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

Academic Program Specification Form for The Academic Year 2020-2021

University of Babylon
College of Engineering
Number of Departments in College: 7
Date of Form Completion:*2021*

Head of Chemical Engineering Department	***Dean 's Assistant for Scientific Affairs***	**Dean 's Name**
Prof. Hameed Hussein Alwan	*Asst. Prof .Dr.Ali Hassoon Nahhab*	*Prof .Dr.Laith Ali*
Date: / /	**Date:** / /	**Date:** / /
Signature	**Signature**	**Signature**

Quality Assurance and University Performance Manager

Date: / /

Signature

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

PROGRAM SPECIFICATION

This Program Specification provides a concise summary of the main features of the program 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 by a description of each course within the program

1. Teaching Institution	University of Babylon
2. University Department/Centre	Chemical Engineering Department/ College of Engineering
3. Program Title	Chemical engineering
4. Title of Final Award	BSc
5. Modes of Attendance offered	Semester
6. Accreditation	Accreditation Board for Engineering and Technology (ABET)
7. Other external influences	Training courses for students to develop students' professional skills / field visits / summer training.
8. Date of production/revision of this specification	

9- Aims of the Program:-

1- Preparing qualified cadres in the field of chemical engineering in Iraq.

2- Contributing to the development of cadres working in the field of chemical engineering in state institutions and administrations.

3- Providing the community with chemical engineers who are able to manage factories and projects for the manufacture of chemical, food, pharmaceutical and oil refineries.

4- The ability to develop engineering cadres and work on their modernity to ensure their conformity with the latest recommendations of the world in the field of chemical engineering.

5- Expansion of chemical engineering disciplines to serve the community and meet its various needs.

10- Learning Outcomes, Teaching, Learning and Assessment Methods
A-Cognitive goals A1- To know the concept of chemical engineering. A2-To classify chemical engineering vocabulary A3- The student understands engineering designs and operations of chemical factories and chemical projects A4- To manage engineering factories with minimum cost
B -The skills goals special to the program B 1- The student's knowledge of the concept of chemical engineering. B 2-The student's ability to analyze and design in chemical engineering. B 3- Enabling students to supervise chemical projects and factories.
Teaching and learning methods
1- Method of giving lectures. a. (Learning Technologies on Campus)(On-campus e-learning) b. (Scientific trips to follow Designed projects in chemical engineering)

c. engineering workshops

d. experiential education

e. Applied Education (Laboratory)

Assessment methods

1- Exams

2- Project discussion

3- summer training

4- Practical exams

C-skills thinking

C1- Thinking skill according to the student's abilities think in which the target from this is the skill that is believe student What is tangible (student abilities) and understand when, what and how should think and works to improve the ability to think reasonably.

C2-High thinking skill (the goal of this skill is to teach thinking well before making the decision that determines the student's life)

C3-critical thinking strategy in learning critical thanking) (It is a term that symbolizes the highest levels of thinking that goal ask a problem and then analyze it logically to reach the solution wanted

C4-BrainStroming

D. General and Transferable Skills (other skills relevant to employability and personal development)

1- VERBAL COMMUNICATION :Student able to express his ideas clearly and confidently in speech

2- TEAMWORK :Work confidently within a group

3- ANALYSING & INVESTIGATING: Gather information systematically to establish facts & principles. Problem solving analyzing and the collection inquiry

the information methodically and my knowledge to establish the facts and the principles solved the problem.

4- INITIATIVE/SELF MOTIVATION : Able to act on initiative, identify opportunities & proactive in putting forward ideas & solutions initiative

5- WRITTEN COMMUNICATION

a) Student able to express himself clearly in writing

b) Written communication

c) Able to express yourself clearly in writing

d) PLANNING & ORGANISING

e) Student able to plan activities & carry them through effectively

f) Planning and Organizing

g) Able to plan activities and carry them out effectively

6- FLEXIBILITY

Adapt successfully to changing situations & environments

Flexibility Adapt successfully to changing situations and environments

7- TIME MANAGEMENT

Manage time effectively, prioritizing tasks and able to work to deadlines.

time management Effective time management, prioritizing tasks and able to work to deadlines

11.Program structure				12.Awards and Credits
				Bachelor
level/year	Course or Module	Course or Module Title	Credit rating	117 hours

quarterly	**CRE111** **CRE121**	**Mathematics I** **Mathematics II**	6 hours 6 units	Bachelor's degree require (116) hour and (145) units Accredited
quarterly	**CHR 110**	**Physics**	4 hours 3 units	
quarterly	**CRE110** **CRE120**	**Computer programming I** **Computer programming II**	8 hours 6 units	
quarterly	**CHE111** **CRE122**	**Engineering drawing I** **Engineering drawing II**	8 hours 4 units	
quarterly	**CHE112** **CHE120**	**Analytical Chemistry** **Organic Chemistry**	8 hours 6 units	
quarterly	**CHE113** **CHE121**	**Principles of Chemical Engineering I** **Principles of Chemical Engineering II**	7 hours 7 units	
quarterly	**CRE112**	**Production operations**	3 hour 2 units	
quarterly	**CHE122**	**Static and strength of materials**	4 hours 2 units	
quarterly	**CRE210** **CRE220**	**Mathematics III** **Mathematics IV**	6 hours 6 units	
quarterly	**CRE211** **CRE221**	**Computer programming III** **Computer program application**	4 hours 4 units	
quarterly	**CHE210**	**Engineering materials**	4 hours 3 units	
quarterly	**CHE223**	**Electrical Engineering**	4 hours 3 units	

quarterly	**CHE211** **CHE221**	**Physical chemistry I** **Physical chemistry II**	8 hours 6 units	
quarterly	**CHE212** **CHE222**	**Fluid mechanics I** **Fluid mechanics II**	8 hours 6 units	
quarterly	**CHE213**	**Properties of petroleum and natural gas**	4 hours 3 units	
quarterly	**CHE224**	**Industrial safety**	2 hours 2 units	
quarterly	**CHE310** **CHE320**	**Engineering analysis** **Numerical analysis**	6 hour 6 units	
quarterly	**CHE311** **CHE321**	**Heat transfer I** **Heat transfer II**	10 hours 8 units	
quarterly	**CHE312** **CHE322**	**Mass transfer I** **Mass transfer II**	6 hours 6 units	
quarterly	**CHE313** **CHE323**	**Reaction kinetics** **Reactor design**	5 hours 5 units	
quarterly	**CHE314** **CHE324**	**Chemical engineering thermodynamics I** **Chemical engineering thermodynamics II**	4 hours 4 units	
quarterly	**CHE314** **CHE324**	**Chemical engineering thermodynamics I** **Chemical engineering thermodynamics II**	5 hours 4 units	
quarterly	**CHE315**	**Engineering economics**	2 hours 2 units	
quarterly	**CHE316**	**Corrosion engineering**	4 hours 3 units	

quarterly	**CHE325**	**Electrochemical engineering**	2 hours 2 units	
quarterly	**CHE326**	**Petroleum refinery**	2 hours 2 units	
quarterly	**CHE411**	**Gas processing**	2 hours 2 units	
quarterly	**CHE412** **CHE423**	**Process control I** **Process control II**	6 hours 5 units	
quarterly	**CHE413**	**Unit operation**	4 hours 3 units	
quarterly	**CHE422**	**Catalyst**	2 hours 2 units	
quarterly	**CHE421**	**Pollution**	2 hours 2 units	
quarterly	**CHE414**	**Chemical industries**	2 hours 2 units	
quarterly	**CHE416**	**Renewable energy**	2 hours 2 units	
quarterly	**CHE424**	**Nanotechnology**	2 hours 2 units	
quarterly	**CHE425**	**petrochemical industries**	2 hours 2 units	
quarterly	**CHE415** **CHE426**	**Equipment design I** **Equipment design II**	7 hours 5 units	

13.Personal Development Planning

GLOBAL SKILLS

Student able to speak and understand other languages

global skills

requester Able to speak and understand Languages other,And theAppreciation other cultures.

NEGOTIATING & PERSUADING

Student able to influence and convince others, to discuss and reach agreement

Thenegotiate And theThePersuade requester able to influence And theconvince others, toto discuss And reach an agreement.

Leadership

Student able to motivate and direct others.

Leadership

able to stimulate guiding others.

INDEPENDENCE

Accepts responsibility for views & actions and able to work under their own direction & initiative

Independence at work

14.Admission criteria

central

15.Key sources of information about the programme

Curriculum Skills Map																			
Please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed																			
				Programme Learning Outcomes															
Year / Level	Course Code	Course Title	Core (C) Title or Option (O)	Knowledge and understanding				The skills goals special to the course				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development			
				A1	**A2**	**A3**	**A4**	**B 1**	**b2**	**b3**	**B4**	**c1**	**C2**	**C3**	**C4**	**d1**	**d2**	**d3**	**D4**
The first stage	**CRE110**	**Computer Programming -I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CRE111	**Mathematics I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CRE112	**Production operations**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CRE121	**Mathematics II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE112	**Analytical Chemistry**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE113	**Principle of Chemical Engineering I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE120	**Organic Chemistry**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE121	**Principle of Chemical Engineering II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE122	**Static and strength of materials**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE110	**Physics**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
The second phase	**CRE210**	**Mathematics III**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CRE220	**Mathematics IV**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE211	**Physical Chemistry I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE212	**Fluid Mechanics I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE213	**Properties of Petroleum and Natural Gas**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*

	CHE210	**Engineering Materials**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE221	**Physical Chemistry II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE222	**Fluid Mechanics II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE223	**Electrical Engineering**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CRE211	**Computer programming III**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CRE221	**Computer program application**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE224	**Industrial Safety**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
third level	**CHE310**	**Engineering Analysis**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE311	**Heat Transfer I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE321	**Heat Transfer II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE312	**Mass Transfer I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE322	**Mass Transfer II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE323	**Reactor Design**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE314	**Chemical engineering thermodynamics I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE324	**Chemical engineering thermodynamics II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE325	**Electrochemical Engineering**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE326	**Petroleum refinery**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
The fourth stage	**CHE411**	**Gas processing**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE412	**Process Control I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE423	**Process Control II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE413	**Unit Operation**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE414	**Chemical industries**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*

	CHE415	**Equipment Design I**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE426	**Equipment Design II**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE416	**Renewable energies**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE424	**Nanotechnology**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
	CHE425	**Petrochemical industries**	**Basic**	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*

Stage One Course Specifications

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

Physics / First Stage / Chemical Engineering Department

16. Teaching Institution	University of Babylon/ College of Engineering
17. University Department/Centre	Chemical Engineering Department
18. Course title/code	Physics
19. Modes of Attendance offered	Students attend regularly at an average of 2 theoretical hours and 2 practical hours per week
20. Semester/Year	Semester
21. Number of hours tuition (total)	124 hours of study for the first semester
22. Date of production/revision of this specification	1-6-2021
23. Aims of the Course	
The course in Units, Physical quantities and vectors, Motion along straight line, Average velocity, Relative velocity, Motion in a plane, average and instantaneous velocity, Newton's law of motion and applications, Force, mass and weight, Application of law I, Application of Newton's law II, Work and energy, Conservation of energy and power, Impulse and momentum.	

24· Learning Outcomes, Teaching, Learning and Assessment Method
A:- knowledge and understanding As shown in the table on the next page
B. The skills goals special to the course. As shown in the table on the next page
25.Teaching and Learning Methods
1- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 2- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture. 3-Brainstorming
Assessment methods
1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5 . Practical lab examinations 10٤ -

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	To be able to understand	The first week Introduction definition of physics and physical units and mass and length and time Two week Scalar Quantities, Vector Quantities, and Collection of Vectors The third week Multiplying vector quantities numerically (points) and directional multiplication and its physical applications. Fourth week Movement in a straight line in one dimension Fifth week Movement in a straight line in two and three dimensions Sixth week movement in the plane and average and instantaneous speed Seven week Newton's Laws of Linear Motion Week 8	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5 4. Practical lab examinations 10

			Applications of Newton's First Law The ninth week applications of Newton's second law Ten week Applications of Newton's Third Law Eleventh week exam Twelfth week work and energy Thirteenth week Energy conservation Fourteenth week strength Fifteenth week Angular momentum and power		

26. Infrastructure
1. Books Required reading: 1. Physics for Scientists and Engineers Raymond A. Serway - Emeritus, James Madison University John W. Jewett - California State Polytechnic University, ISBN 0534408427 1296 pages Case Bound 8 1/2 x 10 7/8 Thomson Brooks/Cole © 2004, 2. Fundamentals of Physics, Frederick-J. Bush, formerly University of Dayton, and David-E-Gerd, Saint Cloud State University 3- Practical Physic
2. Main references (sources) open
A- Recommended books and references (scientific journals, reports…).open
B-Electronic references, Internet sites… Classroom and Telegram program.

Social services (including for example guest lectures, professional training, and field studies**…..** Nothing

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION-1

Basic Principles and Calculations in Chemical Engineering I/First Stage//Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

27. Teaching Institution	University of Babylon
28. University Department/Centre	scientific department / chemical engineering Department
29. Course title/code	Basic Principles and Calculations in Chemical Engineering I
30. Degree	Bachelor
31. Modes of Attendance offered	weekly
32. Semester/Year	Semester
33. Number of hours tuition (total)	3 per week
34. Date of production/revision of this specification	2021
35. Aims of the Course	
The student will learn the following: 1. units conversion and measurements of physical properties 2. the Chemical Equation and Stoichiometry 3. how to formulate and solve material balances 4. behavior of gases and liquids.	

36. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1. The student will able to specify the basic and derived units in the SI and American engineering systems.
2. The student will apply the concepts of dimensional consistency to determine the units of any term in a function.
3. The student will calculate the amount of products for incomplete reactions.
4. The student will be able to solve material balance problems involving multiple subsystems

b- The skills goals special to the course

1. developing problem solving skills for student.
2. becoming familiar with the use of units, physical properties.
3. able to solve successfully problems involving material balances.

Teaching and learning methods

1- Different attractive Methods of giving lecture combined with smart technology

Google classroom the student groups Brainstorming -٢

3- Work Shop, tutorial.

Assessment methods

1- the exam and quizzes
2- class assignments
3- homework

C- thinking skills

C1- The ability to deal with units of mass and force and its conversion.
C2- The ability to formulate and solve multiple equations.
C3- Ability to calculate the stoichiometric quantities of reactants and products given the chemical equation.
C4- Ability to sole material balances involve in condensation and vaporization

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating
D4. Initiative/Self-Motivation

37. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	**INTRODUCTION TO ENGINEERING CALCULATIONS**	Units and dimensions, the Mole unit	**White board and digital screen**	Homework
week (2)	3	**INTRODUCTION TO ENGINEERING CALCULATIONS**	Conventions in Methods of Analysis and Measurement, Basis	**White board and digital screen**	Homework Quizzes
week (3)		**INTRODUCTION TO ENGINEERING CALCULATIONS**	Temperature, Pressure	**White board and digital screen**	Homework Quizzes
week (4)		**INTRODUCTION TO ENGINEERING CALCULATIONS**	Physical and Chemical Properties of Compounds and Mixtures, The Chemical Equation and Stoichiometry.	**White board and digital screen**	Homework Quizzes
week (5)		**INTRODUCTION TO ENGINEERING CALCULATIONS**	Review on previous subjects	**White board and digital screen**	Homework Quizzes
week (6)		**MATERIAL BALANCES**	Define the system and draw the system boundaries for which the material balance is to be made, Explain the difference between an open and a closed system, Write the general material balance in words including all terms. Be able to apply the balance to simple problems, examples of processes in which no accumulation takes place; no generation or consumption takes place; no mass flow in and out takes place, Apply the material balance equation for the simplified case of input and output to the total mass of	**White board and digital screen**	Homework

			material and to an individual species, **Explain** the circumstances in which the mass of a compound entering the system equals the mass of the compound leaving the system. Repeat for moles		
week (7)		**MATERIAL BALANCES**	Define what the term "solution of a material balance problem" means, decide which equations to use if you have redundant equations, solve a set of n independent equations containing n variables whose values are unknown, prepare material flow diagrams from word problems, translate word problems and the associated diagrams into material balances with properly defined symbols for the unknown variables and consistent units for steady-state processes with and without chemical reaction.	**White board and digital screen**	Homework
week (8)		**Mid exam**			
first week (9)		**MATERIAL BALANCES**	Define flue gas, stack gas, Orsat analysis, dry basis, wet basis, theoretical air (oxygen), required air (oxygen), and excess air (oxygen), Given two of the three factors: entering air (oxygen), excess air (oxygen), and required air (oxygen), compute the third factor.	**White board and digital screen**	Homework
first week (10)		**MATERIAL BALANCES**	Write a set of independent material balance equations for a process, solve one or two simultaneous nonlinear equations, solve a set of linear equations, Apply the 10-step strategy to solve steady-state problems (with or without chemical reaction) that require the solution of simultaneous equations**.**	**White board and digital screen**	Homework Quizzes
first week (11)		**MATERIAL BALANCES**	Write a set of independent material balances for a complex process in**volving**	**White board and**	Homework Quizzes

			more than one unit, solve problems involving several connected units by applying the 10step strategy.	**digital screen**	
first week (12)		**MATERIAL BALANCES**	Draw a flow diagram for problems involving recycle, bypass, and Purge, Solve problems in which a modest number of interconnected units are involved by making appropriate balances, Use the overall conversion and single-pass (once-through) conversion concepts to solve recycle problems involving reactors, Explain the purpose of a recycle stream, a bypass stream, and a purge stream.	**White board and digital screen**	Homework Quizzes
first week (13)		**GASES, VAPORS, LIQUIDS, AND SOLIDS**	Ideal gas low, define gas density and specific gravity, Calculate the specific gravity of a gas even if the reference condition is not clearly specified, Calculate the density of a gas given its specific gravity.	**White board and digital screen**	Homework
first week (14)		**GASES, VAPORS, LIQUIDS, AND SOLIDS**	Define vapor pressure, triple point, equilibrium, dew point, bubble point, saturated, superheated, subcooled, and quality, and be able to locate the region or point in a *p-T* chart in which each term applies, Calculate the vapor pressure of a substance from a vapor-pressure equation given values for the coefficients in the equation, and look up the vapor pressure in reference books, Calculate the temperature of a substance from a vapor-pressure equation given the values for the coefficients in the equation, and the vapor pressure, Calculate the properties of a wet mixture given the temperature, pressure, and volume of the mixture, Define saturated gas, Calculate the	**White board and digital screen**	Homework

			partial pressure of the components of a saturated ideal gas given combinations of the temperature, pressure, volume and/or number of moles present; or calculate the partial volume; or calculate the number of moles of vapor.		
first week (15)		**Review on total course, Answering and solve questions.**		**White board and digital screen**	

38.Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Basic Principles and Calculations in Chemical Engineering, David M. Himmelblau / James B. Riggs 5th edition (1989)
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	-

39. The development of the curriculum plan	
Prerequisites	Central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION-2

Basic Principles and Calculations in Chemical Engineering II/First Stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

40. Teaching Institution	University of Babylon
41. University Department/Centre	scientific department / chemical engineering Department
42. Course title/code	Basic Principles and Calculations in Chemical Engineering II
43. Degree	Bachelor
44. Modes of Attendance offered	weekly
45. Semester/Year	Semester
46. Number of hours tuition (total)	4 per week
47. Date of production/revision of this specification	2021

48. Aims of the Course

The student will learn the following:
1. Convert energy and heat capacity in one set of units to another set.
2. Calculation of Enthalpy Changes with and without Change of Phase change.
3. Energy Balances with Chemical Reaction.
4. Heats of Solution and Mixing.
5. Humidity Charts and Their Use.
6. UNSTEADY·STATE MATERIAL AND ENERGY BALANCES

49. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

5. The student will able to convert energy units.
6. The student will calculate heat capacity, kinetic energy and potential energy.
7. The student will calculate enthalpy changes
8. The student will be able to calculate heat of solution and mixing.
9. The student will be able to use Humidity Charts.
10. The student will be able to solve UNSTEADY·STATE MATERIAL AND ENERGY BALANCES.

b- The skills goals special to the course

1. developing energy balance problem solving skills for student.
2. becoming familiar with the use of energy units and work.
3. Using steam tables.
4. able to solve successfully problems involving energy balances.
5. able to use humidity chart and specify the conditions of the humid air.
6. Able to formulate and solve unsteady state material and energy balance problems.

Teaching and learning methods

4- Different attractive Methods of giving lecture combined with smart technology

Google classroom the student groups Brainstorming -٥

6- Work Shop, tutorial.

Assessment methods

4- the exam and quizzes
5- class assignments
6- homework

C- thinking skills

C1- The ability to deal with energy units and its conversion.
C2- The ability to formulate and solve multiple equations of energy balances.
C3- Ability to calculate enthalpy for chemical reactions and work.
C4- Ability to use humidity charts and deal with temperatures and percent saturation of air.
C5- Ability to solve Unsteady state material and energy balance problems.

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating
D4. Initiative/Self-Motivation

50.Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	**ENERGY BALANCES**	Define or explain the following terms: energy, system, closed system, Non flow system, open system, flow system, surroundings, property, extensive property, intensive property, state, heat, work, kinetic energy, potential energy, internal energy, enthalpy, initial state, final state, point (state) function, state variable, cyclical process, and path function, Select and define a system suitable for problem solution, either closed or open, steady or unsteady state and fix the system boundary, Distinguish among potential, kinetic, and internal energy, Convert energy in one set of units to another set, List and apply the equations used to calculate kinetic energy, potential energy, and work.	**White board and digital screen**	Homework
week (2)	4	**ENERGY BALANCES**	Define heat capacity, convert an expression for the heat capacity from one set of units to another, look up from a reference source an equation that expresses the heat capacity as a function of temperature, and compute the heat capacity at a given temperature, Estimate the value of the heat capacity for solids and liquids, fit empirical heat capacity data with a suitable function of temperature by estimating the values of the coefficients in the function	**White board and digital screen**	Homework Quizzes
week (3)	4	**ENERGY BALANCES**	Calculate enthalpy (and internal energy) changes (excluding phase changes) from heat capacity equations, graphs and charts, tables, and computer data bases given the initial and final states of the material, Become familiar with the steam tables and their use both in SI and American engineering units, Ascertain the reference state for enthalpy values from the data source	**White board and digital screen**	Homework Quizzes
week (4)	4	**ENERGY BALANCES**	Estimate the heat of fusion or heat of vaporization from empirical formulas, or look up the value in a reference table, Estimate the heat of vaporization from the Clausius-Clapeyron equation or the Othmer plot, Calculate an enthalpy change of a substance including the phase transitions	**White board and digital screen**	Homework Quizzes

week (5)	4	**ENERGY BALANCES**	Write down the general energy balance in words, Write down the energy balance for a closed system in symbols and apply it to solve energy balance problems. Cite the signs for work and heat entering and leaving the system. Calculate the total energy or any of its components (internal energy, kinetic energy, potential energy) associated with the mass of the system. Define isothermal, adiabatic, isobaric, and isometric processes, make the necessary assumptions and approximations to simplify and solve the energy balance for open systems.	**White board and digital screen**	Homework Quizzes
week (6)	4	**ENERGY BALANCES**	Define a quasi-static and a reversible process, identify a process as reversible or irreversible given a description of the process, define efficiency and apply the concept to calculate the work for an irreversible Process, Write down the steady-state mechanical energy balance for an open system and apply it to a problem.	**White board and digital screen**	Homework
week (7)	4	**ENERGY BALANCES**	Compute heats of formation from experimental data for the enthalpy change (including phase changes) of a process with a reaction taking place, calculate the standard heat of reaction from tabulated standard heats of formation for a given reaction. calculate the standard heat of reaction from tabulated standard heats of combustion for a given reaction, calculate the standard higher heating value from the lower heating value or the reverse.	**White board and digital screen**	Homework
week (8)	4	**Mid exam**			
first week (9)	4	**ENERGY BALANCES**	Distinguish between ideal solutions and real solutions, calculate the heat of mixing, or the heat of dissolution, at standard conditions given the moles of the materials forming the mixture, calculate the standard integral heat of solution, Define the standard integral heat of solution at infinite dilution, Apply the energy balance to problems in which the heat of mixing is significant.	**White board and digital screen**	Homework
first week (10)	4	**ENERGY BALANCES**	Define humidity, humid heat, humid volume, dry-bulb temperature, Wet -bulb temperature, humidity chart, moist volume, and adiabatic cooling line, explain and show by use of equations why the slope of the wet-bulb lines are the same as the adiabatic cooling lines for water-air mixtures, Prepare a humidity chart given relations for the heat capacities of air and water, Use the humidity chart to determine the properties	**White board and digital screen**	Homework Quizzes

			of moist air, and to calculate enthalpy changes and solve heating and cooling problems involving moist air		
first week (11)	4	UNSTEADY·STATE MATERIAL AND ENERGY BALANCES	Write a set of independent material balances for a complex process in**volving more than one unit,** solve problems involving several connected units by applying the 10 step strategy.	**White board and digital screen**	Homework Quizzes
first week (12)	4	**UNSTEADY·STATE MATERIAL AND ENERGY BALANCES**	Write a set of independent material balances for a complex process in**volving more than one unit,** solve problems involving several connected units by applying the 10 step strategy	**White board and digital screen**	Homework Quizzes
first week (13)	4	**UNSTEADY·STATE MATERIAL AND ENERGY BALANCES**	Write a set of independent material balances for a complex process in**volving more than one unit,** solve problems involving several connected units by applying the 10 step strategy	**White board and digital screen**	Homework
first week (14)	4	**UNSTEADY·STATE MATERIAL AND ENERGY BALANCES**	Write a set of independent material balances for a complex process in**volving more than one unit,** solve problems involving several connected units by applying the 10 step strategy	**White board and digital screen**	Homework
first week (15)	4	**Review on total course, Answering and solve questions.**		**White board and digital screen**	

51.Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Basic Principles and Calculations in Chemical Engineering, David M. Himmelblau / James B. Riggs 5th edition (1989)
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	-

52. The development of the curriculum plan

Prerequisites	Central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Statics and strength of materials/First Year/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

53. Teaching Institution	University of Babylon
54. University Department/Centre	scientific department / Chemical engineering Department
55. Course title/code	Statics and strength of materials
56. Degree	Bachelor
57. Modes of Attendance offered	weekly
58. Semester/Year	Semester two
59. Number of hours tuition (total)	60
60. Date of production/revision of this specification	

61. Aims of the Course

At the ending of the course, the student will be able to understand:

1. The fundamental Terms in the mechanics such as the metrics, scalars and vectors
2. General principles and concepts.
3. Resultant and Equilibrium of Forces, Resultant of concurrent Forces Systems, Resultant of collinear Forces, Equilibrium of concurrent Forces Systems, Equilibrium of collinear Forces, Action and Reaction
4. Tension and Compression, Equilibrant and the Force Triangle, Principle of Concurrence, Methods of Solution.
5. Free Body, Analysis of a Simple Structure, Components of a Force, Rectangular Components of a Force, Inclined Plane
6. Resultant of More Than Two Forces in a Plane.
7. Equilibrium of More Than Two Forces, Resultant of Concurrent Forces by Summation, Equilibrium of Concurrent Forces
8. Moments, Equilibrium of Parallel Forces, Uniformly Distributed Loads, Couples.
9. Nonconcurrent- Coplanar Forces, Trusses, Resultant of non-concurrent coplanar forces, General Method, Graphical Method, Applications.
10. Trusses, Methods of Joints, Method of Sections
11. Static and Kinetic Friction, Maximum static friction, friction on an Inclined Plane, Force Necessary to Move a Body up a rough Plane, Least Force, Cone of Friction, Wedge Action.
12. Different and selected applications to The Static
13. Simple Stresses,
14. Use of Properties of Materials in Design, Tension Test, Stress and Strain
15. Definitions, Modulus of Elasticity, Ductility, Brittle Materials.
16. Allowable Stresses, Factor of Safety, Poisson's Ratio.
17. Thermal Expansion, Thermal Stresses.
18. Members compose of Two Materials In Parallel, Members compose of Two Materials In Series.
19. Bolted Joints, Types of Failure in Bolted Joints, Stresses in Bolted Joints.
20. Thin-Walled Pressure Vessels.
21. Centroid, Moment of an Area, Centroids of Composed Area, Moment of Inertia
22. Transfer Formula, Moment of Inertia of Composed Area.
23. Types of Beams, Beams Theory, Shear Force and Bending Moment Diagrams.

24. Relation Between Beams Loadings Shear Diagram and Moment Diagram.
25. Location of Bending Moment from Shear Diagram Area.
26. Torsion, Torsional Shearing Stress, Angle of Twist, Power Transmission.
27. Shaft Couplings, Axial Keys.
28. Combined Stresses, Principle of Superposition
29. Types of Combined Stresses
30. Different and selected applications to The Strength of Materials

62. Learning Outcomes, Teaching ,Learning and Assessment Method

Cognitive goals

1. Study and comprehend general concepts and basic principles in Mechanics. Take advantage of connecting topics with equations to solve them correctly.
2. Learn the correct ways to solve mechnical problems and train the student to solve within the general concepts of speed and accuracy. Refining the scientific concept and consolidating the scientific material correctly through continuous examinations and activating the role of the student not in obtaining the degree, but in understanding and benefiting from this material to the maximum extent.

Teaching and learning methods

3- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details.

4- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture.

Assessment methods

1-Decisions examinations	30
2- Periodic examination	5
3- Home work and Quizzes	5

C- thinking skills

C1- The ability to imagine a geometric figure for the purpose of drawing and preparing its own calculations

Teaching and learning methods

1- Method of giving lectures. 2- Discussion method The course is given to students in the form of class lectures that are received and written on the board with illustrative examples. There is a practical hour in which problems and exercises are solved with the participation of the audience of students. Students are assigned homework. Also, students' understanding and comprehension of the material is tested through sudden daily exams.
Assessment methods
1- semester exam 2- Home and class duties 3- daily exams

63. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	Fundamental Terms	- Introduction to mechanics, basic Terms, Introduction to metrics, - scalars and vectors, General principles and concepts.	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 Marks 2- Periodic examination 5 Marks 3- Home work and Quizzes 5 Marks
week (2)	4	Force systems	-Types of Forces Systems. - Resultant of concurrent Forces Systems. -Resultant of collinear Forces.		
week (3)	4	Moments and Couples	Moments, Sign of Moments, Equilibrium of Parallel Forces, Uniformly Distributed Loads, Couples.		
week (4-6)	12	Equilibrium	-Equilibrium of concurrent Forces Systems. - Equilibrium of collinear Forces. - Resultant of non-concurrent coplanar forces - Methods of Solution. - Free Body - Analysis of a Simple Structure. - Components of a Force. - Rectangular Components of a Force - Equilibrium of general system.		
week (7-8)	8	Analysis of Truss and Frames	- Trusses - Methods of Joints. - Method of Sections - Frame		
week (9)	4	Friction and its Applications	- Maximum static friction. - friction on an Inclined Plane. - Friction applicatons.		
week (10-11)	8	Stress and strain	- Stresses, Simple Stresses - Tension Test. - Stress and Strain. - Modulus of Elasticity. - Ductility, Brittle Materials. - Allowable Stresses, Factor of Safety, - Poisson's Ratio - Bolted Joints, Types of Failure in Bolted Joints - Stresses in Bolted Joints - Thin-Walled Pressure Vessels.		
week (12)	4	Thermal deformations and stresses	- Thermal Stresses. - Thermal Expansion, - Members compose of Two Materials in Parallel. - Members compose of Two Materials in Series.		
week (13)	4	Centroid and moment of Inertia	- Centroid - Centroids of Composed Area - Moment of an Area - Moment Of Inertia - Transfer Formula, Moment of Inertia of Composed Area.		

week (14)	4	Shear force and bending moment	- Types of Beams - Shear Force and Bending Moment Diagrams. - Location of Bending Moment From Shear Diagram Area. - Beams Deflection		
week (15)	4	Torsion, Shafts, Shaft Couplings and Keys	-Torsion. -Torsional Shearing Stress. - Angle of Twist, Power Transmission. -Shaft Couplings, Axial Keys.		

64. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	1 - Meriam, J. L., Kraige, L. G. " Engineering Mechanics-Static",5th edition 2 - Hibbeler," Engineering Mechanics-Static", 13rd edition
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Mathmatic II/First stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

65. Teaching Institution	University of Babylon

66. University Department/Centre	scientific department / chemical engineering Department
67. Course title/code	**MathematicsII /** Math200
68. Degree	Bachelor
69. Modes of Attendance offered	weekly
70. Semester/Year	Yearly
71. Number of hours tuition (total)	5 per week
72. Date of production/revision of this specification	2021

73. Aims of the Course

The course of Mathematics for first stages in the college of engineering is unified and it displays the methods of solution for most mathematical subjects and how to employee these methods with each other to understand and solve the engineering problem such the specifications of the rigid bodies. The course starts with the understanding of the most coordinates in the 2- and 3-dimension. At the ending of this course, the student should try to solve several engineering problems by using the subjects' solution methods which has been undertaken in differentials and integrations form. In other hand, this course represents the link between the principles of the mathematics in the first stage and the advanced mathematics which will study in the next stage.

74. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

3. Study and comprehend general concepts and basic principles in mathematicsTake advantage of connecting topics with equations to solve them correctly.

Learn the correct ways to solve mathematical problems and train the student to solve within the general concepts of speed and accuracyRefining the scientific concept and consolidating the scientific material correctly through continuous examinations and activating the role of the student not in obtaining the degree, but in understanding and benefiting from this material to the maximum extent.

b- The skills goals special to the course

1. The student is familiar with the use of equations and mathematical functions
2. The student gets to know the description of mathematical problems in different fields

Teaching and learning methods

1- Different attractive Methods of giving lecture combined with smart technology and lecture in class.

Google classroom the student groups Brainstorming -٢

3- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture.
Assessment methods
1- the exam and quizzes 2- class assignments 3- homework
C- thinking skills General and transferable skills (other skills related to employability and personal development). Dr1- The ability to use mathematics Dr2- The ability to employ stereoscopic geometry

75.Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1-4)	16	Functions	1 .Functions 1.1Functions and Their Graphs 1.2Combining Functions; Shifting and Scaling Graphs 1.3Trigonometric Functions 1.4 Graphing with Calculators and Computers	. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5
week (5-8)	16	Limits and Continuity	- 2. Limits and Continuity 2.1Rates of Change and Tangents to Curves 2.2Limit of a Function and Limit Laws 2.3The Precise Definition of a Limit 2.4One-Sided Limits 2.5Continuity 2.6Limits Involving Infinity; Asymptotes of Graphs	The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing to them to	Homework Quizzes Report

				give their opinion and comments about the whole parts of the lecture	
week (9-12)	16	.Differentiation	3 .Differentiation 3.1Tangents and the Derivative at a Point 3.2The Derivative as a Function 3.3Differentiation Rules 3.4The Derivative as a Rate of Change 3.5Derivatives of Trigonometric Functions 3.6The Chain Rule 3.7Implicit Differentiation 3.8Related Rates 3.9Linearization and Differentials	The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	Homework Quizzes Report
week (13-15)	15	Applications of Derivatives	4. Applications of Derivatives 4.1Extreme Values of Functions 4.2The Mean Value Theorem 4.3Monotonic Functions and the First Derivative Test 4.4Concavity and Curve Sketching 4.5Applied Optimization 4.6Newton's Method 4.7 Antiderivatives	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
SECOND COURSE					

week (1-4)	20	Integration	5 .Integration ٥,١Area and Estimating with Finite Sums ٥,٢Sigma Notation and Limits of Finite Sums ٥,٣The Definite Integral ٥,٤The Fundamental Theorem of Calculus ٥,٥Indefinite Integrals and the Substitution Method ٥,٦Substitution and Area Between Curves	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5-8)	20	Definite Integrals	6. Applications of Definite Integrals 6.1 Volumes Using Cross-Sections 6.2 Volumes Using Cylindrical Shells 6.3 Arc Length 6.4 Areas of Surfaces of Revolution 6.5 Work and Fluid Forces 6.6 Moments and Centers of Mass	The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	Homework
week (9-12)	20	Limits and Continuity	- 2. Limits and Continuity 2.1Rates of Change and Tangents to Curves 2.2Limit of a Function and Limit Laws 2.3The Precise Definition of a Limit 2.4One-Sided Limits		

week (13-15)	15	. Limits and Continuity	4One-Sided Limits 2.5Continuity 2.6Limits Involving Infinity; Asymptotes of Graphs	The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	Homework Quizzes

76.Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	**References** 1 - K. A. STROUD, "ENGINEERING MATHEMATICS, PROBLEMS AND APPLICATION" McGraw Hill, New York, USA, (1984). 2 - George B. Thomas, Jr. " THOMAS' CALCULUS Vol. 1", Pearson Education, Inc., USA, (2005).
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	-------

77. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

Programming skills/ First Stage/Chemical Engineering

COURSE SPECIFICATION

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. It should be cross-referenced with the Course SPECIFICATION.

78.Teaching Institution	University of Babylon
79.University Department/Centre	scientific department / chemical engineering Department
80.Course title/code	Programming skills
81.Degree	Bachelor
82.Modes of Attendance offered	4 weekly
83.Semester/Year	Semester
84.Number of hours tuition (total)	4 per week
85.Date of production/revision of this specification	2021
86.Aims of the Course	

1. **The student will have the ability to define the computer system and types of computer system**
2. **Define types of programming languages**

3- The student will be able to identify the problem solving.
4_the student can be able to define each problem and design method of solution

A - Cognitive goals

1. **The student taken basic fundamentals of computer.**
2. **The student design a method of problem solving .**
3. **The student will understand the methods of problem solving**

b- The skills goals special to the course

The student will understand the methods of problem solving

Teaching and learning methods

1- Different attractive Methods of giving lecture combined with smart technology
2- Google classroom the student groups Brainstorming
3- Work Shop, tutorial

Assessment methods

1- the exam and quizzes
2- class assignments
3- homework
4- reports

C- thinking skills

Skills in the computer accuracy and speed
Skills in in thinking in definition a problem and find a strategy or solving in short time

87- Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	**primary principles**	Basis concepts of computers, hardware and Software ,types of software, T	**Explaining and projecting on digital screen**	
week (2)	4	**primary principles**	Types of memory high level language ,low level language	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (3)		**primary principles**	basic elements of communications ,LAN and WAN ,email and internet	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (4)		**Problem solving**	**Problem solving ,Definition of problem solving ,Problem solving methods**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5)		**Problem solving**	**Examples of Problem solving**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (6)		**Algorithms**	**Algorithms** - **Algorithms** - **sequential Algorithm examples**.	**Method of giving lectures. Explaining on whiteboard**	Homework

				and projecting on digital screen	
week (7)		***Mid exam***			
week (8)			**- Algorithm examples**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (9)		**Algorithms**	**- branch Algorithm examples)**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
first week (10)		**Algorithms**	**.**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (11)		**Algorithm**	**Iteration statement Algorithm - examples .**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (12)		**Flow chart**	**- sequential flow chart - examples**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (13)		**Flow chart**	**- branch flow chart - examples**	**Explaining on whiteboard and projecting on digital screen**	Semester and daily exam
first week (14)		**Flow chart**	**- Iteration statement flow chart Examples**	**Method of giving lectures. Drawing on the board and drawing on the computer**	Semester and daily exam
first week (15)		**Review on total course and Answering, solve**			

		questions ready for **final exam**			

88. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	
Special requirements (including, for example, workshops, periodicals, software and websites)	---
Social services (including guest lectures, professional training and field studies)	field visit

89. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	70

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Organic Chemistry/First Stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

90. Teaching Institution	University of Babylon
91. University Department/Centre	scientific department / chemical engineering Department
92. Course title/code	**Organic chemistry**
93. Degree	Bachelor
94. Modes of Attendance offered	Weekly
95. Semester/Year	Semester
96. Number of hours tuition (total)	3 per week
97. Date of production/revision of this specification	2021

98. Aims of the Course

3. The student will have the ability to define the organic chemistry and types .
2- 3_the student can be able to recognize each type of organic and the methods of organic treatment
4- the student will learn how to identify the problems and the troubleshooting of equipment of element.

99. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

4. **The student will develop a sense of keeping the environment clean**
5. **The student will realize the effect of analytical of element .**
6. **The student will understand the methods of controlling the pollutant solution such as Recrystallization, deposition of elements**

b- The skills goals special to the course

1. The student will be able to measure the amount of element
2. The student will identify the problems and the troubleshooting of equipment that control pollution

Teaching and learning methods
4- Different attractive Methods of giving lecture combined with smart technology 5- Google classroom the student groups Brainstorming **6-** Work Shop, tutorial
Assessment methods
5- the exam and quizzes 6- class assignments 7- homework 8- reports
C- thinking skills C1- The ability to solve various problems that relate to unit of solution C2- The ability to understand the situation of keeping the environment clean and safe C2- Ability to recognize the element and compound by melting and boiling point C3- Ability to specify the nature of impurity in wastewater C4- Ability to recognize the methods of controlling solution pollution
D - General and transferable skills (other skills related to employability and personal development). D1. Verbal Communication D2. Teamwork D3. Analyzing & Investigating D4. Initiative/Self-Motivation

100. Course structure: first course					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	**Chemical Bonding in organic compounds**	**2**		
week (2)	3	**Functional groups and classification of organic compounds**	**2**		Homework Quizzes Report
week (3)		**Functional groups and classification of organic compounds**			Homework Quizzes Report
week (4)		**Alkanes and Cycloalkanes**			Homework Quizzes Report
week (5)		**Alkenes**			Homework Quizzes Report
week (6)		**Alkynes,**			Homework
week (7)		***Mid exam***			
week (8)		**Aromatic Compounds**			Homework Quizzes
first week (9)		Alkyl halides			Homework
first week (10)		Alcohols, Ethers, Aldehydes and Ketones			Homework Quizzes

first week (11)		Carboxylic Acids			Homework Quizzes
first week (12)		Salts and Esters			Homework Quizzes
first week (13)		**carboxylic acids**			Semester and daily exam
first week (14)		**Amines.**			Semester and daily exam
first week (15)		**Review on total course and Answering, solve questions ready for final exam**			

101. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Morrson &B/boyd
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

102. The development of the curriculum plan	
Prerequisites	Central
Less number of students	

The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Engineering Drawing/First Stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

103. Teaching Institution	University of Babylon
104. University Department/Centre	scientific department / Chemical engineering Department
105. Course title/code	Engineering Drawing
106. Degree	Bachelor
107. Modes of Attendance offered	weekly
108. Semester/Year	Semester One
109. Number of hours tuition (total)	4 per week
110. Date of production/revision of this specification	٢٠٢١
111. Aims of the Course	
1. The student can draw geometric shapes, stereoscopic drawings, and sections, and can read engineering drawings. 2. The student imagines the final shape of the engineering drawing	

112. Learning Outcomes, Teaching ,Learning and Assessment Method
Cognitive goals 1. The student will be familiar with the tools of engineering drawing. 2. The student is familiar with drawing geometric shapes (lines, circles, arcs). 3. The student learns applications and exercises in vertical and stereo projection and drawing sections.
Teaching and learning methods
7- Method of giving lectures. 8- Learning Technologies on Campus Off-campus e-learning. 9- Team Project (student groups) 10- workshops
Assessment methods
1- the exam 2- class assignments 3- homework 4- daily exams
C- thinking skills C1- The ability to visualize the geometric shape of a drawing C2- Ability to work on a computer and master its programs C3- The lie is from the famous AutoCAD drawing program, which needs to imagine the drawing and realize it for the purpose of drawing it C4- Mastery of mathematics to relate it to the stereoscopic geometry of a purpose the answer in descriptive engineering
Teaching and learning methods
Drawing on panels installed on the engineering board
Assessment methods
11- semester exam 12- Home and class duties

D - General and transferable skills (other skills related to employability and personal development).
Being able to visualize and draw a geometric figure his imagination

113. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	Introduction to Engineering Drawing:	Standards of Drawing Sheets, Title block, borders and frames, grid reference and item reference of drawing sheet.	Lectures, and Drawing on the board	Semester and daily exam
week (2)	4	Introduction to Engineering Drawing:	Drawing Instruments and Accessories		
week (3)	4	Lines in engineering drawing	Types of Lines , Lettering		
week (4)	4	Lines in engineering drawing	Types of Lines , Lettering		
week (5)	4	Principles of Geometrical Constructions	Straight Line Operations, Curved Line Operations, Tangency Construction, Drawing of Contour Lines of Parts.		
week (6)	4	Principles of Geometrical Constructions	Circle, Dimensioning.		
week (7)	4	engineering operations	Straight line bisection, dividing a line in to any number of equal parts, draw a straight line that parallel to another line, draw a straight line that parall to another line by using triangles.		
week (8)	4	engineering operations	Angle division, dividing an angle in to any number of equal parts, angle transfer		
week (9)	4	engineering operations	Draw regular pentagon, draw pentagon inside a circle, draw hexagon inside a circle, draw hexagon when the length of his segments is known		
week (10)	4	engineering operations	Dividing the circle into seven equal parts, eight equal parts, draw octagon shape, draw regular polygon with 9 sides.		
week (11)	4	engineering operations	Draw tangent arc, draw ellipse.		
week (12)		Orthographic Projections	Introduction to Graphical Representation, Projection of Points, Projection of Straight Lines		
week (13)	4	Orthographic Projections	Determination of True Length of Straight Lines, Determination of Line Inclination with the Main Planes.		
week (14)	4	Orthographic Projections	Determination of True Length of Straight		

			Lines, Determination of Line Inclination with the Main Planes.		
week (15)	4	Orthographic Projections	Determination of True Length of Straight Lines, Determination of Line Inclination with the Main Planes.		

114. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	**Engineering drawing, written by Abd al-Rasoul al-Khaffaf.**
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	

115. The development of the curriculum plan	
Prerequisites	central
Less number of students	30
The largest number of students	50

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

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. It should be cross-referenced with the Course SPECIFICATION.

COURSE SPECIFICATION

Analytical chemistry/First Stage/Chemical Engineering Department

115. Teaching Institution	University of Babylon
116. University Department/Centre	scientific department / chemical engineering Department
117. Course title/code	**Analytical chemistry**
118. Degree	Bachelor
119. Modes of Attendance offered	Weekly
120. Semester/Year	Semester
121. Number of hours tuition (total)	3 per week
122. Date of production/revision of this specification	2021

123. Aims of the Course

3. The student will have the ability to define the analytical chemistry and types .
2- the student can be able to recognize each type of analysis and the methods of analytical treatment
3- the student will learn how to identify the problems and the troubleshooting of equipment of element.

124. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

4. **The student will develop a sense of keeping the environment clean**
5. **The student will realize the effect of analytical of element .**
6. **The student will understand the methods of controlling the pollutant solution such as Recrystallization, deposition of elements**

b- The skills goals special to the course

1. The student will be able to measure the amount of element

2. The student will identify the problems and the troubleshooting of equipment that control pollution

Teaching and learning methods

13- Different attractive Methods of giving lecture combined with smart technology

14- Google classroom the student groups Brainstorming

15- Work Shop, tutorial

Assessment methods

5- the exam and quizzes

6- class assignments

7- homework

8- reports

C- thinking skills

C1- The ability to solve various problems that relate to unit of analytical

C2- The ability to understand the situation of keeping the environment clean and safe

C2- Ability to recognize the methods of reducing water pollution

C3- Ability to specify the nature of impurity in wastewater

C4- Ability to recognize the methods of controlling solution pollution

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication

D2. Teamwork

D3. Analyzing & Investigating

D4. Initiative/Self-Motivation

125. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	**Types of analysis in analytical chemistry and their uses**	**2**		
week (2)	3	**Expression of concentration and content**	**2**		Homework Quizzes Report
week (3)		**Standard solutions, Amounts of reactants and products, The relationship between chemical kinetics and chemical equilibrium**			Homework Quizzes Report
week (4)		**Electrochemistry, Gravimetric analysis**			Homework Quizzes Report
week (5)		**Electrochemistry, Gravimetric analysis**			Homework Quizzes Report
week (6)		**Electrochemistry, Gravimetric analysis,**			Homework
week (7)		***Mid exam***			
week (8)		**Titer metric analysis ,calculations Acid-base titrations, Precipitation Titrat**			Homework Quizzes
first week (9)		**Titer metric analysis ,calculations , Complex metric ,titrations**			Homework
first week (10)		**Titer metric analysis ,calculations Reduction-oxidation titrations.**			Homework Quizzes

first week (11)		**Chemical equilibrium**			Homework Quizzes
first week (12)		**Volumetric analysis their uses and classification**			Homework Quizzes
first week (13)		**Volumetric analysis their uses and classification**			Semester and daily exam
first week (14)		**Volumetric analysis their uses and classification**			Semester and daily exam
first week (15)		**Review on total course and Answering, solve questions ready for final exam**			

126. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Fundamentals of Analytical Chemistry Douglas A.Skoog – Donald M.West
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

127. The development of the curriculum plan	
Prerequisites	Central
Less number of students	
The largest number of students	25

Second Stage Courses Specification

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Mathematics III /Second Year/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

128. Teaching Institution	University of Babylon
129. University Department/Centre	scientific department / Chemical engineering Department
130. Course title/code	Mathematics III
131. Degree	Bachelor
132. Modes of Attendance offered	weekly
133. Semester/Year	Semester one
134. Number of hours tuition (total)	75
135. Date of production/revision of this specification	
136. Aims of the Course	
Explain the basic principles and shed light on a group of topics related to the development of engineering competence for the student in order to enable him to be able to understand the engineering derivations that pertain to other subjects. It also prepares the student's mind for the purpose of entering the world of numerical and engineering analyzes in other stages.	

The course also aims to achieve the following:
1- The student learns about various types of axes such as diagonal axes and others, as well as how to draw on such axes and calculate the engineering and physical properties of these drawings and how to use this information to benefit from it for the purposes of analysis and design.
2- The student learns how to know vectors and calculate their values for the purpose of employing them in the processes of derivation and geometric analysis.

137. Learning Outcomes, Teaching ,Learning and Assessment Method
Cognitive goals 4. Study and comprehend general concepts and basic principles in mathematics. Take advantage of connecting topics with equations to solve them correctly. 5. Learn the correct ways to solve mathematical problems and train the student to solve within the general concepts of speed and accuracy. Refining the scientific concept and consolidating the scientific material correctly through continuous examinations and activating the role of the student not in obtaining the degree, but in understanding and benefiting from this material to the maximum extent.
b- The skills goals special to the course 2. To make the student familiar with the use of equations and mathematical functions 3. The student gets to know the description of mathematical problems in different fields
Teaching and learning methods
16- Method of giving lectures. 17- Learning Technologies on Campus and Off-campus (e-learning). 18- Team Project The student groups 19- Applied Education
Assessment methods
9- the exam 10- class assignments 11- homework 12- daily exams
C- thinking skills

C1- The ability to imagine a geometric figure for the purpose of drawing and preparing its own calculations
C2- Ability to work on adding equations to solve different problems
c3- Mastery of mathematics to relate it to the stereoscopic geometry of a purpose the answer in descriptive engineering

Teaching and learning methods

3- Method of giving lectures.
4- Discussion method

The course is given to students in the form of class lectures that are received and written on the board with illustrative examples. There is a practical hour in which problems and exercises are solved with the participation of the audience of students. Students are assigned homework. Also, students' understanding and comprehension of the material is tested through sudden daily exams.

Assessment methods

20- semester exam
21- Home and class duties
22- daily exams

D - General and transferable skills (other skills related to employability and personal development).
Dr1- The ability to use mathematics
Dr2- The ability to employ stereoscopic geometry.

138. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	5	**Vectors and Analytic Geometry in Space**	Vectors in the Plane , Cartesian (Rectangular) Coordinates	**Method of giving lectures.**	Semester and daily exam
week (2)	5	**Vectors and Analytic Geometry in Space**	Vectors in Space	**Method of giving lectures.**	Semester and daily exam
week (3)	5	**Vectors and Analytic Geometry in Space**	Dot Products , Cross Products	**Method of giving lectures.**	Semester and daily exam
week (4)	5	**Vectors and Analytic Geometry in Space**	Lines and Planes in Space	**Method of giving lectures.**	Semester and daily exam
week (5)	5	**Vector-Valued Functions and Motion in Space**	Vector-Valued Functions and Curves in Space. Derivatives and Integrals	**Method of giving lectures.**	Semester and daily exam
week (6)	5	**Vector-Valued Functions and Motion in Space**	Modeling Projectile Motion	**Method of giving lectures.**	Semester and daily exam
week (7)	5	**Vector-Valued Functions and Motion in Space**	Directed Distance and the Unit Tangent Vector	**Method of giving lectures.**	Semester and daily exam
week (8)	5	**Vector-Valued Functions and Motion in Space**	Curvature, Torsion, and the TNB Frame	**Method of giving lectures.**	Semester and daily exam
week (9)	5	**Polar Coordinates**	Graphing in Polar Coordinates, Integration in Polar Coordinates System	**Method of giving lectures.**	Semester and daily exam
week (10)	5	**Polar Coordinates**	Area in the plan , Area between two polar curves , Area of a surface of revolution	**Method of giving lectures.**	Semester and daily exam
week (11)	5	**Functions of Two or More Variables and Their Derivatives**	Partial Derivatives ,The Chain Rule	**Method of giving lectures.**	Semester and daily exam
week (12)	5	**Functions of Two or More Variables and**	Directional Derivatives and Gradient Vectors	**Method of giving lectures.**	Semester and daily exam

		Their Derivatives			
week (13)	5	**Functions of Two or More Variables and Their Derivatives**	Tangent Planes and Normal Lines	**Method of giving lectures.**	Semester and daily exam
week (14)	5	**Functions of Two or More Variables and Their Derivatives**	Linearization and Differentials	**Method of giving lectures.**	Semester and daily exam
week (15)	5	**Functions of Two or More Variables and Their Derivatives**	Maxima, Minima, and Saddle Points , Lagrange Multipliers	**Method of giving lectures.**	Semester and daily exam

139. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	George B. Thomas, Jr. "THOMAS'CALCULUS ", 13th edition, 2013 B.S. Grewal,"Higher Engineering Mathematics" 42nd edition.
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	

COURSE SPECIFICATION

Mathematics III /Second Year/Chemical Engineering Department

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

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. It should be cross-referenced with the Course SPECIFICATION.

140. Teaching Institution	University of Babylon
141. University Department/Centre	scientific department / Chemical engineering Department
142. Course title/code	**Mathematics IIII**
143. Degree	Bachelor
144. Modes of Attendance offered	weekly
145. Semester/Year	Semester Two
146. Number of hours tuition (total)	75
147. Date of production/revision of this specification	

148. Aims of the Course

Explain the basic principles and shed light on a group of topics related to the development of engineering competence for the student in order to enable him to be able to understand the engineering derivations that pertain to other subjects. It also prepares the student's mind for the purpose of entering the world of numerical and engineering analyzes in other stages.
The course also aims to achieve the following:
1- Learn about binary and triple integrations and other integrals and on the different axes.
2- Knowing the types of series and the processes of convergence and divergence for them to benefit from them in some topics related to movement, vibration, heat and others
3- Knowing other types of functions other than trigonometric functions such as hyperbolic functions and employing them for engineering purposes and applications.
4- Knowing all kinds of full and partial derivations of functions.
5- Knowing the types of matrices and determinants and how to solve them and use them in solving engineering problems, especially using the electronic computer for analysis and design purposes.

149. Learning Outcomes, Teaching ,Learning and Assessment Method
Cognitive goals 1. Study and comprehend general concepts and basic principles in mathematics Take advantage of connecting topics with equations to solve them correctly. 2. Learn the correct ways to solve mathematical problems and train the student to solve within the general concepts of speed and accuracy Refining the scientific concept and consolidating the scientific material correctly through continuous examinations and activating the role of the student not in obtaining the degree, but in understanding and benefiting from this material to the maximum extent.
b- The skills goals special to the course 4. The student is familiar with the use of equations and mathematical functions 5. The student gets to know the description of mathematical problems in different fields
Teaching and learning methods
1- Method of giving lectures. 2- Learning Technologies on Campus Off-campus (e-learning). 3- Team Project The student groups 4- Applied Education
Assessment methods
1- the exam 2- class assignments 3- homework 4- daily exams
C- thinking skills C1- The ability to imagine a geometric figure for the purpose of drawing and preparing its own calculations C2- Ability to work on adding equations to solve different problems c3- Mastery of mathematics to relate it to the stereoscopic geometry of a purpose the answer in descriptive engineering
Teaching and learning methods
1- Method of giving lectures. 2- Discussion method

The course is given to students in the form of class lectures that are received and written on the board with illustrative examples. There is a practical hour in which problems and exercises are solved with the participation of the audience of students. Students are assigned homework. Also, students' understanding and comprehension of the material is tested through sudden daily exams.
Assessment methods
1- semester exam 2- Home and class duties 3- daily exams
D - General and transferable skills (other skills related to employability and personal development). Dr1- The ability to use mathematics Dr2- The ability to employ stereoscopic geometry.

150. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	5	**Matrix Theory**	Definition, Properties, Special Matrices, Determinants	**Method of giving lectures.**	Semester and daily exam
week (2)	5	**Matrix Theory**	Inverse matrix, System of Linear Equation, Matrix Eigen Values Problem	**Method of giving lectures.**	Semester and daily exam
week (3)	5	**Multiple Integrals**	Double Integrals , Area, Moments, and Centers of Mass , Double Integrals in Polar Form	**Method of giving lectures.**	Semester and daily exam
week (4)	5	**Multiple Integrals**	Triple Integrals in Rectangular Coordinates Volumes and Average Values	**Method of giving lectures.**	Semester and daily exam
week (5)	5	**Multiple Integrals**	Masses and Moments in Three Dimensions	**Method of giving lectures.**	Semester and daily exam
week (6)	5	**Multiple Integrals**	Triple Integrals in Cylindrical and Spherical Coordinates , Substitutions in Multiple Integrals	**Method of giving lectures.**	Semester and daily exam
week (7)	5	**Ordinary Differential Equation**	Definition, Type, Order, Degree	**Method of giving lectures.**	Semester and daily exam
week (8)	5	**Ordinary Differential Equation**	First order Ordinary Differential Equation (Separable Variable Equation, Homogeneous Equation, Linear Differential Equation	**Method of giving lectures.**	Semester and daily exam
week (9)	5	**Ordinary Differential Equation**	Exact Equation, Second Order Differential Equation, Homogeneous Second Order	**Method of giving lectures.**	Semester and daily exam
week (10)	5	**Ordinary Differential Equation**	Non-Homogeneous Second Order (Undetermined Coefficients, Variation of Parameters).	**Method of giving lectures.**	Semester and daily exam
week (11)	5	**Infinite sequences and infinite series**	Limits of sequences of number , infinite series, series without negative term: Comparison and Integral Tests	**Method of giving lectures.**	Semester and daily exam

week (12)	5	**Infinite sequences and infinite series**	Series with Nonnegative Term: Ratio and Root ,Alternating Series and Absolute convergence	**Method of giving lectures.**	Semester and daily exam
week (13)	5	**Infinite sequences and infinite series**	power series ,Taylor Series and Maclaurin Series	**Method of giving lectures.**	Semester and daily exam
week (14)	5	**Fourier series**	Periodic Functions, Fourier Series of Functions with Period 2TI, Fourier Serious of Arbitrary Periodic Functions, Odd and Even Symmetry	**Method of giving lectures.**	Semester and daily exam
week (15)	5	**Fourier Transform**	Definition, Properties of Fourier Transform, Fourier Transforms of Any Function, Sine F.T., Cosine F	**Method of giving lectures.**	Semester and daily exam

151. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	George B. Thomas, Jr. "THOMAS'CALCULUS ", 13th edition, 2013 B.S. Grewal,"Higher Engineering Mathematics" 42nd edition.
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	

152. The development of the curriculum plan	
Prerequisites	central
Less number of students	30
The largest number of students	50

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

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. It should be cross-referenced with the Course SPECIFICATION.

COURSE SPECIFICATION

Programme Skills/Second Year/chemical department

153. Teaching Institution	University of Babylon
154. University Department/Centre	scientific department / chemical engineering Department
155. Course title/code	Programming skills
156. Degree	Bachelor
157. Modes of Attendance offered	4 weekly
158. Semester/Year	Semester
159. Number of hours tuition (total)	60 per week
160. Date of production/revision of this specification	2021
161. Aims of the Course	
4. The student will have the ability matlab programing in more skill computer system and	

5. Define types of programming function(sub function and nested function)
3- The student will be able for using graphic .
4_the student can be able to define file and using in storing data

A - Cognitive goals
The student will have the ability programing in more skill

b- The skills goals special to the course
define engineering problem and solving in matlab programming

Teaching and learning methods

4- Different attractive Methods of giving lecture combined with smart technology
5- Google classroom the student groups Brainstorming
6- Work Shop, tutorial

Assessment methods

5- the exam and quizzes
6- class assignments
7- homework
8- reports

C- thinking skills
Skills in the matlab programming
Skills in in thinking in definition a problem and find program or solving in short time

162- Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	2 theory 2 lab	**function**	**Functions Definition**	**Explaining and projecting on digital screen**	
week (2)	2 theory 2 lab	**function**	**Nested function**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (3)	2 theory 2 lab	**Function**	**sub function Programs**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (4)	2 theory 2 lab	**function**	**Recursive function programs**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5)	2 theory 2 lab	**Graphic**	**Graphic introduction**		Homework Quizzes Report

			Basic graphics commands programs	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	
week (6)	2 theory 2 lab	**Graphic**	**Basic graphics commands**.	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
week (7)		***Mid exam***			
week (8)	2 theory 2 lab	**File**	**File I/O Opening and Closing Files Temporary Files and Directories**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (9)	2 theory 2 lab	**File**	**Files Temporary Files and Directories)**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
first week (10)		**File**	**Binary Files** Reading Binary Files Writing Binary Files .	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes

first week (11)	2 theory 2 lab	**File**	**Controlling Position in a File Formatted Files - examples** .	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (12)	2 theory 2 lab	**File**	Reading Strings Line-By-Line from Text Files	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (13)	2 theory 2 lab	**File**	Reading Formatted Text Writing Text Files	**Explaining on whiteboard and projecting on digital screen**	Semester and daily exam
first week (14)	2 thery 2 lab	**File**	**- programs Examples**	**Method of giving lectures. Drawing on the board and drawing on the computer**	Semester and daily exam
first week (15)		**Review on total course and Answering, solve questions ready for final exam**			

163. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

164. The development of the curriculum plan	
Prerequisites	Central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Materials Engineering/Second stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

165. Teaching Institution	University of Babylon
166. University Department/Centre	scientific department / Chemical engineering Department
167. Course title/code	Materials Engineering/ CHE210
168. Degree	Bachelor
169. Modes of Attendance offered	Weekly , 2 hours experimentally and 2 hrs attendance
170. Semester/Year	quarterly
171. Number of hours tuition (total)	60 hrs totally
172. Date of production/revision of this specification	2020-2021
173. Aims of the Course	

6. The student can know types of materials and its crystal structure.
2- The student can know mechanical properties of materials.
3. The student study the role of phase diagram and types of phase diagram learn how to draw them.
4. Study an introduction to ceramics and polymeric materials.

174. Learning Outcomes, Teaching ,Learning and Assessment Method

A - Cognitive goals

1. **The student will be familiar with the crystalline and amorphous materials.**
2. **The student is familiar with ceramics materials.**
3. **The student will be able to draw and know the types of phase diagram**
4. **Identify the materials imperfections and their types and reasons.**
5. **Students will be able to know the polymeric materials and its structure.**

b- The skills goals special to the course
According to the next table

Teaching and learning methods

1- **Method of giving lectures.**
2- **Learning Technologies on Campus On-campus e-learning.**
3- **Using google class room and classroom meeting.**

Assessment methods

1) Decisions examinations	30
2) Periodic examination	5
3) Home work and Quizzes	5
4) Practical lab examinations	10

C- thinking skills

C1- The ability to draw and identify the type of crystal stracture and solve problems that relates to them.
C2- the ability to know and solve problems which belong to the phase diagrams.
C3- The ability to recognize the difference between all materials according to their structure and properties

D - General and transferable skills (other skills related to employability and personal development). D1. Verbal Communication D2. Teamwork D3. Analyzing & Investigating

175. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
first week (1)	4	**primary principles**	**Study the types of materials**	**Explaining and drawing on the digital screen**	
first week (2)	2	**primary principles**	**Study the atomic structure**	**Explaining and drawing on the digital screen**	Homework and daily quiz
first week (3)	2	**Crystal structure**	**Study the type of interatomic bonding**	**Explaining and drawing on the digital screen**	Discusion and daily exam
first week (4)	2		**Study the periodic table and electron configuration**	**Explaining and drawing on the digital screen**	Semester and daily exam
first week (5)	2		**Study the crystalline materials**	**Explaining and drawing on the digital screen**	Semester and daily exam

first week (6)	2		**Study the non-crystalline materials**	**Explaining and drawing on the digital screen**	Semester and daily exam
first week (7)	2	**Imperfection in crystalline structure**	**Study the defect in crystalline structure and have a discussion about it**	**Explaining and drawing on the digital screen**	Semester and daily exam
first week (8)	2	**Rules of phase and phase diagram**	**Study the unary phase diagram .**	**Explaining and drawing on the digital screen**	Example and question solve by teacher and students
first week (9)	2		**Study The Types of Binary phase diagram**	**Explaining and drawing on the digital screen**	Give Examples and question with daily Exam.
first week (10)	2		**Intermetallic compound phase diagram, Solve problems at the end of this chapter**	**Explaining and drawing on the digital screen**	Give Examples and question with daily Exam.

first week (11)	2	**Ceramic Materials**	**Study the structure of ceramic materials**	**Explaining and drawing on the digital screen**	Semester and daily exam
first week (12)	2		**Have a discussion of ceramic materials and sole problems at the end of this chapter.**	**Explaining and solving on the digital screen**	Semester and daily exam
first week (13)	2	**Polymer materials**	**Distinguish the structure of polymers materials and have a discussion**	**Explaining and solving on the digital screen**	Semester and daily exam
first week (14)	2		**Study the polymer materials and its structure**	**Explaining and solving on the digital screen**	Semester and daily exam
first week (15)	2	**Composite materials and advanced materials**	**Study the composite materials**	**Explaining and solving on the digital screen**	Semester and daily exam

			Study the type of advanced materials		
second course			**Not found**		

176. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	**1. Materials science and engineering an introduction,7th edition,2007,Callister.** **2. science of materials engineering,Askland .**
Special requirements (including, for example, workshops, periodicals, software and websites)	--------
Social services (including guest lectures, professional training and field studies)	field visit

177. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Properties of petroleum and natural gas/Second Stage/Chemical Engineering Department

178.	Teaching Institution	University of Babylon
179.	University Department/Centre	Chemical engineering department
180.	Course title/code	/ Properties of petroleum and natural gas CHE213
181.	Degree	Bachelor
182.	Modes of Attendance offered	Weekly

183. Semester/Year	Seconds semester / second years
184. Number of hours tuition (total)	120
185. Date of production/revision of this specification	٢٠٢١
186. Aims of the Course	The course in properties of crude oil with its products and natural gas , in which this course aim is study the physical and technical properties for crude oil , and the different ways used for distillation curve , and the method to transfer between them , the way of upgrading the petroleum fractions The natural gas properties and way for sweetings .

187. At the ending of the course, the student will be able to understand:

1. The fundamentals terms used in petroleum industries.
2. The crude oil definition, original and contents.
3. The different ways used for petroleum classification.
4. Petroleum fraction (products).
5. Petroleum analysis.
6. ASTM and TBP curves
7. Physical and Technical properties
8. Chemical processing technology
9. Natural gas
10. Natural Gas Dehydration
11. Natural Gas Sweetening

Teaching and learning methods

5- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details.
6- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture.
.

Assessment methods

1- Decisions examinations	30
2- Periodic examination	5
3- Home work and Quizzes	5
٤. Practical lab examinations	10

188. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	Fundamental Terms	- definition -importance of petroleum - origin of petroleum -	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 Marks 2- Periodic examination 5 Marks 3- Home work and Quizzes 5 Marks
week (2)	4	petroleum content	-Hydrocarbon components -non hydrocarbon components		
week (3)	4	Classification of Petroleum	-types of hydrocarbons -API gravity -UOP -sulfur content -correlation Index -viscosity gravity constant -wax content		
week (4-6)	12	Physical and chemical properties of petroleum	-density -API -viscosity -molecular weight -refractive index -surface and interfacial tension -electrical conductivity -melting point and freezing point -thermal properties		
week (7)	4	Fractional distillation of crude oil	-Crude oil -analysis of petroleum -boiling point and distillation curve -true boiling point -distillation curves -TBP and ASTM -EFV -average boiling point - Conversion of Various Distillation Data		
week (8-9)	8	Technical Properties of Petroleum Oil	-odor -cloud point -pour point -flash point -fire point -aniline point -carbon residue -Reid vapor pressure -smoke point -diesel index -auto ignition point		

			-octane number -boiling point -vapor pressure		
week (10-11)	8	Chemical processing technology	-thermal cracking -catalytic cracking -hydro processes -reforming process -Isomerization process -alkylation process -polymerization process -solvent process		
week (12)	4	Petroleum gases	-natural gas -refinery gas -LPG		
week (13)	4	Natural gas chemical and physical properties	-gas-specific gravity -real gas relations -formation volume factor -		
week (14)	4	Natural Gas Dehydration	-absorption dehydration -adsorption dehydration		
week (15)	4	Natural Gas Sweetening	-amine absorbing -Claus process -SCOT process		

189. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	1-M.R.Riazi, characterizations and properties of petroleum fractions, ASTM 100 Barr Harbor, USA, 2005. 2-M.A. Fahi, , T.A. Al-Sahhaf and A.S. Elkilani , Fundamentals of petroleum refining , ELSEVIER , UK , 2010.
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	

190. The development of the curriculum plan	
Prerequisites	central
Less number of students	30
The largest number of students	50

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Physical Chemistry/ Second Stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

191. Teaching Institution	University of Babylon
192. University Department/Centre	scientific department / chemical engineering Department
193. Course title/code	**Physical Chemistry**
194. Degree	Bachelor
195. Modes of Attendance offered	Weekly
196. Semester/Year	year
197. Number of hours tuition (total)	3 per week
198. Date of production/revision of this specification	2021
199. Aims of the Course	
7. The student will have the ability to define the gas and types .	

2- 3_the student can be able to recognize each type of physical and the methods of solution treatment

4- the student will learn how to identify the problems and the troubleshooting of equipment of element.

200. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

6. **The student will develop a sense of keeping the environment clean**
7. **The student will realize the effect of physical properties of gas .**
8. **The student will understand the methods of controlling the pollutant solution such as Recrystallization, deposition of elements**

b- The skills goals special to the course

1. The student will be able to measure the amount of element

2. The student will identify the problems and the troubleshooting of equipment that control pollution

Teaching and learning methods

4- Different attractive Methods of giving lecture combined with smart technology
5- Google classroom the student groups Brainstorming
6- Work Shop, tutorial

Assessment methods

1- the exam and quizzes

1. class assignments
2. homework
3. reports

C- thinking skills

C1- The ability to solve various problems that relate to unit of physical
C2- The ability to understand the situation of keeping the environment clean and safe
C2- Ability to recognize the methods of reducing water pollution
C3- Ability to specify the nature of impurity in wastewater
C4- Ability to recognize the methods of controlling solution pollution

D - General and transferable skills (other skills related to employability and personal development).
D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating
D4. Initiative/Self-Motivation

201. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	**Gas behavior,**	**2**		
week (2)	3	The kinetic theory of gases	**2**		Homework Quizzes Report
week (3)	3	**, First law of thermodynamics,**			Homework Quizzes Report
week (4)	3				Homework Quizzes Report
week (5)	3	**, First law of thermodynamics,**			Homework Quizzes Report
week (6)	3	**Thermo chemistry,**			Homework
week (7)	2	***Mid exam***			
week (8)	3	Second and Third law of thermodynamics, The liquid state (one			Homework Quizzes
first week (9)	3	**Third law of thermodynamics,** .(			Homework
first week (10)	3	**The liquid state (one component system), Solution, Property of dilute solution (collogative properties**			Homework Quizzes
first week (11)	3	The liquid state (one component system), Solution, Property of dilute solution (collogative properties			Homework Quizzes
first week (12)	3	**The liquid state (one component system), Solution, Property of dilute solution (collogative properties**			Homework Quizzes
first week (13)	3	**The liquid state (one component system), Solution, Property of dilute solution**			Semester and daily exam

		(collogative properties			
first week (14)	3	The liquid state (one component system), Solution, Property of dilute solution (collogative properties			Semester and daily exam
first week (15)	3	**Review on total course and Answering, solve questions ready for final exam**			

202. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Atkins
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

203. The development of the curriculum plan	
Prerequisites	Central
Less number of students	
The largest number of students	25

COURSE SPECIFICATION (1 and 2)

HIGHER EDUCATION PERFORMANCE REVIEW: FLUID FLOW

Fluid Flow I and II/Second Stage/Chemical Engineering Department

204. Teaching Institution	University of Babylon
205. University Department/Centre	Scientific Department / Chemical Engineering Department
206. Course title/code	Fluid Flow I and II
207. Degree	Bachelor
208. Modes of Attendance offered	weekly
209. Semester/Year	Semester I and II
210. Number of hours tuition (total)	140 hours For Two Semesters (**75 hours Theory**) for semester I and (**45 hours Theory + 20 hours Experimental**) for semester II
211. Date of production/revision of this specification	2021

212. Aims of the Course (2nd Stage of Chemical Eng., Department)

1. The student will have the ability to define the fluid flow fundamentals and its application.
2. The student will be able to identify the pumps and its type.
3. The student can be able to recognize each type of fluid flow application and the methods of its treatments.
4. To learn the student how to design the mixing agitator processes and select the suitable one.

213. Learning Outcomes, Teaching, Learning and Assessment Method

A - Cognitive goals
1- To teach the student how to analysis the flow pipes.
2- To teach the student how to solve the problem of head losses

B- The skills goals special to the course

1. The student will be able to analysis the losses and calculate them.
2. The student will identify the suitable devices such as pump and how to connect them for the appropriated application

Teaching and learning methods

7- Different attractive Methods of giving lecture combined with smart technology and lecture in class.
8- Google classroom and Telegram are used to build the student groups Brainstorming
9- Work Shop, tutorial

Assessment methods

7- the exam and quizzes
8- class assignments
9- homework
10- reports

C- thinking skills

C1- The ability to design pipe lines of various fluid flowing.
C2- The ability to select the suitable pumps
C2- Solve the industrial problem that related to fluid flow.

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating
D4. Initiative/Self-Motivation

214. Course structure: First Course					
Weeks	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	5	Fluid Properties	Description and what is the fluid flow	Explaining and projecting on digital screen	
week (2)	5	Fluid Properties	Description and what is the fluid flow	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (3)	5	Fluids at rest	Explain the fluid when its velocity equal to zero	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (4)	5	Fluids at rest	Manometer types and applications	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (5)	5	Ideal and Real Bernoulli Equation	Ideal flow without losses	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (6)	5	Ideal and Real Bernoulli Equation	Real flow with loss types and calculations	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework

week (7)	5	Internal Flow	The flow through pipes		
week (8)	5	Internal Flow	The velocity and pressure profiles	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (9)	5	Internal Flow	Friction calculations in different types of flow	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework
week (10)	5	External Flow	Explanation of flow over surfaces	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (11)	5	External Flow	The boundary layers concept	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (12)	5	External Flow	Velocity and pressure profiles through the boundary layers types	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (13)	5	Dimensional Analysis	Explanation the dimensional analysis benefits	Explaining on whiteboard and projecting on digital screen	Semester and daily exam
week (14)	5	Dimensional Analysis	Explain how to reduce no of variables and create the dimensionless groups	Method of giving lectures. Drawing on the board and drawing on the computer	Semester and daily exam

week (15)	5	Applications	Various applications of the taught concepts of this course		

Course structure: Second Course					
Weeks	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	: Reynolds Transport Theorem Concept and Its Applications	Description the theorem and its application to stationary systems	Explaining and projecting on digital screen	
week (2)	3	: Reynolds Transport Theorem Concept and Its Applications	Description the theorem and its application to moving systems	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (3)	3	: Reynolds Transport Theorem Concept and Its Applications	Description the theorem and its application to energy equation	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (4)	3	: Reynolds Transport Theorem Concept and Its Applications	Description the theorem and its application to momentum equation	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (5)	3	Pumps, types and their selection	Explain the calculations and pump selection map	Method of giving lectures.	Homework Quizzes Report

				Explaining on whiteboard and projecting on digital screen	
week (6)	3	Pumps, types and their selection	Pump connections and heads	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework
week (7)	3	Non-Newtonian Fluids Flow	Introduction		
week (8)	3	Non-Newtonian Fluids Flow	Explain the fluid types	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (9)	3	Non-Newtonian Fluids Flow	The flow calculations of various types of fluids	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework
week (10)	3	Non-Newtonian Fluids Flow		Explaining on	Homework Quizzes

			Shear stress explanation	whiteboard and projecting on digital screen	
week (11)	3	Compressible Fluids Flow	Adiabatic Process flow	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (12)	3	Compressible Fluids Flow	Isothermal process flow	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (13)	3	Mixing and Its types	Introduction to mixing concept	Explaining on whiteboard and projecting on digital screen	Semester and daily exam
week (14)	3	Mixing and Its types	Explain types of agitators and their design	Method of giving lectures. Drawing on the board and drawing on the computer	Semester and daily exam
week (15)	3	Naiver-Stoke equations and Their applications	Applications of N-S equations of various types of fluid flow		

215. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	References 1. Fluid Flow for Chemical Engineering by F. Holland and R. Bragg. 2. Fluid Mechanics by Donald Fox 3. Compressible Fluid Flow by M. Saad
Special requirements (including, for example, workshops, periodicals, software and websites)	10 Experiments covers the subjects
Social services (including guest lectures, professional training and field studies)	----

216. The development of the curriculum plan	
Prerequisites	Mathematics I, II, III and IV, Physics
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

The electrical engineering /Second Stage/Chemical Engineering Department

course for the second stage in the College of Engineering is unified and presents the methods of solving most electronic circuits and how to employ these methods

together to understand and solve the engineering problem by learning the principle of electrical foundations. The course starts with the understanding of the ohms law and then followed by other topics. At the end of this course the student should try to solve several electrical circuit problems using the different electrical engineering laws.

217. Teaching Institution	University of Babylon
218. University Department/Centre	scientific department / chemical engineering Department
219. Course title/code	**electrical engineering**
220. Degree	Bachelor
221. Modes of Attendance offered	Weekly
222. Semester/Year	Semester
223. Number of hours tuition (total)	4 per week
224. Date of production/revision of this specification	2021

225. Aims of the Course

The electrical engineering course for the second stage in the College of Engineering is unified and presents the methods of solving most electronic circuits and how to employ these methods together to understand and solve the engineering problem by learning the principle of electrical foundations. The course starts with the understanding of the ohms law and then followed by other topics. At the end of this course the student should try to solve several electrical circuit problems using the different electrical engineering laws.

226. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1. The student will develop his mental abilities in understanding the work of electronic circuits in electrical devices

2. The student realizes the impact of electrical engineering on other engineering disciplines, especially chemical engineering

3. The student learns about the methods of controlling and controlling electrochemical devices

b- The skills goals special to the course

1. The student will be able to connect the components of the electronic circuit and measure and analyze the readings related to the work of the electronic circuit

2. The student will identify the problems and the troubleshooting of equipment

Teaching and learning methods

7- Different attractive Methods of giving lecture combined with smart technology

8- Google classroom the student groups Brainstorming

9- Work Shop, tutorial

Assessment methods

4. the exam and quizzes
5. class assignments
6. homework
7. reports

C- thinking skills

C1. Ability to solve various problems related to electrical engineering

C2. The ability to understand the workings of electronic circuits

C3. The ability to identify ways to solve electrical problems in the work of chemical devices

C4. The ability to identify methods of electrical control and control in chemical treatments

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication

D2. Teamwork

D3. Analyzing & Investigating

D4. Initiative/Self-Motivation

227. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	**Ohms law**	**2**		
week (2)	4	Resistance in Series	**2**		Homework Quizzes Report
week (3)	4	**Voltage Divider**			Homework Quizzes Report
week (4)	4	**Resistance in parallel**			Homework Quizzes Report
week (5)	4	**Short and open circuits**			Homework Quizzes Report
week (6)	4	**Current Divider**			Homework
week (7)	4	***Mid exam***			
week (8)	4	wheatstone bridge			Homework Quizzes
first week (9)	4	**Kirchhoff's Second Law**			Homework
first week (10)	4	**superposition theorem**			Homework Quizzes
first week (11)	4	Star-Delta Transformations			Homework Quizzes
first week (12)	4	**Delta-Star Transformations**			Homework Quizzes
first week (13)	4	**Thevenin Theorem - Circuit Analysis**			Semester and daily exam
first week (14)	4	Norton Theorem - Circuit Analysis			Semester and daily exam
first week (15)	4	**Review on total course and Answering, solve**			

		questions ready for **final exam**			

228. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Atkins
Special requirements (including, for example, workshops, periodicals, software and websites)	---------
Social services (including guest lectures, professional training and field studies)	field visit

229. The development of the curriculum plan	
Prerequisites	central
Less number of students	30
The largest number of students	50

Third Year Courses Specifications

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

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. It should be cross-referenced with the Course SPECIFICATION.

COURSE SPECIFICATION

Heat Transfer/Third Stage/Chemical Engineering Department

230. Teaching Institution	University of Babylon
231. University Department/Centre	chemical engineering Department
232. Course title/code	Heat Transfer
233. Degree	Bachelor
234. Modes of Attendance offered	weekly
235. Semester/Year	Semester
236. Number of hours tuition (total)	3 per week
237. Date of production/revision of this specification	2021

238. Aims of the Course

The objective of the course is to give third year electrochemical engineering students the fundamental physics of heat transfer by conduction, convection and radiation.

239. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

Students are instructed in the analysis and solution of basic heat transfer problems, as supplemented by analytical and numerical methods, practical tables, charts and empirical correlations.

B- The skills goals special to the course

The course outcomes the understanding of thermal properties and heat transport mechanisms in solids, liquids and gases . Learning the methods used for the analysis of heat transfer problems, and application of these methods for the design and development of thermal systems

Teaching and learning methods

- Different attractive methods of giving lecture combined with smart technology
- Google classroom
- Brainstorming
- Workshops, tutorials

Assessment methods

- Exam and quizzes
- Class assignments
- HomeWorks

- Reports

240. Course structure: course I					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3	**introduction**	Concepts and Mechanism of heat flow: Steady and unsteady state heat transfer,	using white board and digital media to present the notes of each lecture	Quizzes, Class assignments, HomeWorks, Reports,
2	3	**introduction**	Modes of heat transfer, their physical mechanism,		
3	3	**introduction**	Laws of heat transfer, thermal conductivity, heat transfer coefficient, radiation heat transfer coefficient.		
4	3	**introduction**	Insulation materials. Thermal resistance and thermal conductance.		
5	3	**conduction**	Generalized one dimensional heat conduction equation and reduction to Fourier		
6	3	**conduction**	Steady state heat conduction without heat generation in plane and composite wall, hollow cylinder.		
7	3	**conduction**	Thermal contact resistance, critical thickness of insulation on cylindrical bodies.		
8	3	**conduction**	Boundary conditions. Steady state heat conduction with heat generation in plane wall, cylinder and sphere.		
9	3	**conduction**	Extended Surface: Types of fins, governing equation,		
10	3	**conduction**	Fin performance, fin efficiency, fin effectiveness, overall fin effectiveness, and approximate solution of fins.		
11	3	**convection**	Principle of heat convection: mechanism, natural and forced convection,		
12	3	**convection**	Convection boundary layers: laminar and turbulent, momentum and energy equations.		
13	3	**convection**	Laminar flow over bodies, turbulent flow inside circular and non-circular ducts,		
14	3	**convection**	Reynolds Colburn analogy for flow over flat plate and flow inside tube, coefficient of friction and friction factor.		
15	3	**convection**	Heat transfer in fully developed flow.		

Course structure: course II					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3	convection	Use of empirical and experimental correlations for forced convection.	using white board and digital media to present the notes of each lecture	Quizzes, Class assignments, HomeWorks, Reports,
2	3	convection	Natural convection over vertical and horizontal plans		
3	3	convection	Natural convection in enclosure.		
4	3	convection	Use of empirical and experimental correlations for natural convection.		
5	3	convection	Principle of condensation and boiling.		
6	3	radiation	Thermal radiation: Concept, Black body radiation.		
7	3	radiation	Spectral and total emissive power, Stefan Boltzmann law,		
8	3	radiation	Radiation laws, irradiation and radiosity, Surface absorption, reflection and transmission, emissivity,		
9	3	radiation	Radiation view factor, radiation heat exchange between two diffuse gray surfaces, radiation shield.		
10	3	radiation	Gas radiation		
11	3	Heat exchangers	Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement		
12	3	Heat exchangers	overall heat transfer coefficient, fouling factor,		
13	3	Heat exchangers	Log-mean temperature difference method.		
14	3	Heat exchangers	NTU –effectiveness method of analysis for rating and sizing of heat exchangers.		
15	3	Heat exchangers	Heat exchanger, design, and selection, practical applications, heat pipe.		

241. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25
242. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	J. P. Holman, Heat Transfer, 10th ed., McGraw Hill, NY,2010

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Thermodynamics1/Third Stage/ ChemicalEngineeringDepartmen

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. It should be cross-referenced with the Course SPECIFICATION.

243. Teaching Institution	University of Babylon
244. University Department/Centre	scientific department / chemical engineering Department
245. Course title/code	Thermodynamics 1 CHE-00
246. Degree	BSc of chemical engineering
247. Modes of Attendance offered	Weekly
248. Semester/Year	Semester
249. Number of hours tuition (total)	3 hours per week
250. Date of production/revision of this specification	23/8/2021
251. Aims of the Course	

1. The student will learn how the forms of energy of all kinds are transformed and its transformation into work according to the first, second and third laws of thermodynamics and the calculation of mass and heat transfer in open and closed systems.

2. The student will know the reversible and irreversible processes, studying the application of steam tables, and how to solve problems related to calculating thermodynamic properties,

especially the enthalpy and entropy of pure gaseous, liquid and solid materials, as well as gaseous and liquid mixtures.

3. The student learns how to perform thermal calculations of standard and industrial chemical reactions.

4. The student will be able to identify the types of heat engines, heat pumps, and entropy evaluation of heat transfer systems.

5. The student will be able to understand PVT Maxwell relationships and the thermodynamic relations derivation.

252. Learning Outcomes, Teaching ,Learning and Assessment Method

A - Cognitive goals

A1. Knowing and understanding the types of energy and how it is converted from one form to another and how the heat can be converted into useful work.

A2. Knowing and understanding the statements and the expressions of the laws of thermodynamics I, II and III and their applications.

A3. Know and understand pressure-volume-temperature relationships for pure gases and mixtures using different equations of state.

A4. Understanding and calculating energy and efficiency of heat engines, heat pumps, and equipment such as pumps, compressors, turbines.

A5. Knowing and understanding the thermodynamics relations and their derivations.

B- The skills goals special to the course

B1 - acquire skill in the applications of the first law of thermodynamics for the processes of mass and heat transfer.

B2 - Acquire skill in the applications of the second law in calculating the efficiency of heat engines and steam generators as well as heat exchange systems.

B3 - Acquires skill in making calculations and evaluating the heat of reaction required for standard and industrial processes.

B3 - Acquire skills in pressure-volume-temperature calculations for systems of pure gases and mixtures.

Teaching and learning methods

1- Using lectures and presentation through LCD with aid of theoretical and practical examples.

2- Conducting intellectual discussions and making participations for students.

3- Team groups to solve thermodynamics problems.

Assessment methods

1 - Improve thinking skills by discussion
2- Mid and final Examinations
3- daily exam
4- Homeworks and quizzes
5- Class tutorial groups

C- thinking skills

C1- The ability to apply the thermodynamics laws to mass and heat transfer systems.
C2- An ability to develop enthalpy and entropy calculations of pure gas and mixture systems.
C3- The ability to evaluate efficiency of heat engines and heat pumps and heating and cooling systems.
C4- Student will be able to calculate the heat of reactions in reactors.

Teaching and learning methods

1- Thinking strategy according to the student's ability
2- High thinking skill strategy
3- Critical thinking strategy

- Determine the facts of a new situation
- Place these facts and information in a pattern so that you can understand them
- Accept or reject the source values and conclusions based on your experience, judgment, and beliefs.

4- Brainstorming

Assessment methods

1- Semester exam
2- Home and class duties
3- Daily exams

D - General and transferable skills (other skills related to employability and personal development).

1- VERBAL COMMUNICATION

Student able to express his ideas clearly and confidently in speech.

2- TEAMWORK

The work in confidence within a group.

3- ANALYSING & INVESTIGATING

Gather information systematically to establish facts & principles and problem solving.

4- INITIATIVE/SELF MOTIVATION

Able to act on initiative, identify opportunities & proactive in putting forward ideas & solutions**.**

5- WRITTEN COMMUNICATION

Able to express yourself clearly in writing planning and organizing
Student able to plan activities & carry them through effectively.

FLEXIBILITY

Manage time effectively, prioritizing tasks and able to work to deadlines.

TIME MANAGEMENT

Effective time management, prioritizing tasks and able to work to deadlines.

253. Course structure: first course

Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
first week (1)	3	Introduction to Chemical Engineering Thermodynamics	Introduction Scope of thermodynamics Dimensions and unit Force Temperature Volume Pressure	LCD lectures	Semester and daily exam
week (2)	3	Introduction to Chemical Engineering Thermodynamics	. Work, energy Internal energy and Enthalpy System and surrounding State functions	LCD lectures	Semester and daily exam

week (3)	3	The First Law of Thermodynamics	Statement steady state non-flow systems steady state flow systems The reversible and irreversible processes	LCD lectures	Semester and daily exam
week (4)	3	The Ideal Gas	Closed System Processes Isometric process Isothermal process Isobaric process Adiabatic process Polytropic process	LCD lectures	Semester and daily exam
week (5)	3	Properties of Two Phase System	Phase Rule Equilibrium of two phase system Property Diagrams Steam Tables Applications	LCD lectures	Semester and daily exam
week (6)	3	The Flow Work Heat Capacity	The flow work Heat Capacity Effect of Temperature on heat capacity for ideal gas	LCD lectures	Semester and daily exam
week (7)	3	Heat of Reactions	The standard heat of formation The standard heat of reactions Effect of Temperature on the Standard Heat of Reaction	LCD lectures	Semester and daily exam
week (8)	3	The Second Law of Thermodynamics	Statement of the second law Carnot cycle Entropy and the second law	LCD lectures	Semester and daily exam

week (9)	3	The Second Law of Thermodynamics	Entropy change of ideal gas Evaluation of entropy Heat Engine and Heat Pump	LCD lectures	Semester and daily exam
week (10)	3	The Second Law of Thermodynamics	Heat Engines and Heat pumps	LCD lectures	Semester and daily exam
week (11)	3	PVT Relations of Pure Substance	Volumetric properties of pure fluid Law of corresponding states Generalized correlation of gases Cubic Equations	LCD lectures	Semester and daily exam
week (12)	3	PVT Relations of Pure Substance	Generalized virial correlations Generalized correlation of liquids PVT relations of liquid	LCD lectures	Semester and daily exam
week (13)	3	Heat Effects Accompanying Phase Changes of Pure Substance	Clapeyron equation Clausius-Clapeyron equation, Antoine equation, ΔH^v at normal boiling point	LCD lectures	Semester and daily exam
week (14)	3	Thermodynamics Relations	Maxwell Relations Derivations for Enthalpy & Entropy Exercises	LCD lectures	Semester and daily exam

week (15)	3	Thermodynamics Relations	Relations for isothermal compressibility and volume expansivity Throttling Process Examples	LCD lectures	Semester and daily exam

254. Infrastructure	
Required readings: Basic texts ▪ Course books ▪ Other ▪	**Textbooks:** 1. Sonntag, Borgnakke, Van Wylen, Fundamentals of Thermodynamics, 7th Edition, Wiley India, New Delhi, 2009. 2. Smith, van Ness and Abbott, "Chemical Engineering Thermodynamics", 7th Edition, McGraw Hill, New York, 2005 **References:** 1. S. I. Sandler, Chemical, Biochemical and Engineering Thermodynamics, Wiley New York, 2006 2. Y V C Rao, "Chemical Engineering Thermodynamics", Universities Press, Hyderabad, 2005. 3. Pradeep ahuja," Chemical Engineering Thermodynamics", PHI Learning Ltd (2009). 4. Gopinath Halder," Introduction to Chemical Engineering Thermodynamics", PHI Learning Ltd (2009).
Special requirements (including, for example, workshops, periodicals, software and websites)	Report about a subject of thermodynamics
Social services (including guest lectures, professional training and field studies)	Practical Training

255. The development of the curriculum plan	
Prerequisites	central
Less number of students	25
The largest number of students	40

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

Reaction kinetics / third Stage / Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

256. Teaching Institution	University of Babylon/ College of Engineering
257. University Department/Centre	Chemical Engineering Department
258. Course title/code	Reaction kinetics
259. Modes of Attendance offered	Students attend regularly at an average of 3 theoretical hours per week
260. Semester/Year	Semester
261. Number of hours tuition (total)	124 hours of study for the first semester
262. Date of production/revision of this specification	1-12-2020
263. Aims of the Course	
The course in Units, reaction kinetics, reaction order, reaction constant, equilibrium constant, half time, activation energy,	

A:- knowledge and understanding As shown in the table on the next page
B. The skills goals special to the ourse. As shown in the table on the next page
264. Teaching and Learning Methods
1-The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 2-The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture. 3-Brainstorming
Assessment methods
1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5 -

265. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	To be able to understand	reaction kinetics, reaction order, reaction constant, equilibrium constant, half time, activation energy, Kinetics of	1. The Presentation method: The teaching item in this method will be displayed in front of the students on	1- Decisio examinations 3 2- Periodic examinatio 3- Home work ar Quizzes

			Homogeneous Reactions .	the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	

266. Infrastructure
1. Books Required reading: **Chemical Reaction Engineering, Third Edition, by Octave Levenspiel**
2. Main references (sources) open
- **Elements of Chemical Reaction engineering by H.** Folger

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

Reactor design / third Stage / Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

267. . Teaching Institution	University of Babylon/ College of Engineering

268. University Department/Centre	Chemical Engineering Department
269. Course title/code	Equipment design
270. Modes of Attendance offered	Students attend regularly at an average of 2 theoretical hours per week
271. Semester/Year	Semester
272. 6. Number of hours tuition (total)	124 hours of study for the first semester also 2ed semester
273. Date of production/revision of this specification	1-6-2021

274. Aims of the Course

a. The course in Units, *MOLEBALANCES, CONVERSION AND REACTOR SIZING, Rate Laws and Stoichiometry, ISOTHERMAL REACTOR DESIGN, COLLECTION AND ANAL'YSIS OF RATE DATA, MULTIPLE REACTIONS, NONELEMENTARY REACTION KINETICSSTEADY-STATE NONISOTHERMAL REACTOR DESIGN*

275. Learning Outcomes, Teaching ,Learning and Assessment Method

A:- knowledge and understanding

As shown in the table on the next page

B. The skills goals special to the course.

As shown in the table on the next page

Teaching and Learning Methods

1) The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details.

2) The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture.

3-Brainstorming

Assessment methods

1- Decisions examinations	30
2- Periodic examination	5
3- Home work and Quizzes	5

-

276. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	To be able to understand	*MOLEBALANCES, CONVERSION AND REACTOR SIZING, Rate Laws and Stoichiometry, ISOTHERMAL REACTOR DESIGN, COLLECTION AND ANAL'YSIS OF RATE DATA, MULTIPLE REACTIONS, NONELEMENTARY REACTION KINETICSSTEADY-STATE NONISOTHERMAL REACTOR DESIGN*	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5

277. Infrastructure
1. Books Required reading: **Elements of Chemical Reaction engineering by H.** Folger
2. Main references (sources) open
Chemical Reaction Engineering **Third Edition** **Octave Levenspiel**

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Corrosion Engineering/Third Stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

278. Teaching Institution	University of Babylon
279. University Department/Centre	scientific department / chemical engineering Department
280. Course title/code	**Corrosion Engineering**
281. Degree	Bachelor
282. Modes of Attendance offered	weekly
283. Semester/Year	Semester
284. Number of hours tuition (total)	3 per week
285. Date of production/revision of this specification	2021

286. Aims of the Course

1) The student will have the ability to define the corrosion, its types and units.
2. The student will able to recognize corrosion types and its protection.
3. The student will learn the protection methods (cathodic and anodic protection, inhibition, coating and material selection).
4. The student will study the corrosion rate measurements.
5. The student will study the corrosion of metals and alloys in different environments.

287. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1) The student will able to think to reduce or prevent corrosion.

2) The student will realize the importance of the corrosion in petroleum and chemical industries.

3) The student will understand the methods of measuring and controlling corrosion by several methods.

b- The skills goals special to the course

1. The student will be able to evaluate the process conditions and risks.

2. The student will identify the corrosion problems and the suitable treatments.

Teaching and learning methods

1) Different attractive Methods of giving lecture combined with smart technology
2) Google classroom the student groups Brainstorming
3) Work Shop, tutorial.

Assessment methods

1. the exam and quizzes
2. class assignments
3. homework
4. reports

C- thinking skills

C1- The ability to recognize corrosion problems.
C2- The ability to specify the corrosion types.
C3- Ability to recognize reasons of corrosion occurring.
C4- Ability to suggest the best method of corrosion reducing or protection.

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating
D4. Initiative/Self-Motivation

288. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	**Definition and introduction**	General lecture about corrosion cost and important. The coarse exams.	**digital screen and white board.**	Homework
week (2)	3	Electrochemical mechanism	The Dry-Cell Analogy and Faraday's Law, Definition of anode and Cathode, Types of Cells and types of Corrosion Damage.	**White board and digital screen**	Homework Quizzes
week (3)		**Thermodynamics: Corrosion tendency and electrode potential**	Change of Gibbs Free Energy, Measuring the Emf of a Cell, Calculating the Half-Cell potential -The Nernst Equation, The Hydrogen Electrode and the Standard Hydrogen Scale, Convention of Signs and Calculation of Emf	**White board and digital screen**	Homework Quizzes
week (4)		**Thermodynamics: POURBAIX Diagrams**	Basis of Pourbaix Diagrams, Pourbaix Diagram for Water, Pourbaix Diagram for Iron, Pourbaix Diagram for Aluminum, Pourbaix Diagram for magnesium and Limitations of Pourbaix Diagrams.	**White board and digital screen**	Homework Quizzes
week (5)		**KINETICS: POLARIZATION AND CORROSION RATES**	Polarization, The Polarized Cell, How Polarization Is Measured, Calculation of *IR* Drop in an Electrolyte, Causes of polarization, Hydrogen Overpotential, Polarization Diagrams of Corroding Metals, Influence of Polarization on Corrosion Rate, Calculation of Corrosion Rates from polarization Data, and Anode–Cathode Area Ratio.	**White board and digital screen**	Homework Quizzes
week (6)		**Passivity**	Definition, Characteristics of Passivation and the Flade Potential, Behavior of Passivators, Passivation of Iron by HNO_3, Anodic Protection and Transpassivity, Theories of Passivity, More Stable Passive	**White board and digital screen**	Homework

			Films with Time, Action of Chloride Ions and Passive–Active Cells, Critical Pitting Potential, Critical Pitting Temperature, Passivity of Alloys, Nickel–Copper Alloys, and effect of Cathodic Polarization and Catalysis.		
week (7)		**IRON AND STEEL**	Aqueous Environments, Effect of Dissolved Oxygen, Effect of Temperature, Effect of pH, Effect of Galvanic Coupling, Effect of Velocity on Corrosion in Natural Waters, Effect of Dissolved Salts, Metallurgical Factors, Varieties of Iron and Steel, Effects of Composition, Effect of Heat Treatment, and Steel Reinforcements in Concrete.	**White board and digital screen**	Homework
week (8)		**Mid exam**			
first week (9)		**EFFECT OF STRESS**	Mechanism of Stress-Corrosion Cracking of Steel and Other Metals, Electrochemical dissolution, Film-Induced Cleavage, Adsorption-Induced Localized Slip, Stress Sorption, Initiation of Stress-Corrosion Cracking and Critical Potentials, Rate of Crack Growth (Fracture Mechanics), Hydrogen Damage, Mechanism of Hydrogen Damage and Effect of Metal Flaws	**White board and digital screen**	Homework
first week (10)		**ATMOSPHERIC CORROSION**	Types of Atmospheres, Corrosion-Product Films, Factors Influencing Corrosivity of the Atmosphere, Particulate Matter, Gases in the Atmosphere, Moisture (Critical Humidity and Remedial Measures	**White board and digital screen**	Homework Quizzes
first week (11)		**CORROSION IN SOILS**	Factors Affecting the Corrosivity of Soils, Bureau of Standards Tests, Pitting Characteristics, Stress-Corrosion Cracking and Remedial Measures**.**	**White board and digital screen**	Homework Quizzes

first week (12)		**OXIDATION**	Initial Stages, Thermodynamics of Oxidation: Free Energy - Temperature Diagram, Protective and Nonprotective Scales, Three Equations of Oxidation, Wagner Theory of Oxidation, Oxide Properties and Oxidation, Galvanic Effects and Electrolysis of Oxides, Hot Ash Corrosion and Hot Corrosion	**White board and digital screen**	Homework Quizzes
first week (13)		**STRAY-CURRENT CORROSION And CATHODIC PROTECTION**	Sources of Stray Currents, Quantitative Damage by Stray Currents, Detection of Stray Currents, Soil-Resistivity Measurement, and Means for Reducing Stray-Current Corrosion How Applied CP, Sacrificial anodes, Combined Use with Coatings, Magnitude of Current Required, Anode Materials and Backfill, Overprotection, Criteria of Protection, Potential Measurements, Doubtful Criteria, Position of Reference Electrode, Economics of Cathodic Protection, and Anodic Protection,	**White board and digital screen**	Homework
first week (14)		**METALLIC COATINGS INORGANIC COATINGS ORGANIC COATINGS**	Methods of Application, Classification of Coatings, Vitreous Enamels, Portland Cement Coatings, Paints, Requirements for Corrosion Protection, Metal Surface Preparation, Cleaning All Dirt, Oils, and Greases from the Surface, Complete Removal of Rust and Mill Scale Filiform Corrosion, Theory of Filiform Corrosion and Plastic Linings	**White board and digital screen**	Homework
first week (15)		**INHIBITORS AND PASSIVATORS**	Passivators, Mechanism of Passivation, Applications of Passivators, Pickling Inhibitors, Applications of Pickling Inhibitors, Slushing Compounds, Vapor-Phase Inhibitors and Inhibitor to Reduce Tarnishing of Copper.	**White board and digital screen**	

289. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	CORROSION AND CORROSION CONTROL R. Winston Revie and Herbert H. Uhlig, 4th ed. (2008) And chapter from other reference.
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

290. The development of the curriculum plan	
Prerequisites	Central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

Electrochemical Engineering / Third Stage / Chemical Engineering Department

291. Teaching Institution	University of Babylon/ College of Engineering
292. University Department/Centre	Chemical Engineering Department
293. Course title/code	Electrochemical Engineering
294. Modes of Attendance offered	Students attend regularly at an average of 2 theoretical
295. Semester/Year	Semester

296. Number of hours tuition (total)	30 hours of study for the first semester
297. Date of production/revision of this specification	28-12-2020

298. Aims of the Course

1. To discover the important of Electrochemical Engineering.
2. To learn about the basic principles of Electrochemical Engineering .
3. To find out the applications of the Electrochemical Engineering.
4. To understand the impact of using Electrochemical Engineering on the society.

299. Learning Outcomes, Teaching ,Learning and Assessment Method

A:- knowledge and understanding

As shown in the table on the next page

B. The skills goals special to course.

As shown in the table on the next page

Teaching and Learning Methods

7- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details.

8- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture.

3-Brainstorming

Assessment methods

1- Decisions examinations	30
2- Periodic examination	5
3- Home work and Quizzes	5

300. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
15	30	First semester	1- Introduction 2- Importance of Electrochemical Engineering 3- Electrochemical Series 4- Daniel's Cell 5-The Ragone Chart 6-Pourbaix Diagram 7-Latimer Diagram 8-Frost Diagrm 9-Electrodes and Electrode Reactions 10- Faradaic and Non-Faradaic Processes 11- Equivalent Circuits 12- Cell Voltage 13- Butler-Volmer Equation 14- Design Equations for an Electrochemical cell 15- Electroplating	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5

301. Infrastructure

1. Books Required reading:

- Newman, John, and Karen E. Thomas-Alyea. *Electrochemical Systems*. 3rd ed. Wiley-Interscience, 2004.
- Bard, Allen J., and Larry R. Faulkner. *Electrochemical Methods: Fundamentals and Applications*. 2nd ed. Wiley, 2000.
- O' Hayre, Ryan, Suk-Won Cha, et al. *Fuel Cell Fundamentals*. 2nd ed. Wiley, 2009.
- Huggins, Robert A. *Advanced Batteries: Materials Science Aspects*. Springer, 2008.

2. Main references (sources) open
A- Recommended books and references (scientific journals, reports…).open
B-Electronic references, Internet sites… Classroom and Telegram program.
Social services (including for example guest lectures, professional training, and field studies….. Nothing

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Mass Transfer-I/Third stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

302. Teaching Institution	University of Babylon
303. University Department/Centre	scientific department / chemical engineering Department
304. Course title/code	**Mass Transfer-I**
305. Degree	Bachelor
306. Modes of Attendance offered	weekly
307. Semester/Year	Semester-I
308. Number of hours tuition (total)	4 per week
309. Date of production/revision of this specification	2021
310. Aims of the Course	

1-The student will have the ability to define the Mass Transfer fundamentals and its application.

2- The student will be able to identify the mass transfer equipments and its type.

3_the student can be able to recognize each type of mass transfer application and the methods of its operation.

4- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units.

5- To learn the student how to solve the problem and the troubleshooting of chemical industries.

311. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units.

2- To learn the student how to solve the problem and the troubleshooting of equipment's for chemical industries.

3- To learn the student how to solve the mass transfer problem of processes.

b- The skills goals special to the course

1. The student will be able to desing the equipment of mass transfer application

2. The student will identify the problems and the troubleshooting of equipment that control its operation

Teaching and learning methods

1- Different attractive Methods of giving lecture combined with smart technology and lecture in class.

2-Google classroom the student groups Brainstorming

3-Work Shop, tutorial

Assessment methods

1- the exam and quizzes

2- class assignments

3-homework

4-reports

C- thinking skills

C1- The ability to solve various problems that relate to mass transfer theory

C2- The ability to understand the application of mass transfer operation

C2- Ability to recognize the methods of design the equipment of each application

C3- Ability to calculate the height and diameter of towers. C4- Ability to recognize the methods of controlling the equipment of different application.
D - General and transferable skills (other skills related to employability and personal development). D1. Verbal Communication D2. Teamwork D3. Analyzing & Investigating D4. Initiative/Self-Motivation

312. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	**Basic and Fundamentals of Mass Transfer**	**الانتشار المتعاكس Reverse Diffusion الانتشار خلال الطبقة Diffusion الساكنة through stagnant layer.**	**Explaining and projecting on digital screen**	
week (2)	4	**Basic and Fundamentals of Mass Transfer**	**معامل الانتشار Coefficient of Diffusivity**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (3)		**Basic and Fundamentals of Mass Transfer**	**نظريات انتقال الكتلة Mass Transfer Theory.**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (4)	4	**Basic and Fundamentals of Mass Transfer**	**نظريات انتقال الكتلة Mass Transfer Theory.**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5)	4	**Basic and Fundamentals of Mass Transfer**	**معامل انتقال الكتلة Mass Transfer Coefficient.**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (6)	4	***Gas Absorption***	**امتصاص الغاز Gas Absorption.** .	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
week (7)	4	***Mid exam*** ***Gas Absorption***	**ارتفاع برج الأمتصاص وقطره The height of absorption tower**		

week (8)	4	***Gas Absorption***	**The أنواع أبراج الامتصاص type of absorption tower.**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (9)	4	***Gas Absorption***	**كفاءة أبراج الامتصاص The efficiency of absorption tower.**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
first week (10)	4	**Distillation**	التقطير Distillation طريقة ميكب–ثيل Mc-Cabe Theile Method	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (11)	4	**Distillation**	طريقة لويس–سوريل Lewis-Sorel Method	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (12)	4	**Distillation**	طريقة بونجون–سافورايت **Bonchon-Savarot M.**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (13)	4	**Distillation**	التقطير الدفعي Batch Distillation	**Explaining on whiteboard and projecting on digital screen**	Semester and daily exam
first week (14)	4	**Distillation**	التقطير للمزيج متعدد المكونات Multicomponent Distilaation	**Method of giving lectures. Drawing on the board and drawing on the computer**	Semester and daily exam
first week (15)	4	**Distillation Final Exam**	التقطير للمزيج متعدد المكونات Multicomponent Distilaation		

313. Infrastructure

Required readings: ▪ Basic texts ▪ Course books ▪ Other	**References** **1-Coulson & Richardson's Chemical Engineering Solutions, Volume 2** 2-**Mass Transfer** From Fundamentals to Modern Industrial Applications ***Koichi Asano*** Tokyo Institute of Technology 3- Mass transfer principles and applications **DIRAN BASMADJIAN**
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

314. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

MassTransfer-II/Third stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

315. Teaching Institution	University of Babylon
316. University Department/Centre	scientific department / chemical engineering Department
317. Course title/code	**Mass Transfer-II**
318. Degree	Bachelor
319. Modes of Attendance offered	weekly
320. Semester/Year	Semester-II
321. Number of hours tuition (total)	4 per week
322. Date of production/revision of this specification	2021

323. Aims of the Course

8. The student will have the ability to define the Mass Transfer fundamentals and its application.
2- The student will be able to identify the mass transfer equipments and its type.
3_the student can be able to recognize each type of mass transfer application and the methods of its operation.
4- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units.
5- To learn the student how to solve the problem and the troubleshooting of chemical industries.

324. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals
1- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units.
2- To learn the student how to solve the problem and the troubleshooting of equipment's for chemical industries.
3- To learn the student how to solve the mass transfer problem of processes.

b- The skills goals special to the course

1. The student will be able to desing the equipment of mass transfer application

2. The student will identify the problems and the troubleshooting of equipment that control its operation

Teaching and learning methods

10- Different attractive Methods of giving lecture combined with smart technology and lecture in class.

11- Google classroom the student groups Brainstorming

12- Work Shop, tutorial

Assessment methods

5. the exam and quizzes
6. class assignments
7. homework
8. reports

C- thinking skills

C1- The ability to solve various problems that relate to mass transfer theory

C2- The ability to understand the application of mass transfer operation

C2- Ability to recognize the methods of design the equipment of each application

C3- Ability to calculate the height and diameter of towers.

C4- Ability to recognize the methods of controlling the equipment of different application.

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication

D2. Teamwork

D3. Analyzing & Investigating

D4. Initiative/Self-Motivation

325. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	**Basic and Fundamentals of Mass Transfer**	الاستخلاص (سائل–سائل) Extraction	**Explaining and projecting on digital screen**	
week (2)	4	**Basic and Fundamentals of Mass Transfer**	حسابات الأستخلاص لحالة الذوبان الجزئي Extraction Calculation for partial misicible solvents	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (3)		**Basic and Fundamentals of Mass Transfer**	حسابات الأستخلاص للسوائل الغير ذائبة Extraction Calculation for immmisicible solvents	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (4)	4	**Basic and Fundamentals of Mass Transfer**	الأستخلاص الدفعي Batch Ectraction	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5)	4	**Basic and Fundamentals of Mass Transfer**	الأستخلاص المستمر للجريان المتوازي والمتعاكس Extraction Calculation for partial misicible solvents co-currenr	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (6)	4	***Gas Absorption***	الأستخلاص المستمر للجريان المتوازي والمتعاكس Extraction Calculation for partial misicible solvents counter-currenr	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework

week (7)	4	*Mid exam* ***Gas Absorption***	الترطيب وابراج التبريد والتجفيف **Humidification and Cooling Tower**		
week (8)	4	***Gas Absorption***	مراحل التجفيف **Drying**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (9)	4	***Gas Absorption***	حسابات زمن التجفيف للمرحلتين الثابتة والتغيرة **Drying calculation for time periods**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
first week (10)	4	**Distillation**	التبخير Evaporation	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (11)	4	**Distillation**	أنواع المبخرات Types of Evaporators	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (12)	4	**Distillation**	أنواع المبخرات Types of Evaporators	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (13)	4	**Distillation**	المبخرات الأحادية والمتعددة Single and Multi effect evaporator	**Explaining on whiteboard and projecting on digital screen**	Semester and daily exam
first week (14)	4	**Distillation**	المبخرات الأحادية والمتعددة Single and Multi effect evaporator	**Method of giving lectures. Drawing on the board and drawing on the computer**	Semester and daily exam
first week (15)	4	**Distillation Final Exam**	موازنة المادة والطاقة في المبخرات Mass and heat balance in evaporator.		

326. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	**References** **1-Coulson & Richardson's Chemical Engineering Solutions, Volume 2** 2-**Mass Transfer** From Fundamentals to Modern Industrial Applications ***Koichi Asano*** Tokyo Institute of Technology 3- Mass transfer principles and applications **DIRAN BASMADJIAN**
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

327. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Petroleum Refinery/Third stage/Chemical Engineering Department

328. Teaching Institution	University of Babylon
329. University Department/Centre	Chemical engineering department

330. Course title/code	CHE326 / Petroleum refinery
331. Degree	Bachelor
332. Modes of Attendance offered	Weekly
333. Semester/Year	Seconds semester / second years
334. Number of hours tuition (total)	90
335. Date of production/revision of this specification	٢٠٢١
336. Aims of the Course	The main purpose of this course is introduction of the principles of chemical engineering to the petroleum refining industry , in which the chemical industry now looks to petroleum refiners for leadership in the development of many phases of chemical engineering especially those related to the large scale processing of fluids and the application of catalysts. .

At the ending of the course, the student will be able to understand: 1. Crude oil refining 2. Crude distillation 3. Crude oil desalting 4. Vacuum distillation 5. Crude oil evaluation 6. Types of reflux 7. Pipes still heaters 8. Catalytic reforming and isomerization 9. Coking **10.** Hydro treating
Teaching and learning methods
1- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 2- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture. .
Assessment methods
1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5

337.Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	Crude oil refining	-definition -refining process	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 Marks 2- Periodic examination 5 Marks 3- Home work and Quizzes 5 Marks
week (2-3)	6	Crude distillation	-atmospheric distillation process -fractionation -cut points -over flash		
week (4)	3	Crude oil desalting	-Introduction -Types of slats in crude oil -desalting process -description of desalter -desalter operating variables		
week (5-6)	12	Vacuum distillation	-introduction -process description		
week (7-8)	6	Crude oil evaluation	Crude oil evaluation		
week (9)	3	Types of reflux	-cold reflux -hot reflux -circulating reflux		
week (10)	3	Pipes still heaters	-definition -types of stills -pipe still heaters design		
week (11-12)	6	Catalytic reforming and isomerization	-catalytic reforming -isomerization -reaction kinetics and catalysts		
week (13-14)	6	Coking	-definition -types of coke -delayed coking -fluid coking		
week (15)	3	Hydro treating	Hydro treating		

338.Infrastructure

Required readings: ▪ Basic texts ▪ Course books ▪ Other	1-W.L. Nelson , Petroleum refinery engineering , 4th edition , McGRAW –HILL , 2-M.A. Fahim , T.A. Al-Sahhaf and A.S. Elkilani , Fundamentals of petroleum refining , ELSEVIER , UK , 2010. 3-James H. Gary and Glenn E. Handwerk , Petroleum refinery technology and economics, 4th edition , Marcel Dekker , Inc. New York, 2001.
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	

339. The development of the curriculum plan	
Prerequisites	central
Less number of students	30
The largest number of students	50

Fourth Stage Courses Specifications

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

Equipment design / fourth Stage / Chemical Engineering Department	
340. Teaching Institution	University of Babylon/ College of Engineering
341. University Department/Centre	Chemical Engineering Department
342. Course title/code	Equipment design

343. Modes of Attendance offered	Students attend regularly at an average of 2 theoretical hours and 2 practical hours per week
344. Semester/Year	Semester
345. Number of hours tuition (total)	124 hours of study for the first semester also 2ed semester
346. Date of production/revision of this specification	1-12-2020
347. Aims of the Course	
The course in Units, design of pipeline, reactor, distillation, separation, absorption, drier, etc	

348. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	To be able to understand	1- Process Planning Flow sheet of process design, Types of flow sheets and symbols, Block diagram, Standards and codes, Piping and utilities diagram, Unit layout, Project evaluation and cost estimation. 2- Piping Network and Pumps Size selection of piping systems, Pipe fittings, Valves, Steam traps, Selection of metal type, Optimum pipe diameter; Types of pumps, Pump specifications, Pump data sheet. 3- Vessels and Tanks Types of vessels, Design principles of storage tanks, pressure vessels and columns, Stress considerations, Materials of construction, Support and foundation. 2ed semester ١- Heat Transfer Equipment Types and design procedure of heat exchangers, Heat exchanger data sheet, Layout of furnaces and steam boilers. ٢-Mass Transfer Equipment	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5 4. Practical lab examinations 10

			Types of columns (plate and packed columns), Types of plates and packing, Design considerations, Column data sheet. ٣-Application of computer software to design; Pressure vessels, Flash drum, Gas-liquid separator, Liquid - liquid separator, Shell and tube heat exchanger, Absorption and distillation columns, Pumps and compressors.		

349. Learning Outcomes, Teaching, Learning and Assessment Method
A: - knowledge and understanding As shown in the table on the next page
B. The skills goals special to the course. As shown in the table on the next page
Teaching and Learning Methods
1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture. 3-Brainstorming
Assessment methods

1- Decision's examinations	30	
2- Periodic examination	5	
3- Home work and Quizzes	5	
٤. Practical lab examinations	10	-

350. Infrastructure

1. Books Required reading:

Coulson & Richardson's
CHEMICAL ENGINEERING, VOLUME 6

2. Main references (sources) open

- chemical engineering plant design Ekert

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

Pollution / Fourth Stage / Chemical Engineering Department

COURSE SPECIFICATION

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. It should be cross-referenced with the Course SPECIFICATION.

351. Teaching Institution	University of Babylon
352. University Department/Centre	scientific department / chemical engineering Department
353. Course title/code	**Pollution**
354. Degree	Bachelor
355. Modes of Attendance offered	weekly
356. Semester/Year	Semester
357. Number of hours tuition (total)	3 per week
358. Date of production/revision of this specification	2021

359. Aims of the Course

1. The student will have the ability to define the pollution and types of pollution.
2- The student will be able to identify the pollutants and its type.
3_the student can be able to recognize each type of pollution and the methods of pollution treatment
4- the student will learn how to identify the problems and the troubleshooting of equipment of pollution prevention.

360. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1. **The student will develop a sense of keeping the environment clean and reduce pollutants.**
2. **The student will realize the effect of pollutants on environment.**
3. **The student will understand the methods of controlling the pollutant such as recycling, reuse, and use renewable energy.**

b- The skills goals special to the course

1. The student will be able to measure the amount of pollution
2. The student will identify the problems and the troubleshooting of equipment that control pollution

Teaching and learning methods
1- Different attractive Methods of giving lecture combined with smart technology 2- Google classroom the student groups Brainstorming **3-** Work Shop, tutorial
Assessment methods
1. the exam and quizzes 2. class assignments 3. homework 4. reports
C- thinking skills C1- The ability to solve various problems that relate to unit of control pollution C2- The ability to understand the situation of keeping the environment clean and safe C2- Ability to recognize the methods of reducing water pollution C3- Ability to specify the nature of impurity in wastewater C4- Ability to recognize the methods of controlling air pollution
D - General and transferable skills (other skills related to employability and personal development). D1. Verbal Communication D2. Teamwork D3. Analyzing & Investigating D4. Initiative/Self-Motivation

361. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	**primary principles**	**An introductory lecture on the pollution course (full explanation of course subject degree distribution, exams, attendance).**	**Explaining and projecting on digital screen**	
week (2)	3	**primary principles**	**Introduction on pollution and define pollutant source of pollution**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (3)		***Water treatment***	**Water treatment methods Sources Nature of impurities in wastewater 1-suspended solids impurities**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (4)		***Water treatment***	**Water treatment methods Sources Nature of impurities in wastewater 2- Colloidal solids**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5)		***Water treatment***	**Water treatment methods Sources Nature of impurities in wastewater 3.** Soluble salts. **.**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (6)		***Water treatment***	**Water treatment methods Sources Nature of impurities in wastewater 4. dissolved gases.**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
week (7)		***Mid exam***			
week (8)		**Filtration & Membrane Processes Technology**	**Filtration & Membrane**	**Explaining on whiteboard and**	Homework Quizzes

			Processes Technology (RO) ***Design equations for reverse osmosis***	**projecting on digital screen**	
first week (9)		**Electrodialysis treatment (ED)**	**Introducing the student about Electrodialysis treatment (ED)**	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
first week (10)		**Ion exchange**	**Introduce the student to how to apply the examples given to him in the previous lecture to the electronic calculator, that is, the practical application of what he took in the previous lecture.**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (11)		**Disinfection in water Treatment**	**Continuing to acquaint the student with how to apply the examples given to him in the previous lecture on the electronic calculator.**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (12)		**Air Pollution**	**Classification of air pollutants**	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (13)		**Air Pollution**	**Methods of Pollution Control**	**Explaining on whiteboard and projecting on digital screen**	Semester and daily exam
first week (14)		**Air Pollution**	**Continuing to introduce the student to how to apply the examples given to him in the previous lecture on the air pollution**	**Method of giving lectures. Drawing on the board and drawing on the computer**	Semester and daily exam
first week (15)		**Review on total course and Answering, solve questions ready for final exam**			

362. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	Environmental engineering principles and practice by Richard O. Mines Jr 2014
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

363. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Chemical Industries/Fourth stage/ Chemical Engineering

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. It should be cross-referenced with the Course SPECIFICATION.

364. Teaching Institution	University of Babylon
365. University Department/Centre	scientific department / chemical engineering Department
366. Course title/code	Chemical Industries CHE-00

367. Degree	BSc of chemical engineering
368. Modes of Attendance offered	Weekly
369. Semester/Year	Semester
370. Number of hours tuition (total)	3 hours per week
371. Date of production/revision of this specification	20/8/2021

372. Aims of the Course

1. The student could understand the types of chemical processes that conducts the industry, as well as how could be applied and explain the types of chemical and physical equipment, separation and purification devices, and process flow charts that achieve the required production sectors.

2 . Knowing the method, steps and designs of chemical processes, starting from raw materials to obtaining the product.

3. Understand how reactions are conducted, purify and separate materials to reach a specific product of high purity in accordance with international specifications and standards, as well as waste treatment or reuse in accordance with environmental requirements

373. Learning Outcomes, Teaching ,Learning and Assessment Method

A - Cognitive goals

A1. Knowing and understanding the types of chemicals and their classification as well as knowing the basics of chemical processes and industrial units.

A2. Knowing and understanding the basic requirements of the chemical industry and what are the steps needed to establish a specific industry in the production of a chemical.

A3. Knowing and understanding the specification of chemicals in terms of sources, preparation, requirements and production procedures.

A4. Knowing and understanding the types of chemical production flow sheets and how to prepare them.

A5. Knowing and understanding the types of reactors and equipment and how could be chosen in chemical processes.

B- The skills goals special to the course

B1 - acquires a skill in how to initiate the design of chemical processes

B2 – acquire skills in knowledge of chemical processes and types of industrial units

B3 - Acquire skills in design, maintenance, research and development, and operation of industrial units

Teaching and learning methods

1- Using lectures and presentation through LCD and giving theoretical and practical examples.

2- Conducting intellectual discussions and making participations for students about the types of industrial projects.

3- Conducting field visits to some industrial plants to know the actual reality of the industry.

Assessment methods

1 - Improve thinking skills by discussion

2- Examinations

3- Class assignments

4- Homeworks and quizzes

5- Develop a design concept

C- thinking skills

C1- The ability to conceive the production engineering drawings

C2- An ability develop a new process plant design

C3- The ability to conduct PFD and P&ID engineering drawings for a project

C4- Solving chemical process problems such as: maintenance, R&D, design of new product, etc….

Teaching and learning methods

1- Thinking strategy according to the student's ability

2- High thinking skill strategy

3- Critical thinking strategy

- Determine the facts of a new situation
- Place these facts and information in a pattern so that you can understand them

- Accept or reject the source values and conclusions based on your experience, judgment, and beliefs.

4- Brainstorming

Assessment methods

4- Semester exam
5- Home and class duties
6- Daily exams

D - General and transferable skills (other skills related to employability and personal development).

6- VERBAL COMMUNICATION

Student able to express his ideas clearly and confidently in speech

7- TEAMWORK

The work in confidence within a group

8- ANALYSING & INVESTIGATING

Gather information systematically to establish facts & principles and problem solving

9- INITIATIVE/SELF MOTIVATION

Able to act on initiative, identify opportunities & proactive in putting forward ideas & solutions

10- WRITTEN COMMUNICATION

Able to express yourself clearly in writing planning and organising
Student able to plan activities & carry them through effectively

FLEXIBILITY

Manage time effectively, prioritizing tasks and able to work to deadlines

TIME MANAGEMENT

Effective time management, prioritizing tasks and able to work to deadlines

374. Course structure: first course

Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
first week (1)	3	Introduction to Chemical processes	Introduction	LCD lectures	Semester and daily exam

week (2)	3	Biotechnology	**Biochemical engineering**	LCD lectures	Semester and daily exam
week (3)	3	Biotechnology	Fermenters & Applications	LCD lectures	Semester and daily exam
week (4)	3	Industrial Gases	Air liquefaction Hydrogen production	LCD lectures	Semester and daily exam
week (5)	3	Industrial Gases	Electrolytic Cells	LCD lectures	Semester and daily exam
week (6)	3	Carbon and Coal Industry	Carbon Morphology And Types	LCD lectures	Semester and daily exam
week (7)	3	Carbon and Coal Industry	Carbon black Activated carbon Graphite Gasifiers	LCD lectures	Semester and daily exam
week (8)		Sulfuric Acid and Its Manufacture	Introduction The contact processes	LCD lectures	Semester and daily exam
week (9)	3	Sulfuric Acid and Its Manufacture	Lead chamber process	LCD lectures	Semester and daily exam
week (10)	3	Nitric acid and Its Manufacture	**Na2NO3 process ARC process**	LCD lectures	Semester and daily exam
week (11)	3	Nitric acid and Its Manufacture	Ammonia oxidation process	LCD lectures	Semester and daily exam
week (12)	3	Phosphoric Acid and Its Manufacture	Thermal process by Blast Furnace Thermal process by Electric Furnace	LCD lectures	Semester and daily exam
week (13)	3	Phosphoric Acid and Its Manufacture	Wet process Engineering Aspects	LCD lectures	Semester and daily exam
week (14)	3	Ammonia and Urea Production	Ammonia production	LCD lectures	Semester and daily exam

week (15)	3	Ammonia and Urea Production	Urea production	LCD lectures	Semester and daily exam

375. Infrastructure	
Required readings: Basic texts ▪ Course books ▪ Other ▪	**Textbooks:** 1. Dryden, C.E, Outlines of Chemical technology, II Ed., Affiliate East-West press, 2003. 2. Mouljin, J.A., Makkee M., and Van Diepen, A.E., Chemical Process Technology, 2nd Edition, John Wiley & Sons Ltd, 2013. **References:** 1. Austin, G.T., Shreve's "Chemical Process Industries", 5th ed., McGraw-Hill, 1984. 2. Srikumar Koyikkal,"Chemical Process Technology and Simulation", PHI Learning Ltd (2013).
Special requirements (including, for example, workshops, periodicals, software and websites)	Report about Industry
Social services (including guest lectures, professional training and field studies)	field visit

376. The development of the curriculum plan	
Prerequisites	central
Less number of students	25
The largest number of students	40

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Nanotechnology/Fourth stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

377. Teaching Institution	University of Babylon
378. University Department/Centre	scientific department / Chemical engineering Department
379. Course title/code	Nanotechnology/ CHE424
380. Degree	Bachelor
381. Modes of Attendance offered	3 hrs Weekly ,
382. Semester/Year	quarterly
383. Number of hours tuition (total)	45 hrs totally
384. Date of production/revision of this specification	2020-2021

385. Aims of the Course

1. Identify the meaning of nanoscience and nanotechnology and the difference (S) between them.
2. Study the classification of nanomaterials according to its shape, size and original.
3. Know the types of natural nanomaterials.
4. Study the synthesis process of nanomaterials.
5. Identify the properties of nanomaterials.
6. Focus of the most modern application of nanomaterials.

386. Learning Outcomes, Teaching, Learning and Assessment Method

A - Cognitive goals

4. **The student will be familiar with the nanomaterials size and shape.**
1. **The student is familiar with Natural nanomaterials.**
2. **The student will be able to draw and know the types of synthesis process of nanomaterials.**
3. **Identify the nanomaterials imperfections and properties and their types and reasons.**
4. **Students will be able to know the most modern application of nanomaterials.**

b- The skills goals special to the course
According to the next table

Teaching and learning methods

1- Method of giving lectures.
2- Learning Technologies on Campus On-campus e-learning.
3- Using google class room and classroom meeting.

Assessment methods

1. the exam
2. class assignments
3. homework
4. daily exams

C- thinking skills

C1- The ability to draw and identify the types of nanomaterials and their synthesis process.
C2- The ability to know the types of nanomaterials according to its shape and size.
C3- The ability to recognize the difference between Nanotechnology, nanoscience and materials science.

D - General and transferable skills (other skills related to employability and personal development).
D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating

387. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
first week (1)	3	**primary principles**	**Introduction to nanoscience and nanotecynology**	**Explaining and drawing on the digital screen**	
first week (2)		**Classification of nanomaterials**	**Study the classification of nanomaterials according to their dimension, chemical composition and original**	**Explaining and drawing on the digital screen**	Homework and daily quiz
first week (3)		**Classification of nanomaterials**	**Natural nanomaterials**	**Explaining and drawing on the digital screen**	Discussion and daily exam
first week (4)		**Why nanomaterials scaled blew than 100 nm**	**Study and discus the reason for this size given appropriates reasons**	**Explaining and drawing on the digital screen**	Discussion of previous subject
first week (5)	3	**Synthesis process of nanomaterials**	**Types of synthesis process**	**Explaining and drawing on the digital screen**	Semester and daily exam
first week (6)		**Top-down approaches**	**Study The milling process- advantages and disadvantages**	**Explaining and drawing on the digital screen**	Make a different question and discussion with student
first week (7)		**Bottom-Up approaches**	**Types of Bottom-Up approaches** **Sol-gel approaches**	**Explaining and drawing on the digital screen**	Semester and daily exam
first week (8)		**Bottom-Up approaches**	**Co-preciptations, Micelles and microemulsions Process, Sonochemical routes**	**Explaining and drawing on the digital screen**	Example and question solve by teacher and students
first week (9)		**Bottom-Up approaches**	**Chemical vapour deposition, Graphene and CNT synthesis**	**Explaining and drawing on the digital screen**	Give Examples and question with daily Exam.

first week (10)		**Characterization method of nanomaterials**	**XRD techniques,** Scanning **Probe Microscopes**	**Explaining and drawing on the digital screen**	Give Examples and question with daily Exam.
first week (11)		**Characterization method of nanomaterials**	**Scanning microscopy technique**	**Explaining and drawing on the digital screen**	Oral exam
first week (12)		**Properties of nanomaterials**	**Optical properties, thermal properties of nanomaterials**	**Explaining and solving on the digital screen**	Semester and daily exam
first week (13)		**Properties of nanomaterials**	**Mechanical and chemical properties of nanomaterials**	**Explaining and solving on the digital screen**	Semester and daily exam
first week (14)		**Colloids materials and application of nanomaterials**	**Types of colloids materials and its structure**	**Explaining and on the digital screen**	Semester and daily exam
first week (15)		**Effect of nanomaterials on the environment**	**Study effect of nanomaterials on the environments**	**Explaining and solving on the digital screen**	Discuss student's seminar
second course			**Not found**		

388. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	**2. Nanotechnology for Chemical Engineers by Said Salaheldeen Elnashaie, Firoozeh Danafar, Hassan Hashemipour Rafsanjani, 2015.** **2.Essential in nanoscience and nanotechnology, Narendra Kumar and Sunita Kumbhat, 2016** **3. Synthesis of Inorganic Nanomaterials, Advances and Key Technologies, 2018.**
Special requirements (including, for example, workshops, periodicals, software and websites)	**--------**
Social services (including guest lectures, professional training and field studies)	field visit

389. The development of the curriculum plan	
Prerequisites	central
Less number of students	

The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

Renewable Energy / Fourth Stage / Chemical Engineering Department

390. Teaching Institution	University of Babylon/ College of Engineering
391. University Department/Centre	Chemical Engineering Department
392. Course title/code	Renewable Energy
393. Modes of Attendance offered	Students attend regularly at an average of 2 theoretical
394. Semester/Year	Semester
395. Number of hours tuition (total)	30 hours of study for the first semester
396. Date of production/revision of this specification	28-12-2020

397. Aims of the Course

5. To discover the important of renewable energy.
6. To learn about the various types of renewable energy resources.
7. To find out the applications of the renewable energy.
8. To understand the impact of using renewable energy on the society.

398. Learning Outcomes, Teaching ,Learning and Assessment Method

A:- knowledge and understanding
As shown in the table on the next page

B. The skills goals special to the course.

As shown in the table on the next page

Teaching and Learning Methods

3- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 4- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture. 3-Brainstorming
Assessment methods
1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5

399. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
15	30	Firs semester	1- Introduction 2- Renewable energy and Sustainability 3- Advantages and Draw back of Renewable Energy Sources 4- Solar Energy 5-Passive Solar 6-Direct Solar 7-Radiation 8-Flat Collectors 9-Concentrating Collectors 10-Photovoltaic Cells 11-Photovoltaic System 12-Wind Energy 13-Hydrolic Power 14-Biomass	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 2- Periodic examination 3- Home work and Quiz

			15-Geothermal Power		

400. Infrastructure
1. Books Required reading: - S.P. Sukhatme, Solar Energy, Principles of Thermal Collection and Storage, Tata. Mc Graw Hill Publishers, Fourth Print, February 1989. - G.D. Rai, Solar Energy Utilizations, Khanna Publishers, Second Revised Edition, 1994. - Ronald Shaw, Wave Energy: A Design Challenge, Eills Horwood Ltd. Publishers, First Edition 1982. - Putnam, Energy from the Wind, Prentice Hall of India.2004. - G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers.2000.
2. Main references (sources) open
A- Recommended books and references (scientific journals, reports…).open
B-Electronic references, Internet sites… Classroom and Telegram program.
Social services (including for example guest lectures, professional training, and field studies….. Nothing

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Catalyst /Fourth Stage/Chemical Engineering Department

401. Teaching Institution	University of Babylon
402. University Department/Centre	Chemical engineering department
403. Course title/code	CHE422 / catalyst
404. Degree	Bachelor
405. Modes of Attendance offered	Weekly
406. Semester/Year	Seconds semester / second years
407. Number of hours tuition (total)	60
408. Date of production/revision of this specification	٢٠٢١
409. Aims of the Course	Successful industrial heterogeneous catalysts fulfill several key requirements: in addition to high catalytic activity for the desired reaction, with high selectivity where appropriate, they

	also have an acceptable commercial life and are rugged enough for transportation and charging into plant reactors. Additional requirements include the need to come online smoothly in a short time and reproducible manufacturing procedures that involve convenient processes at acceptable cost. The development of heterogeneous catalysts that meet these (often mutually exclusive) demands is far from straightforward, and in addition much of the actual manufacturing technology is kept secret for commercial reasons-thus there is no modern text that deals with the whole of this important subject.

410. At the ending of the course, the student will be able to understand:

1. Catalyst definition
2. Catalytic reaction
3. Adsorption
4. Preparation of solid catalyst
5. Catalyst characterizations

Teaching and learning methods

1- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details.

2- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture.

.

Assessment methods

1- Decisions examinations	30
2- Periodic examination	5
3- Home work and Quizzes	5

411. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	2	Catalyst definition	-definition	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 Marks 2- Periodic examination 5 Marks 3- Home work and Quizzes 5 Marks
week (2-3)	4	Catalytic reaction	-catalytic reaction -types of catalytic reaction -heterogeneous catalytic theory		
week (4-5)	4	Adsorption	-definition -types of adsorption		
week (6-10)	20	Preparation if solid catalyst	-solid catalyst categories -precipitation -parameters affecting supersaturating -sol-gel method -supported catalyst -impregnation -drying -ion exchange -washing and filtering -calcination -catalyst shaping and formulation		
week (11-15)	20	Catalyst characterizations	-objective of characterization - characterization techniques -surface are , pore size -X –ray diffraction -pore analysis -pore size -pore size distribution		

412. Infrastructure

Required readings: ▪ Basic texts ▪ Course books ▪ Other	1-Jamed T. Richardson , Principles of catalyst development , Springer Science+Byssiness Media , LLC , 1989
Special requirements (including, for example, workshops, periodicals, software and websites)	
Social services (including guest lectures, professional training and field studies)	
413. The development of the curriculum plan	
Prerequisites	central
Less number of students	30
The largest number of students	50

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

COURSE SPECIFICATION

Unit Operation I/Fourth Stage/Chemical Engineering Department

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. It should be cross-referenced with the Course SPECIFICATION.

414. Teaching Institution	University of Babylon
415. University Department/Centre	scientific department / chemical engineering Department
416. Course title/code	**Unit Operation- Course-I (One course Only)**

417. Degree	Bachelor
418. Modes of Attendance offered	weekly
419. Semester/Year	Semester-I
420. Number of hours tuition (total)	5 per week (3 Theoretical+2 practical)
421. Date of production/revision of this specification	2021

422. Aims of the Course (4th Stage of chemical Eng., Department)

1. The student will have the ability to define the Unit operation fundamentals and its application.
2- The student will be able to identify the mass and heat transfer equipments and its type.
3_the student can be able to recognize each type of mass and heat transfer application and the methods of its operation.
4- To learn the student how to design the equipment of unit operation processes and make the material and energy balance of the units.
5- To learn the student how to solve the problem and the troubleshooting of chemical industries.

423. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1- To learn the student how to design the equipment of mass and heat transfer processes and make the material and energy balance of the units.
2- To learn the student how to solve the problem and the troubleshooting of equipment's for chemical industries.
3- To learn the student how to solve the unit operation problem of processes.

b- The skills goals special to the course

1. The student will be able to desing the equipment of unit operation application
2. The student will identify the problems and the troubleshooting of equipment that control its operation

Teaching and learning methods

1- Different attractive Methods of giving lecture combined with smart technology and lecture in class.
2- Google classroom the student groups Brainstorming
3- Work Shop, tutorial

Assessment methods
1. the exam and quizzes 2. class assignments 3. homework 4. reports
C- thinking skills C1- The ability to solve various problems that relate to unit operation theory C2- The ability to understand the application of unit operation C2- Ability to recognize the methods of design the equipment of each application C3- Ability to calculate the height and diameter of towers and the time of process. C4- Ability to recognize the methods of controlling the equipment of different application.
D - General and transferable skills (other skills related to employability and personal development). D1. Verbal Communication D2. Teamwork D3. Analyzing & Investigating D4. Initiative/Self-Motivation

424. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	**Basic and Fundamentals of Unit Operation**	INTRODUCTION Course description and what is unit operation Unit operation- Types of Flow Type of fluid flow, Mass and heat transfer	**Explaining and projecting on digital screen**	
week (2)	4	**Basic and Fundamentals of Mass Transfer**	Type of fluid flow, Mass and heat transfer Some important definition and dimensionless groups	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (3)		Flow of Fluids through Granular Beds	Flow of Fluids through Granular Beds FLOW OF A SINGLE FLUID THROUGH A GRANULAR BED Carman–Kozeny equations	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (4)	4	Flow of Fluids through Granular Beds	The application of Carman–Kozeny equations Use of Carman–Kozeny equation for measurement of particle surface DISPERSION	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (5)	4	**Filteration**	Liquid Filtration INTRODUCTION FILTRATION THEORY Relation between thickness of cake and volume of filtrate Flow of liquid through the cloth Flow of filtrate through the cloth and cake combined	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework Quizzes Report
week (6)	4	**Filteration**	Compressible filter cakes Compressible filter cakes The filter medium Blocking filtration Effect of particle sedimentation on filtration Delayed cake filtration Cross-flow filtration	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework

			Preliminary treatment of slurries before filtration FILTRATION EQUIPMENT		
week (7)	4	***Fluidization***	Introduction to Fluidized Bed Technology ➢ *Fluidized bed.* ➢ *Fluidization Regimes.* ➢ *Application of fluidization.* Fluidization RELEVANT POWDER AND PARTICLE PROPERTIES BUBBLING AND NON-BUBBLING FLUIDIZATION		
week (8)	4	***Fluidization***	CLASSIFICATION OF POWDERS EXPANSION OF A FLUIDIZED BED ENTRAINMENT HEAT TRANSFER IN FLUIDIZED BEDS APPLICATIONS OF FLUIDIZED BEDS	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (9)	4	Sedimentation	Sedimentation Introduction Theory Sedimentation of discrete particles Horizontal flow settling tanks in practice Settling efficiency of a suspension Influences on settling in a horizontal flow tank Influence of turbulence Influence of stability Influence of bottom scour Influence of flocculant settling	**Method of giving lectures. Explaining on whiteboard and projecting on digital screen**	Homework
first week (10)	4	Sedimentation	Practice Determination of the dimensions of an ideal settling tank Inlet constructions Outlet constructions Settling tank alternatives Vertical flow settling tank	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes

			Floc blanket clarifier Tray settling tanks Tilted plate settling		
first week (11)	4	Centrifugal Separations and Cyclone separator	Centrifugal Separations and Cyclone separator . INTRODUCTION SHAPE OF THE FREE SURFACE OF THE LIQUID CENTRIFUGAL PRESSURE SEPARATION OF IMMISCIBLE LIQUIDS OF DIFFERENT DENSITIES	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (12)	4	Centrifugal Separation and Cyclone Separator	SEDIMENTATION IN A CENTRIFUGAL FIELD FILTRATION IN A CENTRIFUGE MECHANICAL DESIGN . CENTRIFUGAL EQUIPMENT	**Explaining on whiteboard and projecting on digital screen**	Homework Quizzes
first week (13)	4	Centrifugal Separation and Cyclone Separator	Membrane Separation Processes INTRODUCTION CLASSIFICATION OF MEMBRANE PROCESSES .THE NATURE OF SYNTHETIC MEMBRANES GENERAL MEMBRANE EQUATION CROSS-FLOW MICROFILTRATION ULTRAFILTRATION	**Explaining on whiteboard and projecting on digital screen**	Semester and daily exam
first week (14)	4	Centrifugal Separation and Cyclone Separator	REVERSE OSMOSIS MEMBRANE MODULES AND PLANT CONFIGURATION MEMBRANE FOULING ELECTRODIALYSIS REVERSE OSMOSIS WATER TREATMENT PLANT PERVAPORATION LIQUID MEMBRANES GAS SEPARATIONS	**Method of giving lectures. Drawing on the board and drawing on the computer**	Semester and daily exam

first week (15)	4	**Revision**	**Revision and Exercises**		

425. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	**References** **1-Coulson & Richardson's Chemical Engineering Solutions, Volume 2** 2- **Introduction to Particle Technology – Second Edition** Martin Rhodes Monash University, Australia **3-Unit Operations of Chemical Engineering** by Julian Smith,Warren McCabe,Peter Harriott, emeritus
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

426. The development of the curriculum plan	
Prerequisites	central
Less number of students	
The largest number of students	25

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME

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. It should be cross-referenced with the Course SPECIFICATION.

COURSE SPECIFICATION-1

Gas Processing/Fourth Stage/Chemical Engineering Department

427. Teaching Institution	University of Babylon
428. University Department/Centre	scientific department / chemical engineering Department
429. Course title/code	**Gas processing**
430. Degree	Bachelor
431. Modes of Attendance offered	Weekly
432. Semester/Year	Semester
433. Number of hours tuition (total)	3 per week
434. Date of production/revision of this specification	2021

435. Aims of the Course

let the student Know the basic of Natural-gas processing, which is a range of industrial processes designed to purify raw natural gas by removing impurities, contaminants, and higher molecular mass hydrocarbons to produce what is known as pipeline quality dry natural gas.

436. **Learning Outcomes**, Teaching, Learning and Assessment Method

A - Cognitive goals

1. **The student will develop understanding about the source of natural gas and how its form.**
2. **The student will understand the treatment methods of natural gas and why it has been processed**
3. **the student will be able to know the transportation of the Natural gas the ways of NG measurement**

b- The skills goals special to the course

1. The student will be able to recognize the most important units to process NG

2. The student will identify the problems and the troubleshooting of different process

Teaching and learning methods

1- Different attractive Methods of giving lecture combined with smart technology
Google classroom the student groups Brainstorming -٢

3- Work Shop, tutorial

Assessment methods

1. the exam and quizzes
2. class assignments
3. homework
4. reports

C- thinking skills

C1- The ability to solve various problems that relate to units of gas processing
C2- The ability to estimate the NG properties
C2- Ability to recognize the transportation methods of the NG
C3- Ability to specify the flow measurement of NG
C4- Ability to recognize the methods of hydrocarbon recovery Processes

D - General and transferable skills (other skills related to employability and personal development).

D1. Verbal Communication
D2. Teamwork
D3. Analyzing & Investigating
D4. Initiative/Self-Motivation

437. Course structure: first course					
Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	3	To be able to understand and	**An introductory lecture on the natural gas processing course (full explanation of course subject degree distribution, exams, attendance).**	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in .details 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	1- Decisions examinations 30 2- Periodic examination 5 3- Home work and Quizzes 5 4. Practical lab examinations 0
week (2)	3		**Introduction on Natural gas and define the composition the properties and source of natural gas**		
week (3)	3		**Complete the explanation of the properties and the calculation for each property**		
week (4)	3		**Separation process: *Types of Separators, Separator designer***		
week (5)	3		**Dehydration**		
week (6)	3		**Dehydration: methods and calculation** **Dehydration systems used in the natural gas industry fall into four categories in principle:** **(a) Direct cooling** **(b) Compression followed by cooling** **(c) Adsorption** **(d) Absorption**		
week (7)	3		**Mid exam**		
week (8)	3		**Natural Gas Sweetening (Acid Gases Removal)**		
week (9)	3		**Hydrocarbon Recovery Processes: What Are Natural Gas Liquids, NGL Extraction**		
week (10)	3		**Natural Gas Liquid Fractionation (stabilizer)**		
week (11)	3		**Natural gas transportation: Pipeline, CNG Transportation, Gas Compression**		
week (12)	3		**Liquefied Natural Gas (LNG)**		
week (13)	3		**Flow measurement: Orifice Plates, Recording Charts**		
week (14)	3		**Other Methods of Measurement: Displacement Metering, Turbine Meter, Elbow Meter Natural Gas Liquid Measurement**		
week (15)	3		**Continuing to introduce the student to how to apply the examples given to him in the previous lecture on the gas processing**		

438. Infrastructure	
Required readings: ▪ Basic texts ▪ Course books ▪ Other	▪ *Fundamentals of Natural Gas Processing" by Arthur J. Kidnay and William R. Parrish (2006)* ▪ *Natural Gas Processing. Technology and Engineering Design by Alireza Bahadori 2014.* ▪ *Advanced natural gas engineering by Wang, Xiuli, and Michael Economides. Elsevier, 2009.*
Special requirements (including, for example, workshops, periodicals, software and websites)	----------
Social services (including guest lectures, professional training and field studies)	field visit

439. The development of the curriculum plan	
Prerequisites	
Less number of students	
The largest number of students	25