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 programme specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	Organic chemistry
4. Modes of Attendance offered	Full time
5. Semester/Year	2020/2021 Acdemic Year
6. Number of hours tuition (total)	150 hrs.(5 hrs. per week)
7. Date of production/revision of this specification	4/2/2021
8. Aims of the Course	
1- Introduction of the principles of organic Chemistry 2- Understand the theory of modern Organic chemistry 3- Understanding the mechanisms of chemical reactions 4- Understanding of organic chemical reactions and hydrocarbons compounds . 5- Explore the preparation and naming of organic compounds	

9· Learning Outcomes, Teaching ,Learning and Assessment Method

Cognitive goals.

A1.understanding the preparation method of organic compounds

A2. Define the naming method for hydrocarbons compounds

A3. Use laboratory to find and unknown materials and to prepare organic compounds

B. The skillsgoalsspecialtothe course

B1. Help student to develop a range of graduate attributes.
B2. Develop subject-specific skills for student through taking part in lectures, seminars, field-trips, completing assignments, projects, dissertations and outreach work and laboratory experiments.
B3. Student may take the opportunity to become involved in Department events and research seminar (or another college).

Teaching and Learning Methods

1.Facilitating the integration of knowledge, skills and attitudes o teaching and learning in groups
2. Facilitating learning and setting ground rules
3.Explaining

4. Group dynamics
5.Managing the group
6.Lectures
7. Small group teaching methods and discussion techniques

8. Seminars and tutorials
9. Computer based teaching and learning – information technology and the World Wide Web
10. Introducing problem based learning
11. Case based learning and clinical scenarios

References, further reading and useful links

Assessment methods

1. Exams. This includes mid-term exams, final exams, and tests at the end of course units. The best tests include several types of questions – short answer, multiple-choice, true-false, and short essay – to allow students to fully demonstrate what they know.
2. Papers, projects, and presentations. These give students the chance to go deeper with the material to put the knowledge they've acquired to use or create something new from it. This level of application is an extremely important and often overlooked part of the learning process. These types of projects also give students who do not test well a chance to shine.
3. Portfolios. Submitting a portfolio at the end of a course can be a powerful way for students to see the progress they've made. More than just a collection of students' work from the semester, good portfolios also include reflections on their learning. Asking students to spell out the concepts or techniques used with each piece, the themes addressed, and hurdles faced also brings a sense of completion to the learning process

C. Affective andvaluegoals

C1.Thinking Skills are the mental processes we use to do things like: solve problems, make decisions, ask questions, make plans, pass judgements, organise information and create new ideas.
C2. Starting lessons with a puzzle or game can be a useful warm-up, but another possibility is to try some brain gym, a series of exercises and massage routines designed to increase the supply of oxygen to the brain and improve mental alertness
C3. Learn the students to use Mind-maps method which can be a useful tool for note-taking or revision, for thinking through a complex problem or for presenting information to others.

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

D1. Setting appropriate achievement levels can ensure that all students attain the adequate level of transferable skills for a qualification that will allow them to work in their chosen occupation. Achievement levels need to be set based on industry participation and should be reviewed regularly.
D2. **Making learning environments as "real' as possible**
D3. To create a well-functioning, credible assessment system, students' assessment records will have to be stored and made accessible to relevant stakeholders. Having students retake tests to assess their transferable skills when, for instance, changing schools, can create frustration and cynicism about the system

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	5 2 the. 3 lab.	A1,D3	Electronic Structure and orbitals representation of Organic molecules	1-12 of	1 – 3
2	5 2 the. 3 lab.	A1, D2	Bonds of organic Compounds	1-12 of	1 – 3
3	5 2 the. 3 lab.	B1	Chemical composition	1-12 of	1 – 3
4	5 2 the. 3 lab.	A2,B1	General classification and identification of Organic compounds	1-12 of	1 – 3
5	5 2 the. 3 lab.	A2,B1	Structure characterization of organic compounds	1-12 of	1 – 3
6	5 2 the. 3 lab.	A2,B1	Properties of organic compounds	1-12 of	1 – 3
7	5 2 the. 3 lab.	A2,A3, B1	Preparation of Aliphatic hydrocarbons	1-12 of	1 – 3
8	5 2 the. 3 lab.	A2,A3, B1	Preparation of aromatic hydrocarbons	1-12 of	1 – 3
9	5 2 the. 3 lab.	A2,A3, B1	Preparation of alkyl halides	1-12 of	1 – 3

10	5 2 the. 3 lab.	A2,A3, B1	Preparation of alcohols	1-12 of	1 – 3
11	5 2 the. 3 lab.	A2,A3, A4,B1	Preparation of Phenols	1-12 of	1 – 3
12	5 2 the. 3 lab.	A2,A3, A4,B1	Preparation of carboxylic acid	1-12 of	1 – 3
13	5 2 the. 3 lab.	A2,A3, A4,B1	Preparation of Amides	1-12 of	1 – 3
14	5 2 the. 3 lab.	A2,A3, A4,B1	Preparation of either	1-12 of	1 – 3
15	5 2 the. 3 lab.	A2,A3, A4,B1	Preparation of aldehydes	1-12 of	1 – 3
16	5 2 the. 3 lab.	A2,A3, A4,B1	Preparation of ester	1-12 of	1 – 3
17	5 2 the. 3 lab.	B2	Preparation of ketones	1-12 of	1 – 3
18	5 2 the. 3 lab.	B2	Hydrocarbon composition	1-12 of	1 – 3
19	5 2 the. 3 lab.	B2	Organic Sulphides	1-12 of	1 – 3
20	5 2 the. 3 lab.	A5	Organometallic compounds of crude oil fractions	1-12 of	1 – 3
21	5 2 the. 3 lab.	A5	Organometallic compounds of crude oil fractions	1-12 of	1 – 3

11. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	***Textbook*** Modern Organic Chemistry by Rodger w. Griffin JR

	References 1. Organic Chemistry by Joseph M. Hornback ***Others*** 1. Notebook prepared by the instructor of the course. 2. Collection of tutorial sheets of solved and unsolved problems and Exams questions
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures , internship , field studies)	Available websites related to the subject, Video, Seminars, field trips

12. Admissions

Instructor:
Dr. Rana Thabet Abd Al-rubaye
Chem. Eng. Dept.
College of Engineering
University of Baghdad
Tel: +00964-7810864225
Email: Alrubaye.rana@gmail.com

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 program specification.

1. Teaching Institution	College of Engineering University of Baghdad
2. University Department/Centre	Chemical engineering department
3. Course title/code	Analytical chemistry CH.123
4. Programme(s) to which it contributes	Chemical engineering program
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a “Day Program”. The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of about 30-week regular subjects.
6. Semester/Year	Year/ 2020-2021
7. Number of hours tuition (total)	150 hrs. / 5 hrs. per week
8. Date of production/revision of this specification	3 - 2 -2021

9. Aims of the Course

Those who will take this course will have extensive training in the subjects that deal with chemical analysis, like calculations based on the weight relations of chemical formulas and equations, begin our study of quantitative analysis with special emphasis on analytical applications (molarity , normality, pH of solution, Equilibrium constants)
Water treatment calculation like Total Hardness Determination Using EDTA
This will give the students background and strong basic to higher level courses involving dealing with different solutions specifically during dealing with solutions in laboratory.

10· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Knowledge and Understanding

A1. Introduce basic definitions and introductory concepts of analytical chemistry.

A2. Show the different methods to prepare solutions with different concentrations and PH.

A3. Explains the methods to control the precipitation process .

A4. Show the methods for the quantitative calculations of oxidation reduction reactions.

A5. Water treatment like Total Hardness Determination Using EDTA

A6 . Provide a background to higher level courses involving dealing with different solutions.

A7. Provide a strong quantitative and analytical understanding to the students in order to be able to deal with different solution concentrations and its preparation in chemical industry

B. Subject-specific skills

B1. Solve chemical reaction examples using numerical methods.
B2. Boding the class work with the laboratory work.

Teaching and Learning Methods
1. Lectures. 2. Tutorials. 3. Homework and Assignments. 4. Lab. Experiments. 5. Tests and Exams. 6. In-Class Questions and Discussions. 7. Connection between Theory and Application. 8. In- and Out-Class oral conservations. 9. Reports, Presentations, and Posters.
Assessment methods
1. Examinations, Tests, and Quizzes. 2. Extracurricular Activities. 3. Student Engagement during Lectures.
C. Thinking Skills C1. Developing critical and creative thinking skills related to analytical chemistry. C2. Using mathematical models. C3. Analysis assumptions.

D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Communitiy effectivity. D2. Work individually and in group in international and multidicplinary teams. D3. Understanding impact of engineering solutions in an environmental and social context.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2 the. 3 exp.	A1,B1,B2	Introduction to analytical Chem.	1-9 (art.10)	1 – 3 (art. 10)
2	2 the. 3 exp.	A1,B1,B2	Stoichiometric calculations	1-9 (art.10)	1 – 3 (art. 10)
3	2 the. 3 exp.	A1B1,B2	chemical coefficient	1-9 (art.10)	1 – 3 (art. 10)
4	2 the. 5 exp.	A1B1,B2	molarity	1-9 (art.10)	1 – 3 (art. 10)
5	2 the. 5 exp.	A1,B1,B2	normality	1-9 (art.10)	1 – 3 (art. 10)
6	2 the. 5 exp.	A1,B1,B2	titration	1-9 (art.10)	1 – 3 (art. 10)
7	2 the. 5exp.	A1,B1,B2	titration	1-9 (art.10)	1 – 3 (art. 10)
8	2 the. 5 exp.	A1,B1,B2	density	1-9 (art.10)	1 – 3 (art. 10)
9	2 the. 5 exp.	A1,A2, B1,B2	Equilibrium in the acids and bases	1-9 (art.10)	1 – 3 (art. 10)
10	2 the. 5 exp.	A2,B1,B2	pH Strong Acid, Strong Base, Salt of Strong Acid and Strong Base	1-9 (art.10)	1 – 3 (art. 10)
11	2 the. 5 exp.	A2,B1,B2	pH of Aqueous Solution: Salt of Weak Acid and Strong Base, Salt of Weak Base and Strong Acid	1-9 (art.10)	1 – 3 (art. 10)
12	2 the. 5 exp.	A2,B1,B2	graphs of titration	1-9 (art.10)	1 – 3 (art. 10)
13	2 the. 5 exp.	A2,B2,B1	Indicators of bases and acids	1-9 (art.10)	1 – 3 (art. 10)
14	2 the. 5 exp.	A3,B1,B2	Equilibrium in precipitation	1-9 (art.10)	1 – 3 (art. 10)
15	2 the. 5 exp.	A1,A3, B1,B2	solubility	1-9 (art.10)	1 – 3 (art. 10)
16	2 the. 5 exp.	A1,A2, A3,B1,B2	partial precipitation	1-9 (art.10)	1 – 3 (art. 10)
17	2 the. 5 exp.	A1,A2, A3,B1,B2	partial precipitation	1-9 (art.10)	1 – 3 (art. 10)
18	2 the. 5 exp.	A4,A1, B1,B2	Analysis using oxidation and reduction	1-9 (art.10)	1 – 3 (art. 10)
19	2 the. 5 exp	A4,A1, B1,B2	Analysis using oxidation and reduction	1-9 (art.10)	1 – 3 (art. 10)
20	2 the. 5 exp.	A4,A1, B1	Stoichiometry of Redox Reaction	1-9 (art.10)	1 – 3 (art. 10)

21	2 the. 5 exp.	A4,A1, B1	Typical Problem Calculations	1-9 (art.10)	1 – 3 (art. 10)
22	2 the. 5 exp.	A4,A1, A2,B1	electromotive force	1-9 (art.10)	1 – 3 (art. 10)
23	2 the. 5 exp.	A4,A1, A2,B1	use of the half cell potentials	1-9 (art.10)	1 – 3 (art. 10)
24	2 the. 5 exp.	A1,A4, A2,B1	Nernest eq.	1-9 (art.10)	1 – 3 (art. 10)
25	2 the. 5 exp.	A5,A1, A2,B1	Measure of concentration by potential of the cell	1-9 (art.10)	1 – 3 (art. 10)
26	2 the. 5 exp.	A5,B1	Measure of concentration by potential of the cell	1-9 (art.10)	1 – 3 (art. 10)
27	2 the. 5 exp.	A5,B1	Total Hardness Determination Using EDTA	1-9 (art.10)	1 – 3 (art. 10)

13. Admissions	
Pre-requisites	CH 123
Minimum number of students	35
Maximum number of students	95

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Text book, "Quantitative analysis ", by Pierce Haeinsch , Sawyer 4th edition ,1958 Reference book, Analytical chemistry by Gary D. Christian
Special requirements (include for example workshops, periodicals, IT software, websites)	• Laboratory experiments in the (Analytical chemistry Lab) of the department. • Available websites related to the subject. • Extracurricular activitie
Community-based facilities (include for example, guest Lectures , internship , field studies)	scientific visits

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 programme specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Department of Chemical Engineering (CHED)
3. Course title/code	Chemical Engineering Principles /CHE141
4. Programme(s) to which it contributes	Chemical Engineering Department (CHED)
5. Modes of Attendance offered	Annual System; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd Semesters/Academic Year 2020 -2021
7. Number of hours tuition (total)	120 h/ 4 h per week
8. Date of production/revision of this specification	28-11-2020
9. Aims of the Course	
The aims of the course are: 1. Students develop a fundamental understanding of the basic principles of chemical engineering processes and calculations.	

2. Students can examine and select pertinent data, and solve material balance problems (application, analysis, synthesis).
3. Students can select and/or evaluate problem solution methods, for example, between analytic and numerical solution techniques.
4. Students can give examples of important application of material balances in chemical engineering processes.
5. Students can evaluate their own solutions and those of others to find and correct errors.

10· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Knowledge and Understanding

A1. Ability to identify and describe various unit operations in chemical industry.

A2. Ability to change and derive units from one unit to others.

A3. Ability to calculate moles, density and concentrations.

A4. Ability to perform mass balance problems involving simple or multiple-unit processes, recycle, bypass and purge. .

A5. Ability to calculate the density and specific gravity for gases. Calculate the partial pressure of the components of a saturated ideal gas.

B. Subject-specific skills

B1. Solve material balances problems involving ideal gases.

B2. Ability to demonstrate effective team work and problem solving skills.

C. Thinking Skills

C1. Developing critical and creative thinking skills related to material balance on chemical engineering processes.
C2. Using different methods solution.
C3. Analysis assumptions.

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

D1. Community effectively.
D2. Work individually and team members in international and multidicplinary teams.
D3. Understanding impact of engineering solutions in an environmental and social context.

Teaching and Learning Methods
1. Lectures 2. Tutorials 3. Homework and assignments 4. Tests and Exams 5. In-Class questions and discussions 6. Connection between theory and application 7. Seminars 8. In- and Out-Class oral conservations 9. Reports, presentations, and posters
Assessment methods
1. Examinations, Tests, and Quizzes. 2. Extracurricular activities and homework. 3. Student engagement during lectures

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4 3 the. 1 tut.	A1, A2	Dimensions & Units	1-9 of article (10)	1 – 3 of article (10)
2	4 3 the. 1 tut.	A1, A2	Conversion	1-9 of article (10)	1 – 3 of article (10)
3	4 3 the. 1 tut.	A1, A2, A3	Moles & Density	1-9 of article (10)	1 – 3 of article (10)
4	4 3 the. 1 tut.	A1, A2, A3	Concentration	1-9 of article (10)	1 – 3 of article (10)
5	4 3 the. 1 tut.	A1, A2, A3, B2	Choosing a basis	1-9 of article (10)	1 – 3 of article (10)
6	4 3 the. 1 tut.	A1, A2, A3, B2	Temperature	1-9 of article (10)	1 – 3 of article (10)
7	4 3 the. 1 tut.	A1, A2, A3, B2	Pressure	1-9 of article (10)	1 – 3 of article (10)
8	4 3 the. 1 tut.	A1, A2, A3, B2	Differential pressure measurement	1-9 of article (10)	1 – 3 of article (10)
9	4 3 the. 1 tut.	A5, B1, B2	Ideal gases & The ideal gas law	1-9 of article (10)	1 – 3 of article (10)
10	4 3 the. 1 tut.	A4, A5, B1, B2	Ideal gas mixtures and partial pressure	1-9 of article (10)	1 – 3 of article (10)
11	4 3 the. 1 tut.	A4, B1, B2	Introduction to material balance	1-9 of article (10)	1 – 3 of article (10)
12	4 3 the. 1 tut.	A4, B1, B2	Multiple component system	1-9 of article (10)	1 – 3 of article (10)
13	4 3 the. 1 tut.	A4, B1, B2	Accounting for chemical reactions	1-9 of article (10)	1 – 3 of article (10)

14	4 3 the. 1 tut.	A4, B1, B2	The chemical equation and stoichiometry	1-9 of article (10)	1 – 3 of article (10)
15	4 3 the. 1 tut.	A4, B1, B2	The chemical equation and stoichiometry	1-9 of article (10)	1 – 3 of article (10)
16	4 3 the. 1 tut.	A4, B1, B2	General strategy for solving material balance problems	1-9 of article (10)	1 – 3 of article (10)
17	4 3 the. 1 tut.	A4, B1, B2	Solving material balance problems for single units without reaction	1-9 of article (10)	1 – 3 of article (10)
18	4 3 the. 1 tut.	A4, B1, B2	Solving material balance problems for single units without reaction	1-9 of article (10)	1 – 3 of article (10)
19	4 3 the. 1 tut.	A4, B1, B2	Solving material balance problems for single units without reaction	1-9 of article (10)	1 – 3 of article (10)
20	4 3 the. 1 tut.	A4, B1, B2	Material balances for processes involving reaction	1-9 of article (10)	1 – 3 of article (10)
21	4 3 the. 1 tut.	A4, B1, B2	Material balances for processes involving reaction	1-9 of article (10)	1 – 3 of article (10)
22	4 3 the. 1 tut.	A4, B1, B2	Material balances for processes involving reaction	1-9 of article (10)	1 – 3 of article (10)
23	4 3 the. 1 tut.	A4, B1, B2	Material balance problems involving multiple units	1-9 of article (10)	1 – 3 of article (10)
24	4 3 the. 1 tut.	A4, B1, B2	Material balance problems involving multiple units	1-9 of article (10)	1 – 3 of article (10)
25	4 3 the.	A4, B1, B2	Material balance problems	1-9 of article (10)	1 – 3 of article (10)

	1 tut.		involving multiple units		
26	4 3 the. 1 tut.	A4, B1, B2	Recycle (without reaction)	1-9 of article (10)	1 – 3 of article (10)
27	4 3 the. 1 tut.	A4, B1, B2	Recycle (involving reaction)	1-9 of article (10)	1 – 3 of article (10)
28	4 3 the. 1 tut.	A4, B1, B2	Bypass and Purge	1-9 of article (10)	1 – 3 of article (10)
29	4 3 the. 1 tut.	A4, B1, B2	Industrial application of material balances	1-9 of article (10)	1 – 3 of article (10)
30	4 3 the. 1 tut.	A4, B1, B2	Industrial application of material balances	1-9 of article (10)	1 – 3 of article (10)

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	***Textbook*** 1. David M. Himmelblau and James B. Riggs, 2004 "**Basic Principles and Calculations in Chemical Engineering",** Seventh Edition. ***References*** 1. Richard M. Felder and Ronald W. Rousseau, 1999 "**Elementary Principles of Chemical Processes",** Third Edition. 2. Joseph P. Reynolds, John S. Jeris and Louis Theodore, 2002 "Handbook of chemical and environmental Engineering Calculations" ***Others*** 1. Notebook prepared by the instructor of the course 2. Collection of sheets of solved and unsolved problems and Exams sheets
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Available websites related to the subject 2. Excel or similar software for the solution of lengthy problems.

Community-based facilities (include for example, guest Lectures , internship , field studies)	1. Field and scientific visits 2. Extra lectures by foreign guest lecturers

13. Admissions	
Pre-requisites	CHE121 and CHE123
Minimum number of students	40
Maximum number of students	70

Instructor:
Asst. Prof. Dr. Sama M. Al-Jubouri
Assistant Professor, Transport phenomena/Water treatment
Department of Chemical Engineering
College of Engineering
University of Baghdad
Tel: +00964-7803133884
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TEMPLATE FOR COURSE SPECIFICATION

HIGHE REDUCATION PERFORMANCE REVIEW:PROGRAMME REVIEW

COURSE SPECIFICATION

ThisCourseSpecificationprovidesaconcisesummaryofthemainfeaturesofthe course and the learning outcomes that a typical student might reasonably be expectedtoachieveand demonstrateifhe/shetakesfulladvantageofthelearning opportunitiesthatareprovided.Itshouldbecross-referencedwiththeprogramme specification.

1.Teaching Institution	College of Engineering/ University of Baghdad
2.UniversityDepartment/Centre	Chemical Engineering
3.Course title/code	PROCESS DYNAMICS AND CONTROL
4.Modesof Attendance offered	Annual System ; There is only one mode of delivery, which is a “Day Program”. The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.
5.Semester/Year	1st & 2nd / Academic Year 2020-2021
6.Number of hourstuition(total)	90 hrs. /3 hrs. per week
7.Dateof production/revision of this specification	3-2-2021
8.Aimsofthe Course	
1-To study the first order systems response, Time delay, Steady state coefficient.	
2- Understand, the final value theorem, 2nd order system.	
3- Learn how to use the Closed loop systems, Transfer function and flow diagram.	
4-To study the Air control valve.	
5- Understand the proportional, integral, differential controlar.	
6- To study the Optimum control by zegler nickes method, stability, Routh method.	
7-To learn Frequency response bode and niquist diagram .	

9· LearningOutcomes, Teaching,LearningandAssessmentMethode

A-Cognitive goals.

A1.Learn how to derive the transformation function of devices in chemical engineering.

A2- Knowing the response when disturbance occurs on any system.

A3- Knowing how to handle the changes that occur on any device.

A4 - Learn closed control systems.

A5- Know how to use the final control devices.

A6- Understanding the stability of systems

.

B.The skillsgoalsspecialtothe course

B1. Solve process control examples .

B2. Learn graphical methods to solve problems.

TeachingandLearningMethods

1. Lectures.
2. Tutorials.
3. Homework and Assignments.
4. Tests and Exams.
5. In-Class Questions and Discussions.
6. Connection between Theory and Application.
7. Field Trips.
8. Seminars.

Assessmentmethods

1. Examinations, Tests, and Quizzes.
2. Extracurricular Activities.
3. Student Engagement during Lectures.
4. Responses Obtained from Students

C.Affective andvaluegoals

C1. Developing critical and creative thinking skills related process control in chemical engineering.

C2. Using mathematical models.

C3. Analysis assumptions.

TeachingandLearningMethods

1-Lectures.
2-Tutorials.
3-Homework and Assignments.
4 -Tests and Exams.
5-In-Class Questions and Discussions.
6-Connection between Theory and Application.
7 -Field Trips.
8-Seminars.

Assessmentmethods

1-Examinations, Tests, and Quizzes.
2-Extracurricular Activities.
3-Student Engagement during Lectures.
4-Responses Obtained from Students

D.Generalandrehabilitativetransferred skills(other skillsrelevantto employabilityand personaldevelopment)

D1. Communitiy effectivity.
D2. Work individually and team members in international and multidicplinary teams.
D3. Understanding impact of engineering solutions in an environmental and social context.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3 2the. 1 tut.	A1	1st order response	1-9 of article (10)	1 – 4 of article (10)
2	3 2the. 1 tut.	A1	Time delay	1-9 of article (10)	1 – 4 of article (10)
3	3 2the. 1 tut.	B1	Steady state coefficient	1-9 of article (10)	1 – 4 of article (10)
4	3 2the. 1 tut.	A2,B1	Final value theorem	1-9 of article (10)	1 – 4 of article (10)
5	3 2the. 1 tut.	A2,B1	2nd order system	1-9 of article (10)	1 – 4 of article (10)
6	3 2the. 1 tut.	A2,B1	Closed loop systems	1-9 of article (10)	1 – 4 of article (10)
7	3 2the. 1 tut.	A2,A3, B1	Transfer function and flowdiagram	1-9 of article (10)	1 – 4 of article (10)
8	3 2the. 1 tut.	A2,A3, B1	Air control valve	1-9 of article (10)	1 – 4 of article (10)
9	3 2the. 1 tut.	A2,A3, B1	Control system	1-9 of article (10)	1 – 4 of article (10)
10	3 2the. 1 tut.	A2,A3, B1	discontinuous	1-9 of article (10)	1 – 4 of article (10)
11	3 2the. 1 tut.	A2,A3, A4,B1	proportional	1-9 of article (10)	1 – 4 of article (10)
12	3 2the. 1 tut.	A2,A3, A4,B1	integral	1-9 of article (10)	1 – 4 of article (10)
13	3 2the. 1 tut.	A2,A3, A4,B1	differential	1-9 of article (10)	1 – 4 of article (10)
14	3 2the. 1 tut.	A2,A3, A4,B1	Optimum control by zegler nickes method	1-9 of article (10)	1 – 4 of article (10)
15	3 2the. 1 tut.	A2,A3, A4,B1	stability	1-9 of article (10)	1 – 4 of article (10)
16	3 2the.	A2,A3, A4,B1	Routh method	1-9 of article (10)	1 – 4 of article (10)

	1 tut.				
17	3 2the. 1 tut.	B2	Frequency response bode and niquist diagram.	1-9 of article (10)	1 – 4 of article (10)
18	3 2the. 1 tut.	B2	Measuring devices of temperature.	1-9 of article (10)	1 – 4 of article (10)
19	3 2the. 1 tut.	B2	Measuring devices of pressure.	1-9 of article (10)	1 – 4 of article (10)
20	3 2the. 1 tut.	A5	Measuring devices of Concentration.	1-9 of article (10)	1 – 4 of article (10)
21	4 2 the. 1tut.	A5	Measuring devices of Fluid flow.	1-9 of article (10)	1 – 4 of article (10)

11.Infrastructure	
1. BooksRequiredreading:	*Textbook*: Process systems analysis and control by coughanowr&koppel
2. Mainreferences(sources)	*References*:1. Essentials of process control by William l luyben.2. Process systems analysis and control by donald coughanowr.3. Process dynamic and control by Thomas F.Edgar
A- Recommendedbooksand references(scientificjournals, reports…).	1. *Others:* Notebook prepared by the instructor of the course.
B-Electronic references, Internet sites…	2. Available websites related to the subject

12.Thedevelopmentof the curriculum plan

1-- Professional training and field studies
2- Scientific visits.

Instructor:
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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 programm specifications.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	English Language
4. Modes of Attendance offered	time Full
5. Semester/Year	2021/2020 Acdemic Year
6. Number of hours tuition (total)	60 hrs.(2 hrs. per week)
7. Date of production/revision of this specification	1/2/2021
8. Aim of the Course	
Exploring the English language with focus on reading, grammar, and vocabulary.	

9· Learning Outcomes, Teaching ,Learning and Assessment Method

Cognitive goals.

A1.Read English, understand, and summarize

A2. Read again, understand more, and summarize better.

B. The skillsgoalsspecialtothe course

B1.Develop the students' reading skills
B2. Develop the students' speaking skills

Teaching and Learning Methods

1.Facilitating the integration of knowledge, skills and attitudes o teaching and learning in groups
2. Facilitating learning and setting ground rules
3.Explaining

4. Group dynamics
5.Managing the group
6.Lectures
7. Small group teaching methods and discussion techniques

8. Seminars and tutorials

Assessment methods

1. Exams. This includes mid-term exams, final exams, and tests at the end of course units. The best tests include several types of questions – short answer, multiple-choice, true-false, and short essay – to allow students to fully demonstrate what they know.
2. Papers, projects, and presentations. These give students the chance to go deeper with the material to put the knowledge they've acquired to use or create something new from it. This level of application is an extremely important and often overlooked part of the learning process. These types of projects also give students who do not test well a chance to shine.
3. Portfolios. Submitting a portfolio at the end of a course can be a powerful way for students to see the progress they've made. More than just a collection of students' work from the semester, good portfolios also include reflections on their learning. Asking students to spell out the concepts or techniques used with each piece, the themes addressed, and hurdles faced also brings a sense of completion to the learning process

C. Affective andvaluegoals

C1.Thinking Skills are the mental processes we use to do things like: solve problems, make decisions, ask questions, make plans, pass judgements, organise information and create new ideas.
C2. Starting lessons with a puzzle or game can be a useful warm-up, but another possibility is to try some brain gym, a series of exercises and massage routines designed to increase the supply of oxygen to the brain and improve mental alertness
C3. Learn the students to use Mind-maps method which can be a useful tool for note-taking or revision, for thinking through a complex problem or for presenting information to others.

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

D1. Setting appropriate achievement levels can ensure that all students attain the adequate level of transferable skills for a qualification that will allow them to work in their chosen occupation. Achievement levels need to be set based on industry participation and should be reviewed regularly.
D2. **Making learning environments as "real' as possible**
D3. To create a well-functioning, credible assessment system, students' assessment records will have to be stored and made accessible to relevant stakeholders. Having students retake tests to assess their transferable skills when, for instance, changing schools, can create frustration and cynicism about the system

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	A1,B1 A2, B2	Unit 1/It's a wonderful world	1-12 of	1 – 3
2	2	A1,B1 A2, B2	Unit 2 Get happy	1-12 of	1 – 3
3	2.	A1,B1 A2, B2	Unit 3 Telling tales	1-12 of	1 – 3
4	2	A1,B1 A2, B2	Unit 4 Doing the right thing	1-12 of	1 – 3
5	2	A1,B1 A2, B2	Unit 5 On the move	1-12 of	1 – 3
6	2	A1,B1 A2, B2	Unit 6 I just love it	1-12 of	1 – 3
7	2	A1,B1 A2, B2	Unit 7 The world of work	1-12 of	1 – 3
8	2	A1,B1 A2, B21	Unit 8 Just imagine	1-12 of	1 – 3
9	2	A1,B1 A2, B21	Unit 9 Relationsships	1-12 of	1 – 3
10	2	A1,B1 A2, B2	Unit 10 Obsession	1-12 of	1 – 3
11	2	A1,B1 A2, B2	Unit 11 Tell me about it	1-12 of	1 – 3
12	2	A1,B1 A2, B2	Unit 12Life's great events	1-12 of	1 – 3
13	2	A1,B1 A2, B2	English Activity 1	1-12 of	1 – 3
14	2	A1,B1 A2, B2	English Activity 2	1-12 of	1 – 3
15	2	A1,B1 A2, B2	English Activity 3	1-12 of	1 – 3

16	2	A1,B1 A2, B2	English Activity 4	1-12 of	1 – 3
17	2	A1,B1 A2, B2	English Activity 5	1-12 of	1 – 3
18	2	A1,B1 A2, B2	English Activity 6	1-12 of	1 – 3
19	2	A1,B1 A2, B2	English Activity 7	1-12 of	1 – 3
20	2	A1,B1 A2, B2	English Activity 8	1-12 of	1 – 3
21	2	A1,B1 A2, B2	English Activity 9	1-12 of	1 – 3

11. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	***Textbook*** New Headway Intermediate Student's Book By Liz and John Soars
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures , internship , field studies)	Available websites related to the subject, Video, Seminars, field trips

12. Admissions

Instructor:
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TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

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 programme specification.

1. Teaching Institution	College of Engineering University of Baghdad
2. University Department/Centre	Chemical Engineering Department (CHED)
3. Course title/code & Description	Engineering Analysis/ CHE 331 This course concerns with a method of analysis and solution of differential equation. The topics covered are: 1st order differential equations, 2nd order differential equations, Frobineous method, Higher order differential equations, Simultaneous differential equations, Partial differential equations, Laplace transform, Mathematical modelling, Finite differences (application on chemical engineering systems) with multiple steps. The course is taught through 4 hrs per week, 3 theories, and 1 tutorial.
4. Programme(s) to which it Contributes	Chemical Engineering Department (CHED)
5. Modes of Attendance offered	Annual System; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.

6. Semester/Year	1st & 2nd Semesters/Academic Year 2020 – 2021
7. Number of hours tuition (total)	120 hrs. / 4 hrs. per week
8. Date of production/revision of this specification	1 – 10 – 2020

9. Aims of the Course

The aims of the course are:

1. To develop and understanding the methods to solve differential equations.
2. To build students capacity in modeling and solving chemical engineering problems.
3. To present the basic transport equations and to apply these equations practically.
4. To build the capacity in the design of equipment.

10· Learning Outcomes

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

a) Know how to solve the different types of 1st order differential equations using different types of methods.
b) Know how to solve the different types of 2nd order differential equations using different types of methods.
c) Know how to use different techniques to solve partial differential equations
d) Build students capacity in modeling and solving chemical engineering problems.
e) Be familiar with the momentum, heat and mass transport equations and able to use the relevant equations in solving the problems
f) Identify, formulate and solve analysis problems.
g) Understand how to use the initial and boundary conditions.
h) Be able to apply modern knowledge and to apply mathematics, science, engineering and technology to unit operation problems and applications.
i) Work in groups and function on multi-disciplinary teams.
j) Understand professional, social and ethical responsibilities.
k) Communicate effectively.

11. Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and assignments
4. Tests and Exams
5. In-Class questions and discussions

6. Connection between theory and application
7. Seminars
8. In- and Out-Class oral conservations
9. Reports, presentations, and posters

12. Assessment Methods

1. Examinations, Tests, and Quizzes.
2. Extracurricular activities and homework.
3. Student engagement during lectures.

13. Grading Policy

Two Major Exams	15%
Quizzes and homework	10%
Attendance & Class participation	5%
Final Exam	70%
Total	**100%**

14. Course Structure

Week	Hours	Learning Outcomes (Article 10)	Unit Module/Topic	Teaching Method (Article 11)	Assessment Method (Article 12)
1	4 3 theo. 1 tut.	a, f, g, h, i, j, k	Introduction to Engineering Analysis	1	3
٢	4 3 theo. 1 tut.	a, f, g, h, i, j, k	1st order differential equations	1-6	1-3
٣	4 3 theo. 1 tut.	a, f, g, h, i, j, k	Using different methods to solve 1st Order D.E.	1-9	1-3
٤	4 3 theo. 1 tut.	a, f, g, h, i, j, k	Using different methods to solve 1st Order D.E.	1-9	1-3
٥	4 3 theo. 1 tut.	b, f, g, h, i, j, k	2nd Order differential equations	1-9	1-3
٦	4 3 theo. 1 tut.	b, f, g, h, i, j, k	2nd Order Non-linear D.E.	1-9	1-3
٧	4 3 theo. 1 tut.	b, f, g, h, i, j, k	2nd Order Non-linear D.E.	1-9	1-3
٨	4 3 theo. 1 tut.	b, f, g, h, i, j, k	2nd order linear D.E.	1-9	1-3
٩	4 3 theo. 1 tut.	b, f, g, h, i, j, k	Using different methods to solve 2nd order linear D.E.	1-9	1-3
١٠	4 3 theo. 1 tut.	b, f, g, h, i, j, k	Using different methods to solve 2nd order linear D.E.	1-9	1-3
١١	4 3 theo. 1 tut.	b, f, g, h, i, j, k	Solving 2nd order linear D.E. using Frobenius	1-9	1-3
١٢	4 3 theo. 1 tut.	b, f, g, h, i, j, k	Solving 2nd order linear D.E. using Frobenius	1-9	1-3
١٣	4 3 theo. 1 tut.	b, f, g, h, i, j, k	Higher order D.E.	1-9	1-3
١٤	4 3 theo. 1 tut.	b, f, g, h, i, j, k	Simultaneous D.E.	1-9	1-3
١٥	4 3 theo. 1 tut.	c, f, g, h, i, j, k	Introduction to Partial Differential Equations	1-9	1-3
١٦	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Partial Differential Equations	1-9	1-3

١٧	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Solving P.D.E using separation of variables	1-9	1-3
١٨	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Solving P.D.E using changing of variables	1-9	1-3
١٩	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Introduction to Laplace Transformation	1-9	1-3
٢٠	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Solving D.E using L.T.	1-9	1-3
٢١	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Solving D.E using L.T.	1-9	1-3
٢٢	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Solving D.E using L.T.	1-9	1-3
٢٣	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Partial differential equations by L.T.	1-9	1-3
٢٤	4 3 theo. 1 tut.	a, b, c, f, g, h, i, j, k	Partial differential equations by L.T.	1-9	1-3
٢٥	4 3 theo. 1 tut.	d, e, f, g, h, i, j, k	Introduction to mathematical modeling	1-9	1-3
٢٦	4 3 theo. 1 tut.	d, e, f, g, h, i, j, k	Mathematical Modeling	1-9	1-3
٢٧	4 3 theo. 1 tut.	a, b, c, d, e, f, g, h, i, j, k	Mathematical Modeling	1-9	1-3
٢٨	4 3 theo. 1 tut.	a, b, c, d, e, f, g, h, i, j, k	Mathematical Modeling	1-9	1-3
٢٩	4 3 theo. 1 tut.	a, b, d, e, f, g, h, i, j, k	Finite Difference	1-9	1-3
٣٠	4 3 theo. 1 tut.	a, b, d, e, f, g, h, i, j, k	Finite Difference	1-9	1-3

15. Infrastructure

Required reading:
· CORE TEXTS
· COURSE MATERIALS
· OTHER

Text Books:

1. Jensen, V.G., Jeffery, G.V. - Mathematical Methods in Chemical Engineering.
2. Arvind V. and Massimo M. - Mathematical Methods in Chemical Engineering by

References:

1. Rice, R.G., Do, D.D. - Applied Mathematics and Modeling for

	Chemical Engineers. 2. Mickley, H.S., Sherwood, T.K., Reed, C.E. – Applied Mathematics in Chemical Engineering ***Others:*** 1. Notebook prepared by the instructor of the course 2. Collection of sheets of solved and unsolved problems and Exams sheets
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Available websites related to the subject 2. Excel or similar software for the solution of lengthy problems.
Community-based facilities (include for example, guest Lectures , internship , field studies)	1. Field and scientific visits 2. Extra lectures by foreign guest lecturers
16. Admissions	
Pre-requisites	CHE121, CHE221, CHE241, CHE342, CHE 343, and CHE345.
Minimum number of students	-
Maximum number of students	60
17. Course Instructors	**Dr. Hasan Ferhood Makki** Assistant Professor Chemical Engineering Department College of Engineering University of Baghdad Tel: +00964-7805196147 Email: hs_fmfm@yahoo.com drhasanf.m@coeng.uobaghdad.edu.iq

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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 programme specification.

1. Teaching Institution	College of Engineering University of Baghdad
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	**Engineering Drawing/CHE131**
4. Programme(s) to which it contributes	Chemical Engineering Program
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 24-week regular subjects.
6. Semester/Year	1st & 2nd / Academic Year 2020 – 2021
7. Number of hours tuition (total)	90 hrs. / 3 hrs. per week
8. Date of production/revision of this specification	28/11/ 2020
9. Aims of the Course 1- Learning the basic principles of engineering drawing. 2- Develop the student's skills in using tools to draw the engineering shapes. 3- Knowing the types and uses of lines and the difference between them. 4- Understand how to measure, read and put appropriate dimensions and how to distribute dimensions on the shapes inside the sheet. 5- Learning and training students to read the engineering shapes and to dissociate and gather the parts by drawing the projections and sections and then isometric drawing.	

6- The ability to grow and small the shapes in suitable scale.
7- Finally, the student being able to bring out an engineering sheet arranged by geometric art assets through implementation of several applications on engineering operations.

10· Learning Outcomes

At the end of the class, the student will be able to:

a) Know and understand the basic principles of engineering drawing.
b) Understand and apply the right use of the drawing tools.
c) Read and understand the drawing sheets.
d) Conclude of projections and sections that lead to extend the mind and imagination of students.
e) Gather the parts or projections and sections to reach and find the final design for the shape.
f) Draw perfect engineering drawing sheets.
g) Grow and minimize any part or shape.
h) Have communication skills with references and designers.
i) Implement the panel with all engineering requirements (as a designer) that accepted in the field of work, and that reflect the skills that trains them.

Teaching and Learning Methods

1. Lectures.
2. Classwork in the atelier.
3. Homework and assignments.
4. Tests and exams.
5. In-Class questions and discussions.
6. Connection between theory and application.

Assessment methods

1. Examinations, tests, and quizzes.
2. Extracurricular activities.
3. Student engagement during lectures.
4. Responses obtained from students.

11. Course Structure					
Week	**Hours**	**LOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
1	3 1 the. 2 draw	a,b	Introduction , references, tools	1 – 6	1 - 4
2	3 1 the. 2 draw	a,b	Border and title of the sheet, the kind of lines, symbols	1 – 6	1 - 4
3	3 1 the. 2 draw	a,g	Scales of drawing, letters and numbers, free hand drawing	1 – 6	1 - 4
4	3 1 the. 2 draw	c,f	Engineering process	1 – 6	1 - 4
5	3 1 the. 2 draw	c,f	Engineering process	1 – 6	1 - 4
6	3 1 the. 2 draw	c,f	Engineering process	1 – 6	1 - 4
7	3 1 the. 2 draw	c,f	Engineering process	1 – 6	1 - 4
8	3 1 the. 2 draw	a,c,f	Dimensions	1 – 6	1 - 4
9	3 3 draw		Quarterly exam (1)		
10	3 1 the. 2 draw	d,f,h,i	Projection, conclusion of third dimension	1 – 6	1 - 4
11	3 1 the. 2 draw	d,f,h,i	Projection, conclusion of third dimension	1 – 6	1 - 4
12	3	d,f,h,i	Projection, conclusion	1 - 6	1 - 4

	1 the. 2 draw		of third dimension		
13	3 1 the. 2 draw	d,f,h,i	Projection, conclusion of third dimension	1 – 6	1 - 4
14	3 1 the. 2 draw	d,f,h,i	Sections	1 – 6	1 - 4
15	3 1 the. 2 draw	d,f,h,i	Sections	1 – 6	1 - 4
16	3 1 the. 2 draw	d,f,h,i	Sections	1 – 6	1 - 4
17	3 1 the. 2 draw	d,f,h,i	Sections	1 – 6	1 - 4
18	3 1 the. 2 draw	e,f,h,i	Computer drawing (Auto Cad)	1 – 6	1 - 4
19	3 1 the. 2 draw	e,f,h,i	Computer drawing (Auto Cad)	1 – 6	1 - 4
20	3 1 the. 2 draw	e,f,h,i	Computer drawing (Auto Cad)	1 – 6	1 - 4
21	3 1 the. 2 draw	e,f,h,i	Computer drawing (Auto Cad)	1 – 6	1 - 4
22	3 3 draw		Quarterly exam (2)		

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	**Textbook** Engineering Drawing by Abul-Rasol Alkhaffaf **References** 1. Boundy, A.W. Engineering Drawing McGraw-Hill. New York.1990. 2. M. B. Shah and B.C. Rana, Engineering Drawing, Sai Print-O-Pac Pvt. Ltd, India, 2009. 3. Er. R. K. Dhawan, A text Book of Engineering Drawing, S. Chand Publishing, 2008. **Others** 1. Notebook prepared by the instructor of the course. 2. Collection of tutorial sheets of solved and unsolved problems and Exams questions
Special requirements (include for example workshops, periodicals, IT software, websites)	Available websites related to the subject
Community-based facilities (include for example, guest Lectures , internship , field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	100

Instructor

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1. Teaching Institution	College of Engineering /University of Baghdad
2. University Department/Centre	Chemical Engineering Department
3. Course title/ description	Equipment design This course introduces the basic principles and design procedure for different chemical engineering equipment. The design is based on past experience and empirical correlations. These units are heat transfer equipment, shell and tube heat exchanger, condenser, reboilers, vaporizers, packed bed columns, tray columns, absorbers, strippers, distillation columns, and catalytic packed bed reactor. Finally, mechanical design of pressure vessels are extensively demonstrated. The course is taught through 3 theoretical hrs.
4. Program (s) to which it contributes	Chemical Engineering
5. Modes of Attendance offered	Semesters System. The delivery mode is the "Day Program". Also the “Online Program” mode is used for explaining more details. The students are full time students. The academic semester is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd Semesters/Academic Year 2020-2021
7. Number of hours tuition (total)	90 hrs. /3 hrs. per week
8. Date of production/revision of this specification	2021-2-3

9. Aim of the course

1- To know the types of heat exchangers, and to learn the important design considerations, the importance of proper arrangement of heat exchanger and where to assign process and service fluids for a given duty.
2- To learn how to design different types of heat exchangers offering good heat transfer and low pressure drop
3- To understand the fundamentals of condensation and boiling heat transfer. Also to recognize the configurations of condensers, reboilers, and vaporizers as different types of heat transfer equipment. And to learn the design procedure for calculation the size of these units.
4- To learn the difference between the packed and plate column (as a mass transfer equipment) according to different design considerations and process fluids.
5- To learn how to design packed bed absorber or stripper.
6- To recognize the configuration and component parts of plate distillation columns.

7- To learn how to design plate distillation columns including components parts.
8- To design the catalytic fixed bed reactors using space velocity.
9- To learn how to make the complete mechanical design for pressure vessel including heads and supports.

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 program specification.

10. Learning Outcomes

At the end of the class the student will be able to:

a- Understand how to make the proper arrangement of a heat exchanger without phase change following design consideration for a given duty offering good heat transfer and low pressure drop.
b- Design heat exchanger specifying number of tubes, diameter, length, and shell diameter following standards and offering good heat transfer and low pressure drop.
c- Understand how to design condensers, reboilers and vaporizers considering good overall heat transfer coefficient and low pressure drop.
d- Design packed bed absorber or stripper using random packing specifying the diameter and height of the required column and a certain recovery and feed concentration.
e- Learn how to calculate the number of actual plates in distillation columns using empirical equations.
f- Learn how to calculate the diameter of a plate distillation columns
g- Calculate the flooding point, weep point, weir liquid crest, weir height, and weir length at a certain allowable pressure drop.
h- Design the catalytic fixed bed reactors using space velocity method.
i- Make the complete mechanical design and calculations of the thickness required for pressure vessels and for flat or domed heads.
j- Be familiar with different types of vessel support.
k- Work in groups and function on multi-disciplinary teams.
l- Identify, formulate and solve engineering equipment design problems.
m- Understand professional, social, and ethical responsibilities.
n- Communicate effectively.
o- Use the techniques, skills, and modern engineering tools necessary for engineering practice in design applications.

11. Teaching and Learning Methods

1.Lectures
2.Tutorials
3. Presentations, sketches and posters for units and its individual components.
4. Scientific videos of different individual units.
5.Homework and assignments
6.Tests and Exams
7.In-class questions and discussions
8.Connection between theory and application
9. field trips

10. Extracurricular activities.
11. Seminars.
12. In and out-class oral conversations.

12. Assessment methods

1. Exams, Tests and Quizzes.
2. Student engagement during lectures
3. Responses obtained from students, questionnaire about curriculum and faculty member (instructor).
4. extracurricular activities

13. grading policy

1. Exams: there will be a minimum of two closed books and notes exam during the semester, will count 20% of the total course grade.
2. Quizzes: there will be at least one quiz during the semester. The quiz will count 5% of the total course grade
3. Class work: there will be at least two sets of classwork during the academic semester. The class work will count 5 % of the total course grade.
4. Final exam: it will be a comprehensive closed books and notes exam. It will take place on July 2021 from 9:00 AM to 12:00 PM in an academic room. The final exam will count 70% of the total course grade.

14. Course Structure					
Week	Hours	LOs (Article l0)	Unit/Module or Topic Title	Teaching Method (Article 11)	Assessment Method (Article 12)
1	3theo.	A,g,h,I,j,k	Heat transfer equipment, types of heat exchangers, shell and tube exchangers	1-12	1-3
2	3theo.	A,g,h,I,j,k	Design procedure of heat exchanger, tube side heat transfer coefficient and pressure drop	1-12	1-4
3	3theo.	A,b, g,h,I,j,k	Design procedure of heat exchanger, tube side heat transfer coefficient and pressure drop	1-12	1-4
4	3theo.	A,b, g,h,I,j,k	procedure of heat exchanger, tube side heat transfer coefficient and pressure drop	1-12	1-4
5	3theo.	C, g,h,I,j,k	Shell side heat transfer coefficient	1-12	1-4
6	3theo.	C, g,h,I,j,k	Shell side heat transfer coefficient	1-12	1-4
7	3theo.	C,g,h,I,j,k	Shell side heat transfer coefficient (kern's method)	1-12	1-4
8	3theo.	D, g,h,I,j,k	Design of condenser, horizontal and vertical	1-12	1-4
9	3theo.	D,g,h,I,j,k	Design of condenser, horizontal and vertical	1-12	1-4
10	3theo.	D,g,h,I,j,k	Design of vaporizers and reboilers	1-12	1-4
11	3theo.	E, g,h,I,j,k	Design of vaporizers and reboilers	1-12	1-4
12	3theo.	A,g,h,I,j,k	Continuous distillation: process description, design methods for binary systems	1-12	1-3
13	3theo.	A, g,h,I,j,k	Calculation of number of plates, low product concentrations, examples.	1-12	1-4
14	3theo.	A,b, g,h,I,j,k	Empirical correlation, minimum number of stages, minimum reflux ratio, plate efficiency	1-12	1-4

15	3theo.	C, g,h,I,j,k	Empirical correlation, minimum number of stages, minimum reflux ratio, plate efficiency, design procedure, examples.	1-12	1-4
16	3theo.	C, g,h,I,j,k	Approximate column sizing, plate spacing, column diameter, plate hydraulic design, plate areas, column diameter	1-12	1-4
17	3theo.	C,g,h,I,j,k	Distillation plate hydraulic design and plate areas	1-12	1-4
18	3theo.	C, g,h,I,j,k	Flooding entrainment, weep point, weir liquid crest, weir height, weir length, plate pressure drop	1-12	1-4
19	3theo.	D, g,h,I,j,k	Flooding entrainment, weep point, weir liquid crest, weir height, weir length, plate pressure drop	1-12	1-4
20	3theo.	D, g,h,I,j,k	Design of catalytic packed bed reactors using space velocity	1-12	1-4
21	3theo.	D, g,h,I,j,k	Design of catalytic packed bed reactors using space velocity	1-12	1-4
22	3theo.	E, g,h,I,j,k	Mechanical design, design of pressure vessels and the design of thin walled vessels under internal pressure.	1-12	1-4
23	3theo.	E, g,h,I,j,k j	Mechanical design, design of pressure vessels and the design of thin walled vessels under internal pressure.	1-12	1-4
24	3theo.	E, g,h,I,j,k	Mechanical design, cylinder shell design, spherical shells, and vessel supports	1-12	1-4
25	3theo.	E, g,h,I,j,k	Mechanical design, cylinder shell design, spherical shells, and vessel supports	1-12	1-4

26	3theo.	F, g,h,I,j,k	Mechanical design, cylinder shell design, spherical shells, and vessel supports	1-12	1-4

15. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Text Books: Chemical engineering , Coulson, Richardson &Sinnott, Vol.6. An introduction to chemical engineering design, Pergamon, press, Newyork, NY, 2003. References: -Process plant design by Backhurst and Harker, 1999. - Plant design and economics for chemical engineers by Peter and Timmerhaus 1991. - Chemical process equipment selection and design, James R. Couper W. Roy Penney, James R. Fair, Stanley M. Walas. 2nd ed. Butterworth Heinemann 2010 Others: 1- Notebook prepared by the instructor of the course 2- Collection of sheets of solved and unsolved problems and exams questions. 3- Scientific videos of industrial chemical plants. 4- Scientific videos of chemical equipment and the component parts 5- Images of chemical equipment and sketches.
Special requirements (include for example workshops, periodicals, IT software, websites)	1.Available websites related to the subject . 2.Excel or similar software for the solution of lengthy problems.
Community-based facilities (include for example, guest Lectures , internship , field studies)	1.Field and scientific visits. 2.Extra lectures by foreign guest lecturers.

16. Admissions	
Pre-requisites	
Minimum number of students	-
Maximum number of students	60
17. Course Instructors	
Lecturer Dr. Basma Ismael Waisi Chemical Engineering Department College of Engineering University of Baghdad Phone 07702906855 E-mail: basmawaisi@coeng.uobaghdad.edu.iq	

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 programme specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	Fluid Flow
4. Programme(s) to which it contributes	Chemical Engineering Program
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a “Day Program”. The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd / Academic Year 2020-2021
7. Number of hours tuition (total)	90 hrs. / 3 hrs. per week
8. Date of production/revision of this specification	2-2-2021
9. Aims of the Course	
1- The type of fluids and flow. 2- pressure measurements by simple manometer and Bourdon gauge 3- evaluation of volumetric flow rates and average velocities 4- Applications of Bernoulli's equation, evaluation of head losses in pipes. 5- The utilization of flow rates devices. 6- Pumps and turbines with their efficiencies. 7- Flow of fluids in packed bed.	

10· Learning Outcomes, Teaching ,Learning and Assessment Methods

A- Knowledge and Understanding

A1.Calculate the pressure drop for any flow system by accurate methods.

A2. Define the types of fluids and being able for making dimensional analysis for different systems.

A3. Understand the difference in velocity distribution between laminar and turbulent flow.

A4. Being able of making energy balance for any system and knowing the basis for deriving Bernoulli equation.

A5. Measure the losses in the energy due to friction in pipes and fittings and due to sudden expansion or contraction.

A6. Knowing the different types of flow measurement devices for flow through pipes and open channels.

A7. Pumps definition and types, centrifugal pump relations, being able to locate the duty point and NPSH.

A8. Understand the flow through packed beds, and being able of measuring voidage and porosity and friction factor for flow through packed beds.

B. Subject-specific skills

B1. Solve Fluid Flow examples using numerical methods.

B2. Learn graphical methods to solve problems of any fluid flow system.

C. Thinking Skills

C1. Developing critical and creative thinking skills related to Fluid Flow.
C2. Using mathematical models.
C3. Analysis assumptions.

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

D1. Community affectivity.
D2. Work individually and team members in international and multidisciplinary teams.
D3. Understanding impact of engineering solutions in an environmental and social context.

Teaching and Learning Methods

1. Lectures.
2. Tutorials.
3. Homework and Assignments.
4. Tests and Exams.
5. In-Class Questions and Discussions.
6. Connection between Theory and Application.
7. Seminars.
8. In- and Out-Class oral conservations.

Assessment methods

1. Examinations, Tests, and Quizzes.
2. Extracurricular Activities.
3. Student Engagement during Lectures.
4. Responses Obtained from Students

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3 2 the. 1 tut.	A1	Introduction and units	1-8 of article (10)	1 – 4 of article (10)
2	3 2 the. 1 tut.	A1	Dimensional Analysis	1-8 of article (10)	1 – 4 of article (10)
3	3 2 the. 1 tut.	A2	Pressure measurement devices, simple and inclined manometer	1-8 of article (10)	1 – 4 of article (10)
4	3 2 the. 1 tut.	A2,B1	Differential manometer, Bourdon gauge	1-8 of article (10)	1 – 4 of article (10)
5	3 2 the. 1 tut.	A2,B1	Pressure balance	1-8 of article (10)	1 – 4 of article (10)
6	3 2 the. 1 tut.	A3,B1	Linear and average velocities for laminar flow	1-8 of article (10)	1 – 4 of article (10)
7	3 2 the. 1 tut.	A2,A3, B1	Linear and average velocities for turbulent flow	1-8 of article (10)	1 – 4 of article (10)
8	3 2 the. 1 tut.	A3,B1	Velocity distribution for laminar velocity	1-8 of article (10)	1 – 4 of article (10)
9	3 2 the. 1 tut.	A3	Velocity distribution for turbulent velocity	1-8 of article (10)	1 – 4 of article (10)
10	3 2 the. 1 tut.	A2,A3, B1	Continuity equation	1-8 of article (10)	1 – 4 of article (10)
11	3 2 the. 1 tut.	A3,A4, B1	Mass and volumetric flowrate	1-8 of article (10)	1 – 4 of article (10)
12	3 2 the. 1 tut.	A4,B1	Modified energy and Bernoulli equation	1-8 of article (10)	1 – 4 of article (10)
13	3 2 the. 1 tut.	A4,B1	Energy losses calculation and friction factor	1-8 of article (10)	1 – 4 of article (10)

14	3 2 the. 1 tut.	A5,B1	Head loss due to friction	1-8 of article (10)	1 – 4 of article (10)
15	3 2 the. 1 tut.	A6,B1	Orifice and venture flowrate devices	1-8 of article (10)	1 – 4 of article (10)
16	3 2 the. 1 tut.	A6,B1	Pitot tube and Nozzles	1-8 of article (10)	1 – 4 of article (10)
17	3 2 the. 1 tut.	A6	Rotameter	1-8 of article (10)	1 – 4 of article (10)
18	3 2 the. 1 tut.	A7	Pumps and centrifugal pumps	1-8 of article (10)	1 – 4 of article (10)
19	3 2 the. 1 tut.	A7	Systematic and characteristic curves	1-8 of article (10)	1 – 4 of article (10)
20	3 2 the. 1 tut.	A5	NPSH and pump relations	1-8 of article (10)	1 – 4 of article (10)
21	3 2 the. 1 tut.	A7	Duty point, pumps in series and in parallel	1-8 of article (10)	1 – 4 of article (10)
22	3 2 the. 1 tut.	A8	Packed bed ,voidage and porosity	1-8 of article (10)	1 – 4 of article (10)
23	3 2 the. 1 tut.	A8	Volumetric flowrate, average velocity and equivalent diameter	1-8 of article (10)	1 – 4 of article (10)
24	3 2 the. 1 tut.	A8	Reynolds number in packed bed and pressure drop in packed bed	1-8 of article (10)	1 – 4 of article (10)

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	***Textbook*** 1.F.A. Holland and R. Bragg , Fluid Flow for chemical 2. J.M. Coulson and J.F. Richardson, Fluid flow, heat transfer and mass transfer, sixth edition, vol.1, 1991. ***References*** 1. Er. R. K. Rajput, A Textbook of Fluid Mechanics and Hydraulic machines, S.

	CHAND & COMPANY LTD ***2.*** R. Darby, chemical engineering fluid mechanics, second edition, New York, 2001 ***<u>Others</u>*** 3. Notebook prepared by the instructor of the course. 4. Collection of tutorial sheets of solved and unsolved problems and Exams questions
Special requirements (include for example workshops, periodicals, IT software, websites)	Available websites related to the subject
Community-based facilities (include for example, guest Lectures , internship , field studies)	Field and scientific visits

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	75

Instructor:
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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 programme specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	Heat transfer
4. Programme(s) to which it contributes	Chemical Engineering Program
5. Modes of Attendance offered	Annual System ; "Day Program online lessons". The students are full time students. The academic year is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd / Academic Year 2020 – 2021
7. Number of hours tuition (total)	120 hrs. / 4 hrs. per week
8. Date of production/revision of this specification	

9. Aims of the Course
The aims of the course are: 1. Introduction to heat transfer. 2. Conduction 3. Convection 4. Radiation 5. Condensation and boiling 6. Heat exchanger

10· Learning Outcomes, Teaching,Learning and Assessment Method

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

1. Understand the modes of heat transfer.
2. Be familiar with the problems in heat transfer, and their methods of solving.
3. Understand the steady and unsteady process of conduction heat transfer.
4. Be familiar with the free and forced convection.
5. Be familiar with radiation and its application.
6. Understand the heat exchanger, its design and calculation.

Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework
5. Tests and exams.
6. Class discussion.
7. Seminars.
8. Reports, presentations and posters.

Assessment methods

Examinations, Tests, and Quizzes.
Extracurricular activities and homework.
Student engagement during lectures.

11. Course Structure

Week	Hours	Learning Outcomes (Article 10)	Unit Module/Topic	Teaching Method (Article 11)	Assessment Method (Article 12)
1	4 2 theo. 2 tut.	a, l, m, n, o, p, q	Introduction to heat transfer	1	3
2	4 2 theo. 2 tut.	a, b, m, n, o, p, q	Steady state conduction one dimension	1-6	1-3
3	4 2 theo. 2 tut..	b, c, m, n, o, p, q	Plane wall, radial systems	1-9	1-3

			Overall heat transfer coefficient		
4	4 2 theo. 2 tut.	b, c, d, m, n, o, p, q	Composite walls and insulation	1-9	1-3
5	4 2 theo. 2 tut.	b, c, d, m, n, o, p, q	Heat source systems; plane wall and cylinders	1-9	1-3
6	4 2 theo. 2 tut..	b, e, m, n, o, p, q	Conduction-convection systems fins	1-9	1-3
7	4 2 theo. 2 tut.	e, f, m, n, o, p, q	Steady state conduction-multiple dimensions	1-9	1-3
8	4 2 theo. 2 tut.	e, m, n, o, p, q	Mathematical, graphical and numerical methods of analysis	1-9	1-3
9	4 2 theo. 2 tut.	e, f, g, h, i, k, m, n, o, p, q	Unsteady state conduction, lumped heat capacity and application	1-9	1-3
10	4 2 theo. 2 tut.	e, f, g, h, i, k, m, n, o, p, q	Semi-infinite solids	1-9	1-3
11	4 2 theo. 2 tut.	e, f, k, m, n, o, p, q	Convection boundary conditionsn	1-9	1-3
12	4 2 theo. 2 tut.	e, f, k, m, n, o, p, q	Heisler charts and application	1-9	1-3
13	4 2 theo. 2 tut.	e, f, k, m, n, o, p, q	Heisler charts and application	1-9	1-3
14	4	e, f, g, h, i, k,	Principles of	1-9	1-3

	2 theo. 2 tut.	m, n, o, p, q	convection		
15	4 2 theo. 2 tut.1 tut.	e, f, g, h, i, k, m, n, o, p, q	boundary layer theory, momentum and thermal boundary layer	1-9	1-3
16	4 2 theo. 2 tut.1 tut.	e, f, g, h, i, k, m, n, o, p, q	Isothermal heat flux	1-9	1-3
17	4 2 theo. 2 tut.1 tut.	g, h, i, k, m, n, o, p, q	constant heat flux	1-9	1-3
18	4 2 theo. 2 tut.1 tut.	g, h, I, m, n, o, p, q	Heat transfer in laminar tube flow	1-9	1-3
19	4 2 theo. 2 tut.1 tut.	J, k, m, n, o, p, q	Empirical and practical relations for forced convection	1-9	1-3
20	4 2 theo. 2 tut.1 tut.	J, k, m, n, o, p, q	Empirical relations for pipe and tube flow Bulk temperature, hydraulic diameter	1-9	1-3
21	4 2 theo. 2 tut.1 tut.	J, k, m, n, o, p, q	Calculation of heat transfer coefficient using different relations of Nusselt number for isothermal and constant heat flux Flow across cylinders and spheres	1-9	1-3
22	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Natural convection	1-9	1-3

			systems Flat plate		
23	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Empirical relations for vertical plane and cylinders Isothermal and constant heat flux	1-9	1-3
24	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Free convection from horizontal plates Free convection from spheres	1-9	1-3
25	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Condensation and boiling and application	1-9	1-3
26	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Condensation and boiling and application	1-9	1-3
27	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Heat exchangers, types, design, log mean temp. difference, Correction factor NTU	1-9	1-3
28	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Heat exchangers design	1-9	1-3
29	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Log mean temp. difference	1-9	1-3
30	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	Correction factor NTU	1-9	1-3

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	**Text Books:** 1. HEAT TRANSFER By J.P. Holman **Others:** 1. Notebook prepared by the instructor of the course 2. Collection of sheets of solved and unsolved problems and Exams sheets

13. Admissions	
Pre-requisites	
Minimum number of students	/
Maximum number of students	60

Instructor

Prof. Dr. Basma Abbas Abdulmajeed
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Teaching Assistant:
Hassan Abdulkadhim
Asst. Lecturer
Chemical Engineering Department
College of Engineering
University of Baghdad

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 program specification.

1. Teaching Institution	Ministry of higher education/University of Baghdad
2. University Department/Centre	University of Baghdad /College of Engineering/ Chemical Engineering Dept.
3. Course title/code	Industrial Management / 322
4. Modes of Attendance offered	Annual System. The students attend full day program in on line mode using Google class room. The academic year is composed of 30 week.
5. Semester/Year	1st & 2nd / Academic Year 2020 – 2021
6. Number of hours tuition (total)	60hrs. / 2 hrs. per week
7. Date of production/revision of this specification	1-9-2020
8. Aims of the Course	

The aims of the course:

1. **The student will have the skills as a project manager.**
2. **The ability to transform industrial problems to linear programming models and find the optimal solution.**
3. **To deal with unexpected events during the production process.**
4. **To make the right decision of industrial problems to find the maximum profit or minimum cost; such as; assignment, transportation, blending and petroleum refinery problems; such as crude oil distillation; and others.**

5. **Calculate the project time.**
6. **Study how to prevent any delay in project** accomplishes **time.**

9· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Cognitive goals:

A1. The student will have the skills as a project manager:
A2. To convert practical industrial problems to linear programming models.
A3. To Find the optimal solution of the models.
A4. To under stand the duality theory models to the dual form.

A5. The student will be able to deal with unexpected events during the production processes by post –optimally analysis.

A6. To find the minimum cost of the transportation problems.
A7. To make the right decision of assignment problems.
A8. To calculate the project time by studying the net work models.

A9.To find the critical path to prevent any delay in the project accomplishes time.

A10. To study and modeling of important industrial applications, such as, blending of gasoline and petroleum refinery problems.

B. The skills goals special to the course
B1. Modeling of optimization problems.
B2. Studying linear programming methods.

Teaching and Learning Methods
On line learning using Google class room (pdfs , videos & record of on line lectures) .

Assessment methods :
On line discussions using Telegram channel and Google class room

C. Affective and value goals:

C1. Developing critical and creative thinking skills related to optimization problems.
C2. Modeling of industrial problems.
C3.Deal with un-expected events.

Teaching and Learning Methods

1. Lectures.
2. Tutorials.
3. Home and class works and Assignments.
4. Quizzes and Exams.
5. On -line Questions and Discussions.
6. Report.
7. Connection between Theory and Application.
8. Field Trips.
9. Seminars.
10. In- and out- oral conservations on Google class room.

Assessment methods

1. Examinations and Quizzes.
2. Extracurricular Activities.
3. Student Engagement during Lectures.
4. Responses Obtained from Students

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

D1. Community affectivity.
D2. Work individually and team members in international and multidisciplinary teams.
D3. Understanding impact of engineering solutions in an environmental and social context.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	A1	**Concepts Principles, Development, Assumptions (LP)**	1-9 of article (10)	1 – 4 of article (10)
2	2	A1,2,3, B1,2	**General statement , Modeling , Standard Form**	1-9 of article (10)	1 – 4 of article (10)
3	1 the. 1 tut.	A1,2,3, B1,2	**Graphical Method**	1-9 of article (10)	1 – 4 of article (10)
4	1 the. 1 tut.	A1,2,3, B1,2	**Simplex Method**	1-9 of article (10)	1 – 4 of article (10)
5	2 1 the. 1 tut.	A1,2,3, B1,2	**Big M-Technique**	1-9 of article (10)	1 – 4 of article (10)
6	2 1 the. 1 tut.	A1,2,3, B1,2	**Two-Phase Method**	1-9 of article (10)	1 – 4 of article (10)
7	2 1 the. 1 tut.	A1,2,3, B1,2	**Algebric Method**	1-9 of article (10)	1 – 4 of article (10)
8	2 1the. 1 tut.	A1,2,3, B1,2	**Special Cases of LP: Degeneracy, Alternative Solutions**	1-9 of article (10)	1 – 4 of article (10)
9	2 1 the. 1 tut.	A1,2,3, B1,2	**Unbounded Solutions, No feasible Solution**	1-9 of article (10)	1 – 4 of article (10)
10	2	A1,2,3,4, B1,2	**The Dual Model, Duality**	1-9 of article (10)	1 – 4 of article (10)
11	2 1 the. 1 tut.	A1,2,3,4, B1,2	**The Dual Simplex Method**	1-9 of article (10)	1 – 4 of article (10)
12	2	A1,2,3, 5,	**Post Optimally**	1-9 of	1 – 4 of article

	1 the. 1 tut.	B1,2	**Analysis(graphically)**	article (10)	(10)
13	2 1 the. 1 tut.	A1,2,3, 5, B1,2	**Post Optimally Analysis(simplex method)**	1-9 of article (10)	1 – 4 of article (10)
14	2	A1,2,3, 6, B1,2	**Transportation problems: Model**, Matrix	1-9 of article (10)	1 – 4 of article (10)
15	2 1 the. 1 tut.	A1,2,3, 6, B1,2	**The North-West the Least cost and VAM methods**	1-9 of article (10)	1 – 4 of article (10)
16	2 1 the. 1 tut.	A1,2,3, 6, B1,2	**The Un- Balanced Model**	1-9 of article (10)	1 – 4 of article (10)
17	2 1 the. 1 tut.	A1,2,3 ,6, B1,2	**The Stepping Stone Method**	1-9 of article (10)	1 – 4 of article (10)
18	2 1 the. 1 tut.	A1,2,3, 6, B1,2	**Modified Distribution Method**	1-9 of article (10)	1 – 4 of article (10)
19	2	A1,2,3,7, B1,2	**The Assignment Problems: The Model ,Matrix**	1-9 of article (10)	1 – 4 of article (10)
20	2 1 the. 1 tut.	A1,2,3,7, B1,2	**Complete Enumeration Method**	1-9 of article (10)	1 – 4 of article (10)
21	2 1 the. 1 tut.	A1,2,3,7, B1,2	**The Hungarian Method**	1-9 of article (10)	1 – 4 of article (10)
22	2	A1,2,3,7, B1,2	**Un- balanced model**	1-9 of article (10)	1 – 4 of article (10)
23	2	A1,2,3,6,7, B1,2	**LP Method , Transportation Method**	1-9 of article (10)	1 – 4 of article (10)
24	2	A1,8,9	**Network Models: Critical Path Method**	1-9 of article (10)	1 – 4 of article (10)
25	2	A1,8,9	**The Earliest &Latest Times**	1-9 of article (10)	1 – 4 of article (10)
26	2	A1,8,9	**Program Evaluation and Review Technique (PERT)**	1-9 of article (10)	1 – 4 of article (10)

27	2	A1,2,3,10, B1,2	**The Blending problem**	1-9 of article (10)	1 – 4 of article (10)
28	2	A1,2,3,10, B1,2	**Petroleum-refinery operations**	1-9 of article (10)	1 – 4 of article (10)
29	2	A1,2,3,10, B1,2	**Crude oil distillation modeling**	1-9 of article (10)	1 – 4 of article (10)
30	2	A1,2,3,10, B1,2	**Quality control & ISO**	1-9 of article (10)	1 – 4 of article (10)

11.Infrastructure	
1. Books Required reading:	1- Mokhta S. B.,"Linear Programming and Network Flows" 3rd Edition, 2005. 2- Ann J. H.," Linear Programming :An Emphasis on Decision Making", Wesley, 1973
2. Main references(sources)	1. عبـدّ ذيـاب جـزاع "بحـوث العمليـات" الطبعـة الثانيـة و١٩٨٦ 2. النعيمي،"بحوث العمليات"، الطبعة الأولى،١٩٩٩
A- Recommended books and references (scientific journals, reports…).	G. Hadley," Linear Programming" ,Wesley
B-Electronic references, Internet sites…	There are many websites related to the subject.

12. The development of the curriculum plan

Instructor: **Maha Muhyi Alwan Alhussaini**

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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 programme specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	**Mass transfer**
4. Programme(s) to which it contributes	Chemical Engineering Program
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd / Academic Year 2020 – 2021
7. Number of hours tuition (total)	120 hrs. / 4 hrs. per week
8. Date of production/revision of this specification	1-9-2020

9. Aims of the Course

The aims of the course are:

1. Understand the mass transfer theories.
2. Understand the diffusion, mass transfer coefficient, modes of diffusion.
3. Absorption process calculations for tray and packed towers.
4. Liquid –liquid extraction, principles, calculations.
5. Solid-liquid extraction process .principles to.
6. Distillation process from fundamentals to industrial application.
7. Drying process.
8. Evaporation process
9. Humidification process

10· Learning Outcomes, Teaching ,Learning and Assessment Method

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

a) Know the importance of unit operation in the design of most of the chemical engineering units.
b) Be familiar with the momentum, heat and mass transport equations and able to use the relevant equations in solving the problems
c) Recognize the analogy between momentum, heat and mass transport.
d) Understand the boundary layer theory.
e) Understand fluid-particle systems and equipment.
f) Understand fluid flow through packed.
g) Know various chemical engineering separation processes.
h) Select appropriate separation technique for intended problem.
i) Identify separations equipment of various types and their components.
j) Understand the mechanism of the separation .
k) Evaluate competing separation technologies on factors such as simplicity, reliability, and cost.
l) Be able to apply modern knowledge and to apply mathematics, science, engineering and technology to unit operation problems and applications.
m) Work in groups and function on multi-disciplinary teams.
n) Identify, formulate and solve unit operation problems.
o) Understand professional, social and ethical responsibilities.
p) Communicate effectively.
Use the techniques, skills, and modern engineering tools necessary for engineering practice in unit operation applications

Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Homework and assignments
4. Tests and Exams
5. In-Class questions and discussions
6. Connection between theory and application
7. Seminars
8. In- and Out-Class oral conservations
9. Reports, presentations, and posters

Assessment methods

1. Examinations, Tests, and Quizzes.
2. Extracurricular activities and homework.
3. Student engagement during lectures.

11. Course Structure

Week	Hours	Learning Outcomes (Article 10)	Unit Module/Topic	Teaching Method (Article 11)	Assessment Method (Article 12)
1	4 2 theo. 2 tut.	a, l, m, n, o, p, q	Introduction to mass transfer	1	3
2	4 2 theo. 2 tut.	a, b, m, n, o, p, q	diffusion	1-6	1-3
3	4 2 theo. 2 tut..	b, c, m, n, o, p, q	diffusion	1-9	1-3
4	4 2 theo. 2 tut.	b, c, d, m, n, o, p, q	diffusion	1-9	1-3
5	4 2 theo. 2 tut.	b, c, d, m, n, o, p, q	absorption	1-9	1-3
6	4 2 theo. 2 tut..	b, e, m, n, o, p, q	absorption	1-9	1-3
7	4 2 theo. 2 tut.	e, f, m, n, o, p, q	absorption	1-9	1-3
8	4 2 theo. 2 tut.	e, m, n, o, p, q	absorption	1-9	1-3
9	4 2 theo. 2 tut.	e, f, g, h, i, k, m, n, o, p, q	Liquid-liquid extraction	1-9	1-3
10	4 2 theo. 2 tut.	e, f, g, h, i, k, m, n, o, p, q	Liquid-liquid extraction	1-9	1-3
11	4 2 theo. 2 tut.	e, f, k, m, n, o, p, q	Liquid-liquid extraction	1-9	1-3
12	4 2 theo. 2 tut.	e, f, k, m, n, o, p, q	Liquid-liquid extraction	1-9	1-3
13	4 2 theo. 2 tut.	e, f, k, m, n, o, p, q	Solid-liquid extraction	1-9	1-3
14	4 2 theo. 2 tut.	e, f, g, h, i, k, m, n, o, p, q	Solid-liquid extraction	1-9	1-3
15	4 2 theo. 2 tut.1 tut.	e, f, g, h, i, k, m, n, o, p, q	Solid-liquid extraction	1-9	1-3

16	4 2 theo. 2 tut.1 tut.	e, f, g, h, i, k, m, n, o, p, q	Solid-liquid extraction	1-9	1-3
17	4 2 theo. 2 tut.1 tut.	g, h, i, k, m, n, o, p, q	distillation	1-9	1-3
18	4 2 theo. 2 tut.1 tut.	g, h, I, m, n, o, p, q	distillation	1-9	1-3
19	4 2 theo. 2 tut.1 tut.	J, k, m, n, o, p, q	distillation	1-9	1-3
20	4 2 theo. 2 tut.1 tut.	J, k, m, n, o, p, q	distillation	1-9	1-3
21	4 2 theo. 2 tut.1 tut.	J, k, m, n, o, p, q	distillation	1-9	1-3
22	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	distillation	1-9	1-3
23	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	drying	1-9	1-3
24	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	drying	1-9	1-3
25	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	drying	1-9	1-3
26	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	humidification	1-9	1-3
27	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	humidification	1-9	1-3
28	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	humidification	1-9	1-3
29	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	evaporation	1-9	1-3
30	4 2 theo. 2 tut.1 tut.	k, m, n, o, p, q	evaporation	1-9	1-3

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	**Text Books:** 1. Chemical Engineering Vol 1, J. M. Coulson and J. F. Richardson, Fifth Edition, Butterworth-Heinmann, 1998. 2. Chemical Engineering Vol 2, J. M. Coulson and J. F. Richardson, Fifth Edition, Butterworth-Heinmann, 2002. **References:** 1. Separation process principles, Henley ,Seader and Roper, third edition, John Wiley,2011 2. Principles of Mass Transfer, Kal Renganathan, PHI, 2007. 3. Mass Transfer, Koicki, Asano, Wiely-VCH, 2002. **Others:** 1. Notebook prepared by the instructor of the course 2. Collection of sheets of solved and unsolved problems and Exams sheets
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Laboratory experiments in the (Chemical Engineering Lab) 2. Available websites related to the subject 3. Excel or similar software for the solution of lengthy problems.
Community-based facilities (include for example, guest Lectures , internship , field studies)	1. Field and scientific visits 2. Extra lectures by foreign guest lecturers

13. Admissions	
Pre-requisites	
Minimum number of students	/
Maximum number of students	70

Instructor

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TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

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 programme specification.

1. Teaching Institution	College of Engineering University of Baghdad
2. University Department/Centre	Chemical Engineering Department(CHE232)
3. Course title/code & Description	Material Science / This course involves investigating the relationships that exist between the structures and properties of materials. Define the key mechanical properties of materials (tensile strength, yield strength, fatigue resistance, creep strength.
4. Programme(s) to which it Contributes	This programme contributes the graduated chemical engineers to get knowledge in the material science.
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on Campus. The academic semester is consists of 15-weeks for Material Science. The lectures take two hours per week.
6. Semester/Year	one semesters per year
7. Number of hours tuition (total)	Annual system consists of 30 hours

8. Date of production/revision of this specification	6 of February in 2021

9. Aims of the Course

The student will recognize uses of the common engineering alloys and other materials such as polymer, ceramic, etc. by depending on their properties (i.e. mechanical, physical properties, and their reactivity towered the surrounding). He also will able to predict the types of the mechanical failures that can occur during unit operation.

10· Learning Outcomes

The knowledge and skills expected to be attained by the student upon completion of the course. The student will be able to:

a. Review of the types of materials.
b. Review of the atomic structure and atomic bonding in the solid materials.
c. Understand the structure of the crystalline solid material (metals and alloys).
d. Learn how to obtain the mechanical properties of a metal or/and an alloy.
e. Select proper materials during designing equipment of the unit operation.
f. Understand the phase diagram and heat treatment of a metal or/and an alloy.
g. Understanding the metal processing and joining.
h. Understanding the corrosion of metals and alloys
i. Learn the types f corrosion
j. Learn estimating the corrosion rate
k. Knowing the methods of corrosion potection

11. Teaching and Learning Methods

1. Lectures.
2. Make matching between theories and applications.
3. Quizzes and Exams.
4. Case studies.
5.

12. Assessment Methods

There are four methods by which the students can be assessed

a. Several Quizzes and Homework.
b. Two exams per semester.
c. There one only case study for each group at the end of the semester in order to use their information for solving the problem in the industries. Each group consists of 3- 4 students.
d. Final exam at the end of the semester.

13. Grading Policy

The annual system consists of 0ne semester

10% per Semester Exam.
10% Semester Quizzes and Homework.
70% Final Exam.

14. Course Structure

Week	Hours	LOS Artical 10	Topic title	Teaching Method Article (11)	Assessment Method Article (12)
1/	2 the.	a	Introduction to the material science, Types of materials	1-3	a-d
2	2 the.	b	Atomic Structure, Atomic bonding in solid materials	1-3	a-d
3	2 the.	c	The structure of crystalline solids	1-3	a-d
4	2 the.	c	Metals and alloys, Metallic structure and alloying	1-3	a-d
5	2 the.	c	Crystal defects	1-3	a-d
6	2 the.	c	Direction in unit cells	1-3	a-d
7	2 the.	a,b,c	**First examination**	1-3	a-d
8	2 the.	c	Crystal structure analysis	1-3	a-d
9	2 the.	d , e	Mechanical properties of materials	1-3	a-d
10	2 the.	d , e	Mechanical properties of materials	1-3	a-d
11	2 the.	f	Phase diagram	1-3	a-d
12	2 the.	f	Phase diagram	1-3	a-d
13	2 the.	f	Heat-treatment of steel	1-4	a-d
14	2 the.	g	Metals processing and joining	1-4	a-d
15	2 the.	c,d,e,f,g	**Second examination**	1-4	a-d
16	2 the.	a	Introduction to the Corrosion	1-3	a-d

17	2 the.	a	Types of corrosion reactions	1-3	a-d
18	2 the.	a	Basic concept in corrosion	1-3	a-d
19	2 the.	a	Types/forms of corrosion	1-3	a-d
20	2 the.	a	Types/forms of corrosion	1-3	a-d
21	2 the.	b	Thermodynamic of corrosion	1-3	a-d
22	2 the.	b	Thermodynamic of corrosion	1-3	a-d
23	2 the.	a,b	**Third examination**	1-3	a-d
24	2 the.	c	Kinetic of Corrosion Reaction	1-3	a-d
25	2 the.	c	Kinetic of Corrosion Reaction	1-3	a-d
26	2 the.	d	Methods of corrosion protection	1-3	a-d
27	2 the.	d	Methods of corrosion protection	1-3	a-d
28	2 the.	c,d	Fourth examination	1-4	a-d
29	4-6 the	a,b,c,d, e,f	**Presentation of the case study**	1-4	a-d
30	4-6 the	a,b,c,d, e,f	**Presentation of the case study**	1-4	a-d

15. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	1. Materials Science and Engineering by William D. Callister. 2. Engineering Metallurgy by Higgins. 3. Mechanical Properties of Metals II. 4. Mechanical Testing and Properties. 5. . Corrosion and protection engineering materials 6. materials and processes by Einar Bardal. 7. Principles of corrosion Engineering and Corrosion Control by Zaki Ahmed. 8. Corrosion Engineering by Mars Fontana.
Special requirements (include for example workshops, periodicals, IT software, websites)	Solution of case study
Community-based facilities (include for example, guest Lectures , internship , field studies)	Lectures

16. Admissions

Pre-requisites	

Minimum number of students	
Maximum number of students	
17. Course Instructors	Assist teacher: Hassan A. Alwan Office: College of Eng./ Chemical. Eng. Dept. E.male: alwan_hassan@coeng.uobaghdad.edu.iq

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 program specification.

1. Teaching Institution	College of Engineering University of Baghdad
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Mathematics/CHE 111
4. Programme(s) to which it contributes	Chemical Engineering Department
5. Modes of Attendance offered	Annual system. There is only one mode of delivery, which is a "Day Program". The academic year is composed of 26-week regular subjects. 3-hour each week.
6. Semester/Year	(1^{st} and 2^{nd} semesters)/2020-2021
7. Number of hours tuition (total)	78 hrs./ 3hrs. per week
8. Date of production/revision of this specification	28/11/2020

9. Aims of the Course

1. To master algebraic topics introduced in precalculus and trigonometry.
2. To understand limits and investigate some of their basic properties.
3. To understand the basic relationship between tangent lines, rates of change, and the derivative.
4. To master the techniques of differentiation.
5. To become familiar with the standard applications of the derivative in physics, engineering, biology, chemistry, and economics.
6. To become familiar with parts of the theoretical framework that are appropriate at this level.
7. To understand the integral and its relation to the derivative.
8. To master techniques of integration for simple integrals and their application.
9. To understand numerical solution of the first of partial differential equations.

10· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Knowledge and Understanding: By the end of the course the student should be able to

A1- Work in groups and solving different problems.

A2- Understand professional social and ethical responsibilities

A3- Communicate effectively

B. Subject-specific skills

B1.Know the importance of mathematics in most of the chemical engineering problems.

B2.Understand the differentiation concepts

B3.Select appropriate technique for intended problem

B4. Identify formulate and solve chemical engineering problems

Teaching and Learning Methods

1- lectures
2- Tutorials
3- Homework
4- Tests and exams
5- In class questions and discussions

Assessment methods

1- Examinations, tests and quizzes.
2- Homework's.
3- Student engagement during lectures.

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Precalculus Review	1-5	1-3
2	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Precalculus Review	1-5	1-3
3	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Transcendental Functions	1-5	1-3
4	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Transcendental Functions	1-5	1-3
5	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Transcendental Functions	1-5	1-3
6	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Trigonometric functions	1-5	1-3
7	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Trigonometric functions	1-5	1-3
8	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Trigonometric functions	1-5	1-3
9	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Trigonometric functions	1-5	1-3
10	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Limits and Continuity	1-5	1-3
11	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Limits and Continuity	1-5	1-3
12	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Limits and Continuity	1-5	1-3
13	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4-B3	Derivatives	1-5	1-3

14	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4-B3	Derivatives	1-5	1-3
15	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4-B3	Derivatives	1-5	1-3
16	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4-B3	Derivatives	1-5	1-3
17	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Integration	1-5	1-3
18	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Integration	1-5	1-3
19	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Integration	1-5	1-3
20	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Integration	1-5	1-3
21	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Integration	1-5	1-3
22	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Application of derivatives and integration	1-5	1-3
23	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Application of derivatives and integration	1-5	1-3
24	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	Application of derivatives and integration	1-5	1-3
25	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	First order differential equation	1-5	1-3
26	3 2 theo. 1 tut.	A1-A2-A3-B1-B2-B4	First order differential equation	1-5	1-3

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Text books Thomas' Calculus 12th Edition, 2010. References: Mathematical methods for science student,G.stephenson ,New Art printer co.,1999 Schaum's Outlines Advanced Calculus, 2nd Edition, Robert C. Wrede.2000. Others Notebook prepared by the instructor of the coarse
Special requirements (include for example workshops, periodicals, IT software, websites)	1- Available websites related to the subject. 2- Excel or similar software for the solution of lengthy problems.
Community-based facilities (include for example, guest Lectures , internship , field studies)	1- Field and scientific visits. 2- Extra lectures by foreign guest lecturers.

13. Admissions	
Pre-requisites	CE111
Minimum number of students	
Maximum number of students	60

Assit. Prof. Maha Hadi Alhassani

Chemical Engineering Department

College of Engineering

University of Baghdad

TEMPLATE FOR COURSE SPECIFICATION

HIGHE REDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

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 program specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2.University Department/Centre	Chemical Engineering
3.Course title/code	Numerical Methods
4.Modes of Attendance offered	Annual
5.Semester/Year	1st & 2nd / Academic Year 2020 – 2021
6.Number of hours tuition (total)	128 hrs. / 4 hrs. per week
7. Date of production/revision of this specification	February 2020
8.Aims of the Course	
The objective of the course is to be able to use Numerical methods in solving engineering problems and comparing with Analytical methods and apply these methods on Chemical Engineering problems (Mass, Heat, and Momentum transfer) and also to be able to use the spreadsheets of Microsoft EXCEL to solve these problems.	

9· Learning Outcomes, Teaching, Learning and Assessment Methods

A-Cognitive goals.

A1. Using Numerical methods in solving engineering problems.

A2. Comparing with Analytical methods and apply these methods on Chemical Engineering problems.

A3. Using the spreadsheets of Microsoft EXCEL to solve these problems.

A4.

A5.

B. The skills goals special to the course.

B1. Using Numerical methods in solving engineering problems.

B2. Comparing with Analytical methods and apply these methods on Chemical Engineering problems.

B3. Using the spreadsheets of Microsoft EXCEL to solve these problems.

Teaching and Learning Methods

1. The course consists of Two Halves. Both halves consist of 2 hour per week class lecture and a 2 hour computer Lab.
2. Each class will commence with a recap of the previous lecture, 15-20 minutes for quiz and/or homework discussion, questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered.
3. The first half subjects are mainly on Numerical methods with Chemical Engineering (Mass, Heat, Fluid, Reactor design and Thermodynamics) applications. The 2nd half subjects are on both Numerical methods and Optimization with Chemical Engineering application.
4. Exam is taken at the end of each general subject. Computer Lab. Exam is taken at the end of each halves.
5. A computer Lab. Final Exam is taken on subjects of both Halves.

Assessment methods

1. Homework: There will be a minimum of twenty sets of homework during the academic semester. The homework will count 5 % of the total course grade.
2. Quizzes: There will be minimum two closed books and notes quizzes during each academic course. The quizzes will count 5% of the total course grade.
3. Exams: There will be four closed books and notes exams during the academic year. The four exams will count 20% of the total course grade.
4. Laboratory: Lab. work and two Lab. exams will count 10%.
5. Final Exam: The final exam will be Lab. exam (will count 10%) follow by (in different day) comprehensive exam (closed books and notes) that count 50%. The final exam will count 60% of the total course grade.

C. Affective and value goals

C1.

C2.

C3.

C4.

Teaching and Learning Methods

Assessment methods

D. General and rehabilitative transferred skills (other skills relevant to employability and personal development)

D1.

D2.

D3.

D4.

10.Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2		Introduction to Applied Numerical Methods and Error estimation	Online lecture + Power point slides	
2	2	Finding roots of equation	Roots of equations: Fixed point iteration, Xi+1= g(Xi))		
3	2		Newton-Raphson / Bisection / False-Position		
4	2		Applications on finding of roots		
5	2		Matrix operating rules (definition, forms and operations)		General exam. +Lab. exam.
6	2	Solving of matrices	Solving sets of linear equations: Cramer’s rule / Matrix methods	Online lecture + Power point slides	
7	2		Jacobi / Gauss-Siedel Iterations, Elimination methods		
8	2		Applications to linear equations		
9	2		Solving sets of non-linear equations: (Newtons’ method)	Online lecture + Power point slides	
10	2		Finite difference (definition, operations and relations between operators), Difference equations (definitions, degree and order)		General exam. +Lab. exam.

11	2	Solving of integrals	Solution of difference equation (definition, complementary function and particular integral)	Lab. Lecture Microsoft excel	
12	2		Interpolation and extrapolation (introduction and definitions): Lagrangian polynomials.		
13	2		Interpolation with equal intervals (Gregory-Newton forward and backward formulas) with application	Online lecture + Power point slides	
14	2		Interpolation with un-equal intervals (Lagrangian polynomials divided difference formula) with application		General exam. +Lab. exam.
15	2		Numerical Differentiation and integration (introduction): differentiation forward and backward folrumals	Lab. Lecture Microsoft excel	
16	2		Integration (trapezoidal, Simpson 1/3, Simpson 3/8 and Weddle's) with application		
17	2	Solving of ordinary equations	Solution of ordinary differential equations (ODE): Initial value problem (Maclarian and Taylor series) with application.	Online lecture + Power point slides	
18	2		Taylor's series for simultaneous first order ODE, Taylor 's series for 2nd order ODE with application		General exam. +Lab. exam.
19	2		Euler's method (general, Improved and modified Euler formula) with application	Lab. Lecture Microsoft excel	

20	2		Range-Kutta method (2nd, 3rd, and 4th order) with application		
21	2		Range-Kutta for simultaneous 1st order ODE and for 2nd order ODE with application		
22	2		Finite difference method for solution of ODE (definitions): central difference approximation expressions (1st, 2nd, ….ect.)	Online lecture + Power point slides	
23	2		Applications to ODE		
24	2	Solving of differentia l equations	Solution of partial differential equations (PDE): introduction, definition and classification		General exam. +Lab. exam.
25	2		Elliptic PDE (Laplace and Poisson's PDE) with application	Lab. Lecture Microsoft excel	
26	2		Parabolic PDE (Bender-Schmidt and Crank-Nicholson methods) with application		
27	2		Hyperbolic PDF with application		
28	2		Optimization (introduction and definitions): Newton search	Online lecture + Power point slides	
29	2		Elimination methods (bisecting search, golden ratio search and Fibbonatci's search) with application		General exam. +Lab. exam.
30	2		Multi-dimensional optimization: direct method (random and grid search) and indirect method (Newton search) with application		

31	2		Constrained optimization: linear programming (simplex) and non-linear programming (generalized reduced gradient search)	Online lecture + Power point slides	
32	2		Application to optimization		General exam. +Lab. exam.

11.Infrastructure	
1. Books Required reading:	1. Mario G. Salvadori, Melvin L. Baron, Numerical methods in engineering (1982).
2. Main references (sources)	1. Notebook prepared by the instructor of the course. 2. Collection of tutorial sheets of solved and unsolved problems and Exams questions
A- Recommended books and references (scientific journals, reports…).	1. Davis M. E., "Numerical methods and modeling for chemical engineers", John Wiley and Sons, Inc. 2001. 2. BEERS, K. J ., "Numerical Methods for Chemical Engineering Applications in MATLAB® ",Cambridge University Press, 2007. 3. Richard A. Davis, Practical Numerical Methods for chemical engineers using Excel with VBA, third edition, 2014. 4. Jeffry R. Chasnov, Introduction to numerical methods, 2012.
B-Electronic references, Internet sites…	https://ocw.mit.edu/courses/chemical-engineering/10-34-numerical-methods-applied-to-chemical-engineering-fall-2015/lecture-notes/

12.The development of the curriculum plan
There is an idea to give additional examples about the application of numerical methods in solving the chemical engineering problems in the fields of mass, heat, and fluid transfer. In addition, the statistical program will be included in the lab. Lecture to show the student the benefit of using numerical methods in fitting of experimental data.

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 programme specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	Petroleum Refining Industry
4. Programme(s) to which it contributes	Chemical Engineering Program
5. Modes of Attendance offered	Full time
6. Semester/Year	Academic Year 2020-2021
7. Number of hours tuition (total)	120 hrs.(4 hrs. per week)
8. Date of production/revision of this specification	28-11-2020
9. Aims of the Course	
1.Understand the basic principles in the crude oil refining industry 2. Understand the origin, composition and specifications of crude oil and the operation of oil refineries 3. Understand the separation and processing of crude oil and oil segments 4. Use mathematical methods to design petroleum units. 5. Knowing the different petroleum applications and processes in petroleum refineries	

10· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Knowledge and Understanding

A1. Understanding the origin, physical and chemical properties of crude oil and petroleum products.

A2. Evaluation, treatment, and separation of crude oil.

A3. Understanding the thermal and catalytic processes in petroleum refineries

A4. Design of different units types in the petroleum refineries.

B. Subject-specific skills

B1. Help student to develop a range of graduate attributes.
B2. Develop subject-specific skills for student through taking part in lectures, seminars, field-trips, completing assignments, projects, dissertations and outreach work.
B3. Student may take the opportunity to become involved in Department events and research seminar (or another college).

Teaching and Learning Methods

1. The theory lectures.

2. Practical lectures.

3. Homework

4. Tests and examinations.

5. Questions and discussions in class

6. A connection between theory and practice.

7. Field trips.

8. Seminars.

9. Discussions inside and outside the classroom.

10. References and useful links

Assessment methods

1. Exams. This includes mid-term exams, final exams, and tests at the end of course units. The best tests include several types of questions – short answer, multiple-choice, true-false, and short essay – to allow students to fully demonstrate what they know.
2. Papers, projects, and presentations. These give students the chance to go deeper with the material to put the knowledge they've acquired to use or create something new from it. This level of application is an extremely important and often overlooked part of the learning process. These types of projects also give students who do not test well a chance to shine.
3. Portfolios. Submitting a portfolio at the end of a course can be a powerful way for students to see the progress they've made. More than just a collection of students' work from the semester, good portfolios also include reflections on their learning. Asking students to spell out the concepts or techniques used with each piece, the themes addressed, and hurdles faced also brings a sense of completion to the learning process

C. Thinking Skills

C1.Thinking Skills are the mental processes we use to do things like: solve problems, make decisions, ask questions, make plans, pass judgements, organize information and create new ideas.

C2. Starting lessons with a puzzle or practice can be a useful warm-up, but another possibility is to try some brain practice , a series of exercises and massage routines designed to increase the supply of oxygen to the brain and improve mental alertness

C3. Teach the students to use Mind-maps method which can be a useful tool for note-taking or revision, for thinking through a complex problem or for presenting information to others.

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

D1. Setting appropriate achievement levels can ensure that all students attain the adequate level of transferable skills for a qualification that will allow them to work in their chosen occupation. Achievement levels need to be set based on industry participation and should be reviewed regularly.

D2. **Making learning environments as "real' as possible**

D3. To create a well-functioning, credible assessment system, students' assessment records will have to be stored and made accessible to relevant stakeholders. Having students retake tests to assess their transferable skill.

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4 2 the. 2 tut.	A1,D3	Definition and origin of crude oil	1-10 of article (10)	1 – 3 of article (10)
2	4 2 the. 2 tut.	A1, D2	Definition and origin of crude oil	1-10 of article (10	1 – 3 of article (10)
3	4 2 the. 2 tut.	B1	Chemical composition	1-10 of article (10	1 – 3 of article (10)
4	4 2 the. 2 tut	B1	Chemical composition	1-10 of article (10	1 – 3 of article (10)
4	4 2 the. 2 tut.	A2,B1	Physical and chemical characteristic	1-10 of article (10	1 – 3 of article (10)
5	4 2 the. 2 tut.	A2,B1	Physical and chemical characteristic	1-10 of article (10	1 – 3 of article (10)
6	4 2 the. 2 tut	A2,B1	Desalting and dehydration of crude oil	1-10 of article (10	1 – 3 of article (10)
7	2 the. 2 tut	A2,B1	Desalting and dehydration of crude oil	1-10 of article (10	1 – 3 of article (10)
8	4 2 the. 2 tut	A2,B1	Distillation of crude oil	1-10 of article (10	1 – 3 of article (10)
9	4 2 the. 2 tut	A2,B1	Distillation of crude oil	1-10 of article (10	1 – 3 of article (10)
10	4 2 the. 2 tut	A2,A3, B1	Catalytic isomerization and Reforming	1-10 of article (10	1 – 3 of article (10)
11	4 2 the. 2 tut	A2,A3, B1	Catalytic isomerization and Reforming	1-10 of article (10	1 – 3 of article (10)
12	4 2 the. 2 tut.	A2,B1	Thermal processes	1-10 of article (10	1 – 3 of article (10)
13	4 2 the. 2 tut.	A2,A3, B1	Thermal processes	1-10 of article (10	1 – 3 of article (10)

14	4 2 the. 2 tut.	A2,A3, B1	Thermal processes	1-10 of article (10	1 – 3 of article (10)
15	4 2 the. 2 tut.	A2,A3, B1	Catalytic cracking processes	1-10 of article (10	1 – 3 of article (10)
16	4 2 the. 2 tut	A2,A3, B1	Catalytic cracking processes	1-10 of article (10	1 – 3 of article (10)
17	4 2 the. 2 tut.	A2,A3, B1	Hydrocracking processes	1-10 of article (10	1 – 3 of article (10)
18	4 2 the. 2 tut.	A2,A3, B1	Catalytic alkylation	1-10 of article (10	1 – 3 of article (10)
19	4 2 the. 2 tut.	A2,A3, B1	Catalytic polymerization	1-10 of article (10	1 – 3 of article (10)
20	4 2 the. 2 tut.	A2,A3, A4,B1	Conventional chemical treatment of refinery products	1-10 of article (10	1 – 3 of article (10)
21	4 2 the. 2 tut.	A2,A3, A4,B1	Conventional chemical treatment of refinery products	1-10 of article (10	1 – 3 of article (10)
22	4 2 the. 2 tut.	A2,A3, A4,B1	Lubricating Oils	1-10 of article (10	1 – 3 of article (10)
23	4 2 the. 2 tut.	A2,A3, A4,B1	Production of Gasoil	1-10 of article (10	1 – 3 of article (10)
24	4 2 the. 2 tut.	A2,A3, A4,B1	Production of solvent	1-10 of article (10	1 – 3 of article (10)
25	4 2 the. 2 tut.	A2,A3, A4,B1	Production of Car and aero plane gasoline	1-10 of article (10	1 – 3 of article (10)
26	4 2 the. 2 tut.	B2	Production of Jet fuel	1-10 of article (10	1 – 3 of article (10)
27	4 2 the. 2 tut.	B2	Production of Kerosene	1-10 of article (10	1 – 3 of article (10)
28	4 2 the. 2 tut.	B2	Production of diesel	1-10 of article (10	1 – 3 of article (10)
29	4 2 the. 2 tut.	A5	Production of Asphalt	1-10 of article (10	1 – 3 of article (10)
30	4 2 the. 2 tut.	A5	Production of Wax	1-10 of article (10	1 – 3 of article (10)

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	***Textbook*** Petroleum refinery Engineering By W.L. Nelson ***References*** 1. Petroleum Refining Technology and Economics by H. Gary ***Others*** 1. Notebook prepared by the instructor of the course. 2. Collection of tutorial sheets of solved and unsolved problems and Exams questions
Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures , internship , field studies)	Available websites related to the subject, Video, Seminars, field trips

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	40

Instructor:
Prof.Dr. HUSSEIN QASIM HUSSEIN
Chem. Eng. Dept.
College of Engineering
University of Baghdad

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course a1st & 2nd / Academic Year 2020 – 2021, 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 program specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	Physical chemistry
4. Programme(s) to which it contributes	Chemical engineering program
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a “Day Program”. The students are full time students, and on campus. They attend full day program . The academic year is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd / Academic Year 2020-2021
7. Number of hours tuition (total)	120 hrs. / 4 hrs. per week and 90/3 hrs lab.
8. Date of production/revision of this specification	28/11/2020
9. Aims of the Course	
1-Give an introduction to the uses of physical chemistry in chemical engineering	
2-It provide many opportunities for the intermediate applications of ideas and equations in solving problems	
3-Studying thermodynamics laws zero,first , second and third law	
4-Learning about Thermo chemistry	
5-Show how rates of chemical reactions can be understood	
6-Learn about different energy like entropy ,Gibbs and Helmoltz energies	
7-Drive Maxwell relation used in thermodynamics relations	

8-Understnnd phase equilibrium and chemical equilibrium

10· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Knowledge and Understanding
A1. Calculation of ideal gas law and real gas laws
A2.calculationsof enthalpy at different conditions
A3.calculations of different energies
A4.learning about reactions rates

B. Subject-specific skills
B1.solving physical chemistry problems using differentiated laws during all the chapters
B2.connect between theory and the experimental work in the physical chemistry laboratory

Teaching and Learning Methods

C1. Developing critical and creative thinking skills related to physical chemistry.
C2.Using mathematical models.
C3. Analysis assumptions.

Assessment methods

.D. General and Transferable Skills (other skills relevant to employability and personal development)
D1.Communitiyeffectivity.
D2. Work individually and team members in international and multidicplinary teams.
D3. Understanding impact of engineering solutions in an environmental and social context.

C. Thinking Skills
C1. Developing critical and creative thinking skills related to physical chemistry.
C2. Using mathematical models
C3. Analysis assumptions

Teaching and Learning Methods

1. Lectures.

2. Tutorials.
3. Homework and Assignments.
4. Tests and Exams.
5. In-Class Questions and Discussions.
1. Con Examinations, Tests, and Quizzes.
2. Extracurricular Activities.
3. Student Engagement during Lectures.
6. Responses Obtained from Students connection between Theory and Application.
7. Field Trips.
8. Seminars.

In- and Out-Class oral conservations

9-experments in physical chemistry lab

Assessment methods

1- Examinations ,Tests , and Quizzes
2-Students Engagements during lectures
3-Response obtained from students
4-Examinations in lab

11. Course Structure					
Week	Available websites related to the subject Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4 2 the. 2 tut.	A1	Zero law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
2	4 2 the. 2 tut.	A1	Zero law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
3	4 2 the. 2 tut.	B1	First law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
4	4 2 the. 2 tut.	A2,B1	First law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
5	4 2 the. 2 tut.	A2,B1	Second law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
6	4 2 the. 2 tut.	A2,B1	Second law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
7	4 2 the. 2 tut.	A2,A3, B1	Third law of thermodynamics	1-9 of article (10)	1 – 4 of article (10)
8	4 2 the. 2 tut.	A2,A3, B1	thermochemistry	1-9 of article (10)	1 – 4 of article (10)
9	4 2 the. 2 tut.	A2,A3, B1	Gibbs energy and Helmoltz energy	1-9 of article (10)	1 – 4 of article (10)
10	4 2 the. 2 tut.	A2,A3, B1	Chemical equilibrium	1-9 of article (10)	1 – 4 of article (10)
11	4 2 the. 2 tut.	A2,A3, A4,B1	Chemical equilibrium	1-9 of article (10)	1 – 4 of article (10)
12	4 2 the. 2 tut.	A2,A3, A4,B1	Phase equilibrium	1-9 of article (10)	1 – 4 of article (10)
13	4 2 the. 2 tut.	A2,A3, A4,B1	Phase equilibrium	1-9 of article (10)	1 – 4 of article (10)
14	4	A2,A3,	Gas kinetics	1-9 of	1 – 4 of article

	2 the. 2 tut.	A4,B1		article (10)	(10)
15	4 2 the. 2 tut.	A2,A3, A4,B1	Gas kinetics	1-9 of article (10)	1 – 4 of article (10)
16	4 2 the. 2 tut.	A2,A3, A4,B1	Electro chemical equilibrium	1-9 of article (10)	1 – 4 of article (10)
17	4 2 the. 2 tut.	B2	Electro chemical equilibrium	1-9 of article (10)	1 – 4 of article (10)
18	4 2 the. 2 tut.	B2	Electro chemistry	1-9 of article (10)	1 – 4 of article (10)
19	4 2 the. 2 tut.	B2	Electro chemistry	1-9 of article (10)	1 – 4 of article (10)
20	4 2 the. 2 tut.	A5	Ideal solution	1-9 of article (10)	1 – 4 of article (10)
21	4 2 the. 2 tut.	A5	Non ideal solution	1-9 of article (10)	1 – 4 of article (10)

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Text book Physical chemistry seventh edion by alberty Refrences Physical chemistry by **Robert J. Silbey** Physical chemistry by moore ***Others*** 1. Notebook prepared by the instructor of the course. 2. Collection of tutorial sheets of solved and unsolved problems and Exams questions
Special requirements (include for example workshops, periodicals, IT software, websites)	Available websites related to the subject
Community-based facilities (include for example, guest Lectures , internship , field studies)	Field and scientific visits

13. Admissions	
Pre-requisites	

Minimum number of students	/
Maximum number of students	75

Instructor

Assist. Prof. Dr. Hayder Abdulkareem Rasheed

Chem. .Eng .Dept

College of Engineering

University of Baghdad

Email : haider.aljendeel@coeng.uobaghdad.edu.iq

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

University: Baghdad
College: Engineering
Number of Departments in the College:
Date of Form Completion:

Dean's Name

Date: / /

Signature

Dean's Assistant For Scientific Affairs

Date: / /
Signature

The College Quality Assurance And University Performance Manager

Date: / /
Signature

Quality Assurance And University Performance Manager
Date: / /
Signature

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

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 Programme specification.

1.Teaching Institution	College of Engineering University of Baghdad
2.University Department/Centre	Chemical Engineering Department (CHED)
3.Course title/code	Pollution and Industrial safety (215CHPO)
4.Modes of Attendance offered	Annual System; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.
5.Semester/Year	1st& 2nd Semesters/Academic Year 2020-2021
6.Number of hours tuition(total)	60 hrs. / 2 hrs. per week
7.Dateof production/revision of this Specification	September 2020

8.Aims of the Course

1. The courses will provide students with an understanding and appreciation of the environmental pollution, its types and complex interactions of man, health, and the environment.
2. It will expose students to the multi-disciplinary nature of Environmental Health Sciences; the information and tools required to assess environmental quality as it relates to human and ecosystem health; the negative impacts that environmental degradation can have on human, wildlife and other bioreceptors in aquatic and terrestrial ecosystems.
3. The purpose of this course is to give the students methods for prevention, control measures required to minimize, manage and/or eliminate specific environmental problems (especially air and water pollution).

9· Learning Outcomes, Teaching, Learning and Assessment Method

A-Cognitive goals

1. Upon successful completion of the course, students should be able to explain how important environmental pollution and industrial safety science issues. e.g., environmental types and its definition, control, treatment, preventions, disease, toxic chemicals, air and water quality, ecosystem degradation…etc.) Impact the health of the public in the developed and developing world.
2. How to Select appropriate separation technique for intended pollution problems.
3. Evaluate competing separation technologies on factors such as simplicity, reliability, and cost.
4. Upon successful completion of the course, students should be able to understand and use the basic principles, concepts, and terms of environmental health.
5. Upon successful completion of the course, students should be able to apply the scientific method for observation, inquiry and evaluate the relationships between science, technology, and society as these affect critical historical or contemporary issues.
6. Be familiar with the pollution, and industrial safety.
7. Recognize the analogy between health hazard and sustainability and the limit of health hazard..
8. Identify separations equipment of various types and their components.
9. Understand the mechanism of the separation by membrane processes and the properties of membrane units in Reverse osmosis.

B. Subject-specific skills

B1. Use the techniques, skills, and modern engineering tools necessary for engineering practice in environmental pollution applications

B2. Communicate effectively.

B3. Understand professional, social and ethical responsibilities.

B4. Identify, formulate and solve environmental pollution problems

B5. Work in groups and function on multi-disciplinary teams.

B6. Be able to apply modern knowledge and to apply mathematics, science, engineering and technology to environmental pollution control problems and applications.

B7. Evaluate competing environmental pollution technologies on factors such as simplicity, reliability, and cost.

Teaching and Learning Methods

1. Lectures.
2. Homework and assignments.
3. Tests and Exams.
4. In-Class questions and discussions.
5. Connection between theory and application.
6. Seminars.
7. Reports, presentations, and posters.

Assessment methods

1. Examinations, Tests, and Quizzes.
2. Extracurricular activities and homework.
3. Student engagement during lectures.

C. Affective and value goals

C1. Characterization, analyses and evaluate scientific and engineering information and identify knowledge gaps and opportunities to solve pollution and design control equipment

C2. An ability to draw on your academic or subject knowledge to identify solutions of a practical or technical nature.

C3. Identify knowledge gaps and opportunities to solve pollution and design control equipment

D. General and rehabilitative transferred skills (other skills relevant to employ ability and personal development)

D1. Working in a group or team to solve effectively the problems related to environmental pollution

D2. Speed intuitive, predictability and evaluate information and ideas in the handling of pollution from petroleum and other industries

10.Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1.	2	understanding	Introduction to environmental pollution	Lectures	partial test (Oral questions)
2.	2	understanding	Ecosystems and environment	Lectures	partial test (Oral questions)
3.	2	understanding	Effect of pollution on health	Lectures	partial test (Oral questions)
4.	2	understanding	Classification of pollutants	Lectures	partial test (Oral questions)
5.	2	understanding	Types of pollution	Lectures	partial test (Oral questions)
6.	2	understanding	Noise and soil pollution	Lectures	partial test (Oral questions)
7.	2	understanding	Thermal and Radiation pollution	Lectures	partial test (Oral questions)
8.	2	understanding	Solid waste pollution	Lectures	partial test (Oral questions)
9.	2	understanding	Air pollution	Lectures	partial test (Oral questions)
10.	2	understanding	Atmospheric layers	Lectures	partial test (Oral questions)
11.	2	understanding	Global Climate Change and Ozone depletion	Lectures	partial test (Oral questions)
12.	2	understanding	Air quality and measurements	Lectures	partial test (Oral questions)
13.	2	understanding	Air Pollution Control devices(gases)	Lectures	partial test (Oral questions)
14.	2	understanding	Air Pollution Control devices(solid part1)	Lectures	partial test (Oral questions)

15.	2	understanding	Air Pollution Control devices(solid part2)	Lectures	partial test (Oral questions)
16.	2	understanding	Water pollution	Lectures	partial test (Oral questions)
17.	2	understanding	Water quality	Lectures	partial test (Oral questions)
18.	2	understanding	Specific measurement of water	Lectures	partial test (Oral questions)
19.	2	understanding	Supply and treatment of water	Lectures	partial test (Oral questions)
20.	2	understanding	Purification of water	Lectures	partial test (Oral questions)
21.	2	understanding	Overview of water treatment	Lectures	partial test (Oral questions)
22.	2	understanding	Technologies in water treatment	Lectures	partial test (Oral questions)
23.	2	understanding	Industrial safety	Lectures	partial test (Oral questions)
24.	2	understanding	Safety terms and equipments	Lectures	partial test (Oral questions)
25.	2	understanding	dangerous	Lectures	partial test (Oral questions)
26.	2	understanding	Effect of radioactive materials	Lectures	partial test (Oral questions)
27.	2	understanding	Chemical effects	Lectures	partial test (Oral questions)
28.	2	understanding	Biological effects	Lectures	partial test (Oral questions)
29.	2	understanding	Storage of chemicals	Lectures	partial test (Oral questions)
30.	2	understanding	Fires and their causes	Lectures	partial test (Oral questions)

11.Infrastructure	
1. Books Required reading:	1. Environmental Engineering by Joseph A. Salvato, P.E., Dee, Fifth Edition, 2003, John Wiley & Sons, Inc. 2. Industrial safety, Roland p. Blake, 1963 by prentice Hall, Inc.

2. Main references(sources)	Library, Websites
A- Recommended books and references (scientific journals, reports…).	1. Environmental Engineering by Ruth E Weiner and Robin A. Matthews, Fourth Edition, 2003, Butterworth-Heineman press. 2. Bharucha, E. 2003, Textbook for Environmental Studies, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environmental Education and Research. 3. Fundamentals of Water Treatment Unit Processes by David Hendricks, 2011, CRC Press.
B-Electronic references, Internet Sites…	Websites

12. The development of the curriculum plan
1. Work to develop the curriculum by increasing the cognitive and scientific capacity through scientific publications and recent research of books, references and conferences. 2. Adopting modern interactive teaching methods. 3. Activating the programs of twinning with international universities to view modern curricula and teaching methods and exchange experience.

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 programme specification.

1. Teaching Institution	University of Baghdad - College of Engineering
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Basic principles of chemical engineering 2 – Chem. E.244
4. Modes of Attendance offered	Yearly system with full study
5. Semester/Year	1st & 2nd / Academic Year 2020 – 2021
6. Number of hours tuition (total)	120 hour / 4 hour per weak
7. Date of production/revision of this specification	6/2/2021

8. Aims of the Course

1. Material balances with chemical reaction review
2. Study material balances with recycle, by pass and purge.
3. Study Real gas relationships and gas mixture
4. Study Forms of energy and Latent heat of vaporization
5. Knowing the First law of thermodynamic
6. Define Standard heat of reaction ,Types of systems ,Heat capacity
7. Energy balance without and with chemical reaction
8. Humidity charts and their uses
9. Heat of solution, Enthalpy-concentration charts and their uses.
10. Material and energy balance for complete projects.
11. Unsteady state material balance ,
12. Unsteady State energy balance.

9· Learning Outcomes, Teaching ,Learning and Assessment Methods

A- Knowledge and Understanding

A1. Calculation Real gas relationships and gas mixture.

A2. Define Forms of energy and the First law of thermodynamic

A3. Using Energy balance without and with chemical reaction

A4. Enthalpy-concentration charts and their uses

A5. Using Humidity charts

A6. Knowing how to balance unsteady material and energy systems

B. Subject-specific skills

B1. Solving problems for real gas and their mixture

B2. Solving problems for energy balance with and without chemical reactions

B3. Using diagrams and chart for calculation Humidity and heat of solution

B4. Using unsteady state balances for solving systems

C. Thinking Skills

C1. Learning the basic calculation and principles in chemical engineering

C2. Using mathematical methods for solving material and energy balances

C3. Solving unsteady state models

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

D1. Activity with society

D2. The work with a team

D3. How engineering is benefitial for society and environment

10 Teaching and Learning Methods

1. Lectures
2. Class work
3. Home work
4. Daily and monthly exams
5. Problem answers
6. Meeting

11 Assessment methods

1. Daily and monthly exams
2. Outside lecture teaching
3. Students problem answers
4. Students notes

12. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4 Hours 2 Theoretical 2 Tutorial		Review of material balance with chemical reactions	1-6 of article (10)	1-4 of article (11)
2	4 Hours 2 Theoretical 2 Tutorial		Study material balance with recycle, bypass and purge	1-6 of article (10)	1-4 of article (11)
3	4 Hours 2 Theoretical 2 Tutorial	A1, B1	Real gas relationships and gas mixture	1-6 of article (10)	1-4 of article (11)
4	4 Hours 2 Theoretical 2 Tutorial	A1, B1	Real gas relationships and gas mixture	1-6 of article (10)	1-4 of article (11)
5	4 Hours 2 Theoretical 2 Tutorial	A2	Forms of energy	1-6 of article (10)	1-4 of article (11)
6	4 Hours 2 Theoretical 2 Tutorial	A2	Latent heat of vaporization	1-6 of article (10)	1-4 of article (11)
7	4 Hours 2 Theoretical 2 Tutorial	A2	First law of thermodynamic	1-6 of article (10)	1-4 of article (11)
8	4 Hours 2 Theoretical 2 Tutorial	A2,A3, B2	Standard heat of reaction	1-6 of article (10)	1-4 of article (11)
9	4 Hours 2 Theoretical 2 Tutorial	A2,A3, B2	Types of systems	1-6 of article (10)	1-4 of article (11)
10	4 Hours 2 Theoretical 2 Tutorial	A2,A3, B2	Heat capacity	1-6 of article (10)	1-4 of article (11)
11	4 Hours 2 Theoretical 2 Tutorial	A2,A3, B2	Energy balance without chemical reaction	1-6 of article (10)	1-4 of article (11)
12	4 Hours 2 Theoretical 2 Tutorial	A2,A3, B2	Energy balance with chemical reaction	1-6 of article (10)	1-4 of article (11)
13	4 Hours 2 Theoretical 2 Tutorial	A2,A3, B2	Material and energy balances	1-6 of article (10)	1-4 of article (11)
14	4 Hours	A2,A	Material and energy	1-6 of	1-4 of

	2 Theoretical 2 Tutorial	3, B2	balances	article (10)	article (11)
15	4 Hours 2 Theoretical 2 Tutorial	A4, B3	Heat of solution	1-6 of article (10)	1-4 of article (11)
16	4 Hours 2 Theoretical 2 Tutorial	A4, B3	Enthalpy-concentration charts and their uses	1-6 of article (10)	1-4 of article (11)
17	4 Hours 2 Theoretical 2 Tutorial	A5, B3	Definitions of different kinds of humidity	1-6 of article (10)	1-4 of article (11)
18	4 Hours 2 Theoretical 2 Tutorial	A5, B3	Humidity charts and their uses	1-6 of article (10)	1-4 of article (11)
19	4 Hours 2 Theoretical 2 Tutorial	A2, A3 B2	Material and energy balance for complete projects.	1-6 of article (10)	1-4 of article (11)
20	4 Hours 2 Theoretical 2 Tutorial	A6 B4	Unsteady state material balance	1-6 of article (10)	1-4 of article (11)
21	4 Hours 2 Theoretical 2 Tutorial	A6, B4	Unsteady State energy balance	1-6 of article (10)	1-4 of article (11)

12.Infrastructure	
1. Books Required reading:	Basic principles and calculations in chemical engineering 7th edition,by David M.Himmeblau the University of Texas.
2. Mainreferences(sources)	Elementary principles of chemical processes 3rd edition(2005) Richard M.Felder ,Ronald W.Rousseau.
A- Recommendedbooksand references(scientificjournals, reports…).	Supplementry problems for basic principles and calculations in chemical engineering 6th edition,by David M.Himmeblau the University of Texas(1996).

B-Electronic references, Internet sites…	https://www.engineeringbookspdf.com/principles-chemical-engineering-processes-material-energy-balances-second-edition-nayef-ghasem-redhouane-henda

13. The development of the curriculum plan
1. Organize seminars for students to discuss and solve problems for complete systems. 2. Organize field visits to the factories and refinery units to learn more about the construction and the operation of operational units.

Instructor

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REACTOR DESIGN COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This document provides the academic description of the Reactor Design course, which includes introducing the skills of the third stage students in the Department of Chemical Engineering to understand what chemical reactions are from an engineering point of view.

This course will provide students with sufficient understanding to convert the information obtained by laboratory into information useful in designing chemical reactors, which will make the most of them in the next phase of designing the reactors for the engineering project and thus provide a graduate who is able to design reactors.

1.Teaching Institution	University of Baghdad - College of Engineering
2.UniversityDepartment/Centre	Chemical Engineering Department
3.Course title/code	Reactor Design
4.Modes of Attendance offered	Class / online class
5.Semester/Year	Annually (2 semesters)
6.Number of hours tuition(total)	64 hours
7.Date of production/revision of this specification	2020-2021
8.Aims of the Course	
The goals of studying this subject are the successful design and operation of chemical reactors and design multiple reactors system.	

9· Learning Outcomes, Teaching, Learning and Assessment Methods

The course including 64 total teaching hours (32 of them are tutorials). Also, the course containing 4 examinations and 2 quizzes with overall grade of 30 % (15% per each semester), and the final examination of 70% of the total grade.

A-Cognitive goals. A1. Overview of Chemical Reaction Engineering
A1. Kinetics of Homogeneous Reactions
A2. Interpretation of Batch Reactor Data
A3. Introduction to Reactor Design
A4. Ideal Batch Reactors
A5. Design for Single Reactions

B. The skills goals special to the course.

This course will provide students with sufficient understanding to convert the information obtained by laboratory into information useful in designing chemical reactors, which will make the most of them in the next phase of designing the reactors for the engineering project and thus provide a graduate who is able to design reactors.

Teaching and Learning Methods

The course including 64 total teaching hours (32 of them are tutorials).

Assessment methods

The course containing 4 examinations and 2 quizzes with overall grade of 30 % (15% per each semester), and the final examination of 70% of the total grade.

C. Affective and value goals

At the end of the course presented, the student will possess all the necessary skills to deal with problems in designing or operating reactors.

D. General and rehabilitative transferred skills (other skills relevant to employability and personal development)

With the Reactor Design Course, the graduate will have sufficient skill and knowledge in designing and operating reactors in various state departments and their laboratories or laboratories of large companies and small enterprises of the private sector.

10.Course Structure					
Week	Hours	I L	Unit/Module or Topic Title	Teaching Met	Assessment Method
1	2		Chemical Reaction Engineering	Class	
2	2		Homogeneous Reactions in Ideal	Class	
3	2		Reactors	Class	
4	2		Kinetics of Homogeneous Reactions	Class	
5	2		Concentration-Dependent Term of a	Class	
6	2		Temperature-Dependent Term of a	Class	
7	2		Searching for a Mechanism	Class	Exam. 1
8	2		Predictability of Reaction Rate from	Class	
9	2		Interpretation of Batch Reactor Data	Class	
10	2		Constant-volume Batch Reactor	Class	
11	2		Constant-volume Batch Reactor	Class	
12	2		Varying-volume Batch Reactor	Class	
13	2		Temperature and Reaction Rate	Class	
14	2		Temperature and Reaction Rate	Class	
15	2		The Search for a Rate Equation	Class	Exam. 2
16	2		The Search for a Rate Equation	Class	
17	2		Introduction to Reactor Design	Class	
18	2		Ideal Reactors for a Single Reaction	Class	
19	2		Ideal Batch Reactors	Class	
20	2		Steady-State Mixed Flow Reactors	Class	
21	2		Steady-State Mixed Flow Reactors	Class	
22	2		Steady-State Plug Flow Reactors	Class	Exam. 3
23	2		Steady-State Plug Flow Reactors	Class	
24	2		Design for Single Reactions	Class	
25	2		Size Comparison of Single Reactors	Class	
26	2		Multiple-Reactor Systems	Class	
27	2		Multiple-Reactor Systems	Class	
28	2		Multiple-Reactor Systems	Class	
29	2		Recycle Reactor	Class	
30	2		Recycle Reactor	Class	
31	2		Recycle Reactor	Class	
32	2		Autocatalytic Reactions	Class	Exam. 4

11.Infrastructure

1. Books Required reading:	*Chemical Reaction Engineering by Octave Levenspiel*
2. Main references (sources)	*Chemical Reaction Engineering by Octave Levenspiel*
A- Recommended books and references (scientific journals, reports…).	*Chemical Engineering Kinetics by J.M. Smith Elements of Chemical Reaction Engineering by Fogler*
B-Electronic references, Internet sites…	Non

Instructor

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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 program specification.

1. Teaching Institution	College of Engineering/ University of Baghdad
2. University Department/Centre	Chemical Engineering
3. Course title/code	Chemical Engineering Thermodynamics
4. Program (s) to which it contributes	Chemical Engineering Program
5. Modes of Attendance offered	Annual System ; There is only one mode of delivery, which is a "Day Program". The students are full time students, and on campus. They attend full day program in face-to-face mode. The academic year is composed of 30-week regular subjects.
6. Semester/Year	1st & 2nd / Academic Year 2020 – 2021
7. Number of hours tuition (total)	120 hrs. / 4 hrs. per week
8. Date of production/revision of this specification	01-10-2020
9. Aims of the Course	
1- Review of the laws of thermodynamics and driving a network of applicable equations in all branches of chemical engineering.	
2- Review of the methods for the calculation of heat and work requirements in physical and chemical processes.	
3- Review of the methods for the determination of equilibrium conditions for transfer of chemical species between phases.	

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	12	A1	Introduction to Thermodynamics	1-6	1-3
4-6	12	A1	First law and basic concepts	1-6	1-3
7-11	20	A1	Volumetric properties of pure fluids	1-6	1-3
12-15	16	A2	Heat effects	1-6	1-3
16-18	12	A2	Second law of thermodynamics	1-6	1-3
19-22	16	A2	Thermodynamic properties of fluids	1-6	1-3
20-22	12	A2	Production of power from heat	1-6	1-3
23-25	12	A2	Refrigeration and Liquefaction	1-6	1-3
26-30	20	A3	Introduction to vapor liquid equilibrium	1-6	1-3

1. Examinations, Tests, and Quizzes.
2. Extracurricular activities.
3. Student engagement during lectures.
4. Responses obtained from students

F- General and Transferable Skills (other skills relevant to employability and personal development)

F1. Community effectivity.

F2.Work individually and team members in international and multidisciplinary teams.

F3. Understanding impact of engineering solutions in an environmental and social context.

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	***Textbook*** J. M. Smith & H. C. Van Ness "INTRODUCTION TO CHEMICAL ENGINEERING THERMODYNAMICS" 8th edition. McGraw-Hill 2018 ***References*** 1- Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey "Fundamentals of Engineering Thermodynamics " 9th Edition, 2018. 2- Robert H. Perry, Don Green "Perry's Chemical Engineering Handbook "9th edition McGraw-Hill 2019. 3- Yunus A. Cengel, and Michael A. Boles," Thermodynamics: An Engineering Approach " 7th edition , 2012.
Special requirements (including example workshops, periodicals, IT software, websites)	Available websites related to the subject
Community-based facilities (including example, guest lectures, internship, field studies)	Field and scientific visits

13. Admissions	
Pre-requisites	
Minimum number of students	30
Maximum number of students	80

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