1. Integrate the knowledge and understanding in designing separation columns with other unit operation. 2. Explain the theoretical basis of processes involving Humidification / dehumidification, drying, evaporation, crystallization and membrane separation.			

Module 38

Code	Course/Module Title	ECTS	Semester
	Design of Industrial Equipment 1	6	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	46	134
Description			
Course Outcomes: At the end of the course, students are able to: 1. Synthesize a layout plan for a given process plant with all the major components. 2. Select main controlling and monitoring requirements for a given product or utility line.			

Module 39

Code	Course/Module Title	ECTS	Semester
	Reactor Design 2	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	60	90
Description			
Definition, classification of catalysts, properties of heterogeneous catalysts (activity, acidity, selectivity, and porosity), effectiveness of presence the catalysts on kinetic and thermodynamic properties, mechanism of chemical interactions occurring within the catalysts, applications of catalysts in catalytic processes, movement of the reactant molecules around and throughout the body of a catalyst in different types of reactors (fixed-, fluidized-, slurry-, and trickle-bed), intraparticle and diffusivities inside porous catalysts, and modern characterization techniques **at the end of the semester the student should be able to :-** 1-The objective of this course focuses on: in-depth understanding of the catalyst and its impact on either chemical reactionskinetics or thermodynamics.			

2-comprehension the principle of diffusion on the internal and external surfaces of the porous catalyst particles with their impact on the nature of reaction products in terms of increasing the quantity and quality and reducing the operating cost.
3-As well as the utilize of the operating equations and design for various kinds of reactors containing the catalyst particles as a key parameter in their work.
4-also to discover the theoretical knowledge about the equipments and characterization techniques used in catalyst and catalysisscience.
5-In addition, identify scientific and engineering information about the performance of a catalyst in enhancing the reaction mechanisms, problem solving, and other related issues.

Module 40

Code	Course/Module Title	ECTS	Semester
	English Languge-4	2	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	1	45	15
Description			
This course aims to develop students' knowledge, understanding and fluency in their use of the English language and to build their skills as effective communicators in daily activities and universal topics. Students improve their control of language by reading and viewing a range of texts, listening to various audios, practicing speaking, and discovering grammar that used in everyday activities; in addition to learning an intermediate skill of writing.			

Module 41

Code	Course/Module Title	ECTS	Semester
	Project-1	5	7
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
	7	101	49
Description			
This is an independent study under the supervision of department staff. Each student is expected to do research trying to explore and define a potential study area suitable for a senior design project. A specific engineering problem must then be identified from within the selected study area. Results from this study must be documented and submitted in the form of a design project proposal.			

Level-4 / Semester-8

Module 43

Code	Course/Module Title	ECTS	Semester
	Design of Industrial Equipment -2	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	59	121
Description			
This course aims to improve students' skills. and able to. 1. Synthesize a layout plan for a given process plant with all the major components. 2. Select the main controlling and monitoring requirements for a given product or utility line. 3. The ability to apply the design equation and equipments specifications as practical 4. prepare students to be able to read and understand chemical engineering plants drawing			

Module 44

Code	Course/Module Title	ECTS	Semester
	Professional Ethics	**3**	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	**1**	45	45
Description			
To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others			

Module 45

Code	Course/Module Title,	ECTS	Semester
	Measurement and control Engineering	6	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	101	79
Description			
Analysis ofclosed-loop Chemical Engineering processes system to design and select closed-loop controlscheme that will operate the plant with stable conditions. **Course Outcomes:** At the end of the course, students are able to: 1. Analyze responses of systems with different orders. 2. Analyze closed loop block diagrams. 3. Design controllers for closed loop systems. 4. Tune controllers that has been designed using various methods such as Bode stability criteria and dynamic error criteria. 5. Analyze the stability of closed loop systems that has been designed.			

Module 46

Code	Course/Module Title	ECTS	Semester

	Corrosion	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	3	73	77

Description

Introduction, Classification of Corrosion, Kinetics of aqueous corrosion, Thermodynamics, Determining Passivity, Reference Electrode, Corrosion prevention, Protection methods

At the end of the semester the student should be able to :-
1- Understanding the concept of corrosion. The form of corrosion.
2- Determine the corrosion rates and electrochemical behavior of the metals and the thermodynamics of corrosion reactions.
3- Applying the corrosion prevention technology.
4- Selection of materials involved in applying the corrosion prevention technology.

Module 47

Code	Course/Module Title	ECTS	Semester
	Modeling and Simulation	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
2	2	73	77

Description

Course outcomes: At the end of the course, the students should be able to:
1. Use commercially softwares to perform mass and energy balance calculations.
2. Perform first principles modelling for chemical process systems.
3. Formulate degrees of freedom method to solve all types of models for chemical processes.
4. Linearize and solve nonlinear models using Laplace transform
5. Perform model sensitivity analysis for process models.
6. Programming and analyses of chemical process models using Matlab and Simulink Software.
7. Use commercially available softwares such as AspenPlus and HYSYS to perform mass and energy balance calculations.
8. to simulate the operation of major unit operations such as reactors, distillation columns, heat exchangers, absorbers, etc.

Module 48

Code	Course/Module Title	ECTS	Semester
	Project-2	5	8
Class (hr/w)	**Lect/Lab./Prac./Tutor**	**SSWL (hr/sem)**	**USWL (hr/w)**
	7	101	49

Description

This is an independent study under the supervision of department staff. Each student is expected to do research trying to define a potential study area suitable for a senior design project. A specific engineering problem must then be identified from within the selected study area. Results from this study must be documented and submitted in the form of a design project proposal.

Contact

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