College of Engineering
Academic Accreditation Committee

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UNIVERSITY OF ANBAR

College of Engineering

COURSE SYLLABUS

ENGLISH LANGUAGE I

CHE 1102

1st Semester, 2022 / 2023

COURSE SYLLABUS

Course Title	English Language I		
Course Code	CHE1102		
Credit Hours	2		
Pre-requisite(s)	/		
Co-requisite(s)			
Semester	1	**Year**	2022 - 2023
Instructors Name	Khaled Jamal Hamid		
Office Location	Room 2, Chemical & Petrochemical Eng. Dpt.		
Tel. No.	00964 7823237037		
Email	Khaled.j.h@uoanbar.edu.iq		
Lecture Times	Monday 10:30-12:30		
Office Hours	Mondays, Tuesdays 9:00-2:00		

Course Description (as in the catalogue):

This course is designed to enable the students to communicate effectively in English by concentration on many of the most useful language and grammar points. They will learn and practice these essential grammar points by using all four skills: reading, writing, listening, and speaking. Students, in this course, will improve their speaking and listening skills, build their English vocabulary and develop their ability to maintain conversations in English. Moreover, they will be able to talk about themselves, their interests and ask questions to others. Regarding writing skills, students will learn the basics of writing, begin with writing simple compound to complex sentences which make them able to use these kinds of sentences to write different kinds of paragraphs.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. read and understand basic expressions, short and simple texts.
2. integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.
3. demonstrate limited control of essential grammatical structures.
4. recognize and use properly ancient and modern dictionaries to look up words and meanings.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1. read and understand basic expressions, short and simple texts.	Link			5				
	Assess			H,Q,E				
2. integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.	Link			5				
	Assess			Q,E				
3. demonstrate limited control of essential grammatical structures.	Link			5				
	Assess			Q,E				
4. recognize and use properly ancient and modern dictionaries to look up words and meanings.	Link			5				
	Assess			H,Q,E				

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	• **Grammar** (Present, past, and future tenses, Questions & questions words) • **Vocabulary** (Parts of speech, Words with more than one meaning) • **Everyday English** (Social expressions I) • **Reading** (people, the main communicators'- the many ways we communicate)		6
2.	• **Speaking** (Information gap, Discussion, Role-play) • **Listening** (Neighbors) • **Writing** (Informal Letter)		6
3.	• **Grammar** (Present tenses) • **Vocabulary** (Describing countries, Collocation-Daily life) • **Everyday English** (Making Conversation) • **Reading** (Living in the USA)		6
4.	• **Speaking** (Information gap, Exchanging information about immigrants to the USA) • **Listening** ("You drive me mad", but I love you) • **Writing** (Linking words, Describing a person)		6
5.	• **Grammar** (Past tenses) • **Vocabulary** (Irregular verbs, Noun, verbs, and adjectives, Making negatives) • **Everyday English** (Time expressions, At, on, in) • **Reading** (The burglars' friend, The thief, his mother, and $2 billion, Teenager goes on spending spree, Sherlock Holmes- the three students)		6
6.	• **Speaking** (Telling stories) • **Listening** (An extract from the three students) • **Writing** (Linking words, Writing a story 1)		6
7.	**Progressive Exam**		6
8.	• **Grammar** (Quantity, Articles) • **Vocabulary** (Buying things) • **Everyday English** (Prices and shopping) • **Reading** (Markets around the world)		6
9.	• **Speaking** (Survey-the good things and bad things about living in your city, Discussion) • **Listening** ('My uncle's a shopkeeper') • **Writing** (Filling in forms)		6
10.	**Midterm Exam**		6
11.	• **Grammar** (Verb patterns-1, Future intentions) • **Vocabulary** (Hot verbs) • **Everyday English** (How do you feel?)		6

Week	Topic	Comments*	Course SLO
	• **Reading** (Hollywood kids- growing up in Los Angles isn't easy)		
12.	• **Speaking** (What are your plans and ambitions? Being a teenager) • **Listening** (A song- you've got a friend) • **Writing** (Writing a postcard)		6
13.	• **Grammar** (What's it like?, Comparative and superlative adjectives) • **Vocabulary** (Talking about cities, Money, Synonyms and antonyms) • **Everyday English** (Directions) • **Reading** ('A tale of two millionaires'- one was mean and one was generous)		6
14.	• **Speaking** (Information gap, Discussion- the rich and their money) • **Listening** (Living in another country) • **Writing** (relative cluses1, describing a place)		6
15.	**Practical session (speaking)**		6
16.	**Final Exam**		6

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
15.	**Practical session (speaking)**	

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
/	/	/

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week-15	10
Progressive exam	Week-7	10
Mid semester exam	Week-10	15
Practical session (speaking)	Week-15	5
Final Exam	Week-16	60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. read and understand basic expressions, short and simple texts.	Lectures	H, Q, E	50% pass
2. integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.	Lectures	H, Q	50% pass
3. demonstrate limited control of essential grammatical structures.	Lectures	H, Q	50% pass
4. recognize and use properly ancient and modern dictionaries to look up words and meanings.	Lectures	H, Q, E	50% pass

Teaching and Learning Resources:

- Raymond Murphy; "English Grammar in Use", 4th edition 2012

Text Book(s):

- John & Liz Soars, "New Headway Plus Beginner", 10th ed 2012

Recommended Readings:

-

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Prepared by:

Khaled Jamal Hamid

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Academic Accreditation Committee

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COURSE SYLLABUS

Course Title

PRACTICAL PHYSICS

Course Code

CHE1302

2nd Semester

2022 - 2023

COURSE SYLLABUS

Course Title	Practical Physics		
Course Code	CHE1302		
Credit Hours	3		
Pre-requisite(s)	General Chemistry (**CHE 1204**)		
Co-requisite(s)	-		
Semester	Second	**Year**	2022-2023
Instructors Name	Khaled J Hamid		
Office Location	Chemical & Petrochemical Eng. Building, 2nd floor, Room No.2		
Tel. No.	+964 7823237037		
Email	Khaled.j.h@uoanbar.edu.iq		
Lecture Times	Mondays, 8:30-10:30		
Office Hours	Mondays, Tuesdays, 10:30-1:00		

Course Description (as in the catalogue):

This course provides a basic understanding of the core area of physical chemistry, based around the theme of systems, states and processes. As students receive a solid background in chemistry through the CHEM 1204, this course is an appropriate ensuing course for students because it will give them a good understanding of physical chemistry which is very important to students intending to complete a major or minor study in Chemical Engineering. This course covers the basic principles and methods of Physical Chemistry, mainly: ideal gas behavior and its laws, real gases and thermodynamics.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. explore the scope of physical chemistry and its importance to chemical engineering education.
2. develop a fundamental understanding of the basic principles of physical chemistry.
3. develop problem-solving ability based on relevant laws, mathematical equations and graphical relationships.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be:

1. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model.
2. able to demonstrate an understanding of thermodynamics laws and their applications.
3. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant.
4. skilled in problem solving and analytical reasoning as applied to scientific problems.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model.	Link	5						
	Assess	Q, E						
2. able to demonstrate an understanding of thermodynamics laws and their applications.	Link	5						
	Assess	H, Q, E						
3. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant.	Link	5						
	Assess	H, Q, E						
4. skilled in problem solving and analytical reasoning as applied to scientific problems.	Link	5						
	Assess	H, Q, E						

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Pre-Requisites by Topic CHE1204: General Chemistry.

Distribution of Course Topics/Contents (Hours):

1. Introduction to Physical Chemistry	1 Lecture
2. First law of Thermodynamics: Internal Energy, Enthalpy	4 Lectures
3. Second law of Thermodynamics, Entropy	4 Lectures
4. Third law of Thermodynamics, Gibbs Free Energy	2 Lectures
5. Chemical Reaction	2 Lectures
6. Chemical Equilibrium	2 Lectures
7. Kinetics: Rate of Reaction equation	4 Lectures
8. Catalysis	2 Lectures
9. Introduction to Nanotechnology	2 Lectures
10. Project presentations/ Progress Exams	7 Lectures

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	Introduction to Physical Chemistry		1
2.	Gases: Properties, behavior and gases laws		2
3.	Thermodynamics: definitions, the First law of Thermodynamics		1,2
4.	Enthalpy and Thermochemistry		1,2
5.	The Second law of thermodynamics: Spontaneity& Entropy		1,2,3
6.	Progress Exam 1		1,2,3
7.	The Third law of thermodynamics & Gibbs Free Energy		1,2,3
8.	Chemical Reaction		1,2,3
9.	Kinetics: Rate of Reaction equation		1,4
10.	Kinetics: The Order of the reactions		1,4
11.	Chemical Equilibrium		1,4
12.	Catalysis		1,2,3
13.	Progress Exam 2		3,4
14.	Introduction to Nanotechnology		
15.	Presentations		1,3,4,6
16.	**Final Exam**		1,2,3,4,5

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
/	/	/

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Presentations (***or*** posters)	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions, Presentations.	Week-15	10%
Progress Exam 1	Week-6	15%
Progress Exam 2	Week-13	15%
Final Exam	Week-16	60%
Total		**100%**

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model.	Lectures and tutorials	Q, E	**50% pass**
2. able to demonstrate an understanding of thermodynamics laws and their applications.	Lectures and tutorials	Q, E	**50% pass**
3. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant.	Lectures and tutorials	Q, E	**50% pass**
4. skilled in problem solving and analytical reasoning as applied to scientific problems.	Lectures and tutorials	Q, E	**50% pass**

Teaching and Learning Resources:

Text Book(s):

1- Atkin's Physical Chemistry 10th edition.

Recommended Readings: -

Other Resources:

1- Chemistry: Chang

2- Chemistry3: Burrows (OXFORD)

Estimated Content

Engineering Topics	%34	1 Credit
Engineering Science	%66	2 Credit
Engineering Design		0 Credit

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive final warning notice. A student missing 10% will be forced to withdraw and considered failed for this course and the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COLLEGE OF ENGINEERING

College of Engineering

Mechanical Engineering Department

COURSE SYLLABUS

Course Title:

ENGINEERING STATISTICS

Course Code: ME3201

1st Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Engineering Statistics		
Course Code	ME3201		
Credit Hours	3		
Pre-requisite(s)	ME 1202 Calculus-2		
Co-requisite(s)			
Semester	1	**Year**	2021/2022
Instructors Name	Sattar Abed Mutlag		
Office Location	ME Building, Room No.1		
Tel. No.	07812818819		
Email	satmutt1961@yahoo.com		
Lecture Times	8:30 AM-10:30 AM, thurs. and wed.		
Office Hours	Sunday , 10:30-12:30		

Course Description (as in the catalogue)

Classification of Data. Graphical representation. Arithmetical description. Probability theory, probability of an event and composite events. Addition rule and multiplication rule, independent events. Counting techniques. Random variables and probability distributions. Expected values. Continuous and discrete random variables. Normal distribution. Binomial distribution. Poisson distribution. Joint and marginal probability distributions. Independence of random variables. Covariance and correlation. Random sampling. Unbiased estimates. Statistical intervals and test of hypothesis for a single sample.

Course Objectives/Goals (optional)

The goals of this course are to enable students to:

1. Understand the practical concepts of random process , deterministic process discrete , continuous random variables..
2. Apply the knowledge to Solve probability problems and its applications by to determine the sampled data and analyze it graphically that are related to Engineering statistics .
3. An ability to understand the theoretical of the normal distribution and some distributions with many populations in practice .
4. Learn statistical hypotheses by carrying statistical tests, using different significance levels.

1. Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Use a number of methods and techniques for visualisation of data sets; random process , deterministic process discrete , continuous random variables.
2. Compute probabilities in simple cases and be able to use some common probability distributions;
3. Give an account of some typical engineering applications of probability and statistics

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1-Use a number of methods and techniques for visualisation of data sets; random process , deterministic process discrete , continuous random variables.	Link	4				4		
	Assess	E,H,Q				H,Q		
2-Compute probabilities in simple cases and be able to use some common probability distributions;	Link	5				3		
	Assess	E,H,Q				E,H, Q		
3-Give an account of some typical engineering applications of probability and statistics	Link	4				4		
	Asse	E,H,Q				E,H, Q		

CLOs	SOs (ABET) / NGOs (INAC)						
	ss						
	Link						
	Assess						

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College of Engineering

Mechanical Engineering Department

COURSE SYLLABUS

Course Title:

ENGINEERING STATISTICS

Course Code: ME3201

1st Semester, 2021 / 2022

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments *	Course CLO
1	Introduction, Data Summary and Presentation		1, 2,3
2	Probability: Addition rule, conditional probability, multiplication rule and Bayes Theorem.		1, 2,
3	Discrete random variables. Probability mass function. Mean and variance of discrete random variables.		1, 2,3
4	Discrete random variables. Probability mass function. Mean and variance of discrete random variables.		1, 2,3
5	Probability Distribution functions: Uniform, Binomial, Geometric and Negative Binomial, Hyper-geometric and Poisson distribution		1, 3
6	Continuous random variables. Probability Density functions.		1, 2,3
7	Normal Distribution. Approximation to Binomial and Poisson Distribution. Exponential distribution. Other continuous distributions.		1, 2,3
8	Joint probability function. Multiple discrete and continuous random variables.		1, 2,3
9	Covariance and correlation. Bivariate Normal Distribution. Linear combination of random variables. Functions of random variables.		1, 2,3
10	Parameter estimation. Properties of estimators. Method of Moments.		1, 2,3
11	Parameter estimation. Properties of estimators. Method of Moments.		1, 2,3
12	Method of Maximum likelihood.		1, 2
13	Method of Maximum likelihood.		1, 2
14	Interval estimation. Inference on the mean of a population: variance known or unknown. Inference on the variance of a normal population		1, 2,3
15	Hypothesis testing about the mean and Proportion: Small and Large Sample**.**		1, 2,3
1.	**Final Exam**		1, 2,3

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 4	
HW	Week 7	
HW	Week 9	
HW	Week 12	
HW	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework's		6
Lab		0
Final Exam		60
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
1-Use a number of methods and techniques for visualisation of data sets; random process , deterministic process discrete , continuous random variables.	Lectures and tutorials	**E,H,Q**	50% pass
2-Compute probabilities in simple cases and be able to use some common probability distributions;	Lectures and tutorials	**E,H,Q**	50% pass
3-Give an account of some typical engineering applications of probability and statistics	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

1-William Mendenhall and Terry Sincich, Statistics for Engineering and the Sciences, Prentice Hall, 8th ed., 2017.

Recommended Readings:

2-Statistical Methods for Engineers, 1st Edition by Richard H. McCuen 1985.

3-Probabilistic Methods in the Mechanics of Solids and Structures. Edited by S. Eggwertz and N. C. Lind

Other Resources:

Estimated Content

Engineering Topics 50% 1 Credit

Engineering Science 50% 3 Credit

Engineering Design 2 Credit

Attendance policy:

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Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

COURSE TITLE

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Course Code

Programming Science

First Semester, 2020/ 2021

COURSE SYLLABUS

Course Title	Programming Science		
Course Code			
Credit Hours	2		
Pre-requisite(s)	General Programming Science		
Co-requisite(s)			
Semester	First	**Year**	2021-2022
Instructors Name	Suha Mahdi Salih		
Office Location	Mechanical Eng. Building, 2nd floor, Room No.2		
Tel. No.	07802094281		
Email	Suhamahdi82@uoanbar.edu.iq		
Lecture Times	1-3 Mondays		
Office Hours			

Course Description (as in the catalogue):

Learn an introduction to the phases of the computer and how it developed
Learn the derivation of the word computer, how to deal with data and information, and learn the most important features of the computer and its components
Learn the most important types of computers and ways to classify them in terms of purpose, use, performance and size
Learn the types of small, handheld computers, etc.
Classification of computers according to the type of data entered and on the basis of the operating system
Learn the components of the computer and the physical entity of the computer input devices
Learn the most important parts of the keyboard, typing, control, functions and navigation keys
Learn the types of mechanical, optical, laser, wired and wireless mouse Learn the trackball and the types of touchpad and scanner
Learn digital camera, light pen, joystick, microphone, and optical mark reader
Learn about output devices, optical display units, speakers, video viewers, engraved and dot matrix printers, ink pumping, etc.
Learning the computer box of the system unit, learning the most important internal and external parts of the system unit, and studying the most important parts of the CPU
Learn the most important instructions and applications and how to use them in Windows

Teaching the basics of typography in terms of type of writing, font, page organization, additions, creating tables, etc.
Supplement for everything related to typography

Course Objectives/Goals (optional):

The goals of this course are to enable students to: know the basics of programming science and know the types of computer and computer contents and important and how the computer improve also study the windows and everything about the word

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Learn an introduction to the phases of the computer and how it developed

2. Learn the derivation of the word computer, how to deal with data and information, and learn the most important features of the computer and its components

3. learn the parts of computer

4.study the basic of windows

5.study everything related to printing in word

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1.Learn an introduction to the phases of the computer and how it developed	Link	1	3	0	0	0	0	0
	Assess	Q,E	Q,E	-	-	-	-	-
2. Learn the derivation of the word computer, how to deal with data and information, and learn the most important features of the computer and its components	Link	1	3	0	0	0	0	0
	Assess	-	H,Q,E	-	-	-	-	-
3. learn the parts of computer	Link	1	3	0	0	0	0	0
	Assess	-	H,Q,E	-	-	-	-	-

CLOs		SOs (ABET) / NGOs (INAC)						
4.study the basic of windows	Link	1	3	0	0	0	0	0
	Assess	-	H,Q,E	-	-	-	-	-
5.study everything related to printing in word	Link	3	3	0	3	1	3	0
	Assess	PR,Q,E	Q,E	-	PR	-	-	-

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	**Learn an introduction to the phases of the computer and how it developed ,**		1
2.	**Learn the derivation of the word computer, how to deal with data and information**		2
3.	**and learn the most important features of the computer and its components**		1,2
4.	**Learn the most important types of computers and ways to classify them in terms of purpose, use, performance and size**		1,2,3
5.	**Learn the types of small, handheld computers, etc. Classification of computers according to the type of data entered and on the basis of the operating system**		1,2,3
6.	**Learn the components of the computer and the physical entity of the computer input devices**		1,2,3
7.	**Learn the most important parts of the keyboard, typing, control, functions and navigation keys**		1,2,3
8.	**Learn about output devices, optical display units, speakers, video viewers, engraved and dot matrix printers, ink pumping, etc.**		1,4
9.	**Learn the types of mechanical, optical, laser, wired and wireless mouse Learn the trackball and the types of touchpad and scanner**		1,4
10.	**Learn digital camera, light pen, joystick, microphone, and optical mark reader**		1,4
11.	**Learning the computer box of the system unit,**		5
12.	**learning the most important internal and external parts of the system unit, and studying the most important parts of the CPU**		1,2,3,6

Week	Topic	Comments*	CLO
13.	**Learn the most important instructions and applications and how to use them in Windows**		1,2,3,6
14.	**Teaching the basics of typography in terms of type of writing, font, page organization, additions, creating tables, etc.**		1,2,3,6
15.	**Supplement for everything related to typography**		1,2,3,6
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
/	/	/	/
/	/	/	/
/	/	/	/
/	/	/	/
/	/	/	/
/	/	/	/
/	/	/	/
/	/	/	/
/	/	/	/

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Writing reports	**First week**	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Every week	20
Mid semester exam	Week 7	30

Assessment Tool(s)**	Date	Weight (%)
Practical sessions		/
Final Exam		50
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1.Learn an introduction to the phases of the computer and how it developed	Video Lectures and		
2. Learn the derivation of the word computer, how to deal with data and information, and learn the most important features of the computer and its components	Tutorials on Google meeting	Q,E	50% pass
3. learn the parts of computer	Video Lectures and	Q,E	50% pass
4.study the basic of windows	Tutorials on Google meeting	Q,E	50% pass
5.study everything related to printing in word	Video Lectures and	Q,E	50% pass

Teaching and Learning Resources:

Text Book(s):

Computer basics book and its office applications

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

COURSE TITLE
FLUID MECHANICS-I-
Course Code

1st Semester, 2021/ 2022

COURSE SYLLABUS

Course Title	Fluid Mechanics-I		
Course Code			
Credit Hours	4		
Pre-requisite(s)	Calculas-I and Calculas-II		
Co-requisite(s)			
Semester	1st semester	**Year**	2021-2022
Instructors Name	Dr. Mustafa B. Al-hadithi		
Office Location	Chemical and petrochemical Building, Room No.2		
Tel. No.	009647831249838		
Email	Mustafaalhadithi@uoanbar.edu.iq		
Lecture Times	Sunday, 08:30-10:30, Tuesday, 8:30-10:30		
Office Hours	Monday 9:00 – 1:00		

Course Description (as in the catalogue):

This course cover all major aspects of fluid mechanics , including fundamental concepts in fluid mechanics, pressure distribution in fluids, hydrostatic forces on plane and curved surfaces, manometer measurements, buoyancy and stability of floating body, basic concept of fluid flow, dynamics of fluid flow, applications of momentum theorem and applications of energy equation.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1- Provide a thorough understanding and practical applications fluid mechanics problems analysis for determinate the solution.

2- Testing and examine fluid mechanics under different load conditions to find the solution behavior.

3- Understanding and applying mathematical model for the solution of indeterminate fluid flow problems.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Analyze and determine the pressure distribution in fluid static problems under different load conditions.
2. Determine the manometer pressure for different shapes and locations.
3. Determine the magnitude, direction and location of pressure force on submerged body.
4. Find the magnitude and direction forces produced from fluid flow motion.
5. Apply energy equation along stream line, then find the resultant pressure.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1.Analyze and determine the pressure distribution in fluid static problems under different load conditions.	Link	×						
	Assess	H Q						
2.Determine the manometer pressure for different shapes and locations.	Link	×						
	Assess	H Q E						
3.Determine the magnitude, direction and location of pressure force on submerged body.	Link	×						
	Assess	T H E						
4.Find the magnitude and direction forces produced from fluid flow motion.	Link	×						
	Assess	H Q						
5.Apply energy equation along stream line, then find the resultant pressure.	Link	×						
	Assess	H Q						

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
		E						
	Link							
	Assess							
	Link							
	Assess							
	Link							
	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	**Definitions of Stress on Fluid and Continuum**		**1**
2.	Fluid Properties Distinction between Newtonian and NonNewtonian Fluid		**2**
3.	Compressibility, Surface tension of Liquids, Units and Dimensions		**1,2**
4.	Forces on Fluid element, Normal Stress in Stationary Fluid		**2,3,4**
5.	Fundamental equation of fluid static and Applications		**1,2,3**
6.	Hydrostatic Thrust on Submerged Surfaces and Applications		**2,3,4**
7.	Stability of Unconstrained bodies, Applications		**2,3**
8.	Applications, **1st Semester Exam**		**4,5**
9.	Scalar &Vector fields flow field description of fluid motion		**1,2,3**
10.	Variation of flow parameters in time and space material & acceleration, Applications		**2,3**
11.	Stream line, path lines, one, two and three dimensional flow		**3,4**
12.	System, Conservation of mass, Conservation of momentum		**2,3,4**
13.	Applications, **2nd Semester Exam**		**3,4,5**
14.	Conservation of energy, Bernoulli's equation, Applications		**2,3,4**

Week	Topic	Comments*	CLO
15.	Measurements of flow rate, Applications of equation of motion		**5**
16.	**Final Exam**		**1,2,3,4,5**

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Through 15 weeks	10%
1st semester exam	Week-8	15%
2nd semester exam	Week-13	15%
Final Exam	Week-16	60%

Assessment Tool(s)**	Date	Weight (%)
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Teaching and Learning Resources:

Text Book(s):

1- Fundamentals of fluid mechanics by Dr. Mustafa B. Al-hadithi.
2- White,_Frank_M._-_Fluid_Mechanics_7th_Ed_[McGraw_Hill]

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

Course Title

PHYSICAL CHEMISTRY

Course Code

CHE2306

1st Semester

2022 - 2023

COURSE SYLLABUS

Course Title	Physical Chemistry		
Course Code	CHE2306		
Credit Hours	3		
Pre-requisite(s)	General Chemistry (**CHE 1204**)		
Co-requisite(s)	-		
Semester	First	**Year**	2022-2023
Instructors Name	Khaled J Hamid		
Office Location	Chemical & Petrochemical Eng. Building, 2nd floor, Room No.2		
Tel. No.	+964 7823237037		
Email	Khaled.j.h@uoanbar.edu.iq		
Lecture Times	Mondays, 8:30-10:30		
Office Hours	Mondays, Tuesdays, 10:30-1:00		

Course Description (as in the catalogue):

This course provides a basic understanding of the core area of physical chemistry, based around the theme of systems, states and processes. As students receive a solid background in chemistry and organic chemistry through the CHEM 1204 and CHEM 2304, respectively, this course is an appropriate ensuing course for students because it will give them a good understanding of physical chemistry which is very important to students intending to complete a major or minor study in Chemical Engineering. This course covers the basic principles and methods of Physical Chemistry, mainly: ideal gas behavior and its laws, real gases, thermodynamics and chemical kinetics.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. explore the scope of physical chemistry and its importance to chemical engineering education.
2. develop a fundamental understanding of the basic principles of physical chemistry.
3. develop problem-solving ability based on relevant laws, mathematical equations and graphical relationships.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be:

1. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model.
2. able to demonstrate an understanding of thermodynamics laws and their applications.
3. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant.
4. skilled in problem solving and analytical reasoning as applied to scientific problems.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model.	Link	5						
	Assess	Q, E						
2. able to demonstrate an understanding of thermodynamics laws and their applications.	Link	5						
	Assess	H, Q, E						
3. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant.	Link	5						
	Assess	H, Q, E						
4. skilled in problem solving and analytical reasoning as applied to scientific problems.	Link	5						
	Assess	H, Q, E						

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Pre-Requisites by Topic CHE1204: General Chemistry.

Distribution of Course Topics/Contents (Hours):

1. Introduction to Physical Chemistry	1 Lecture
2. First law of Thermodynamics: Internal Energy, Enthalpy	4 Lectures
3. Second law of Thermodynamics, Entropy	4 Lectures
4. Third law of Thermodynamics, Gibbs Free Energy	2 Lectures
5. Chemical Reaction	2 Lectures
6. Chemical Equilibrium	2 Lectures
7. Kinetics: Rate of Reaction equation	4 Lectures
8. Catalysis	2 Lectures
9. Introduction to Nanotechnology	2 Lectures
10. Project presentations/ Progress Exams	7 Lectures

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	Introduction to Physical Chemistry		1
2.	Gases: Properties, behavior and gases laws		2
3.	Thermodynamics: definitions, the First law of Thermodynamics		1,2
4.	Enthalpy and Thermochemistry		1,2
5.	The Second law of thermodynamics: Spontaneity& Entropy		1,2,3
6.	Progress Exam 1		1,2,3
7.	The Third law of thermodynamics & Gibbs Free Energy		1,2,3
8.	Chemical Reaction		1,2,3
9.	Kinetics: Rate of Reaction equation		1,4
10.	Kinetics: The Order of the reactions		1,4
11.	Chemical Equilibrium		1,4
12.	Catalysis		1,2,3
13.	Progress Exam 2		3,4
14.	Introduction to Nanotechnology		
15.	Presentations		1,3,4,6
16.	**Final Exam**		1,2,3,4,5

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
/	/	/

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Presentations (***or*** posters)	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions, Presentations.	Week-15	10%
Progress Exam 1	Week-6	15%
Progress Exam 2	Week-13	15%
Final Exam	Week-16	60%
Total		**100%**

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. able to demonstrate an understanding of gas behavior using different equations of state and kinetic molecular model.	Lectures and tutorials	Q, E	**50% pass**
2. able to demonstrate an understanding of thermodynamics laws and their applications.	Lectures and tutorials	Q, E	**50% pass**
3. able to demonstrate knowledge about kinetics laws, define the rate of reaction and the rate constant.	Lectures and tutorials	Q, E	**50% pass**
4. skilled in problem solving and analytical reasoning as applied to scientific problems.	Lectures and tutorials	Q, E	**50% pass**

Teaching and Learning Resources:

Text Book(s):

1- Atkin's Physical Chemistry 10th edition.

Recommended Readings: -

Other Resources:

1- Chemistry: Chang

2- Chemistry3: Burrows (OXFORD)

Estimated Content

Engineering Topics	%34	1 Credit
Engineering Science	%66	2 Credit
Engineering Design		0 Credit

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive final warning notice. A student missing 10% will be forced to withdraw and considered failed for this course and the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

THERMODYNAMICS I

CHE 2311

1st Semester, 2022 / 2023

COURSE SYLLABUS

Course Title		Environmental Engineering		
Course Code		CHE2311		
Credit Hours		3		
Pre-requisite(s)		Non		
Co-requisite(s)		Non		
Semester		1st	**Year**	2022-2023
Instructors Name		Asst.Prof Dr. Hamed Abdullah Fayyadh Al-Falahi		
Office Location		Chemical Engineering Department		
Tel. No.		+9647812778244		
Email		h.alfalahi@uoanbar.edu.iq		
Lecture Times		Mon:10:30 Am-12:30 PM		
Office Hours		Thursday:12:30 -14:30Am		

Course Description (as in the catalogue):

The objective of this course is to organize the ideas of students about energy into forms suitable for engineering analysis. The presentation begins with a review of energy concepts from mechanics. The thermodynamic concept of energy is then introduced as an extension of the concept of energy in mechanics. The student studies energy and its transformations and the relationship between the properties of physical materials that are affected by these transformations from an engineering point of view, which takes into account the linkage between fluid mechanics, heat transfer and energy sources, as well as preparing the student to use engineering thermodynamics in his engineering practices effectively and successfully. Accurate proofs are used in these lectures to enable students to tackle various design issues to explore the wonders of this exciting science.

Course Objectives/Goals (optional):

Course objectives will guide the participant to develop key concepts and techniques to design equipment in development process plant. These key concepts can be utilized to make design and operating decisions, training, and. Course such as these should be almost a requirement for engineers and can utilized as refresher for engineers with experience.

1. To introduce students to the principles concepts of thermal systems engineering using several contemporary applications.
2. Enable students to gain access to the science of thermodynamics by understanding how engineering analysis is done How to deal with laws, equations, illustrations, and other data, and link the data to reach the outputs and enable the student to be able to analyze, elicit and draw conclusions
3. Enable students to gain access to the science of thermodynamics by understanding how engineering analysis is done

Course Learning Outcomes:

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

1. As the design of the chemical process represents a productive and commercial goal, so we expect through this program that the engineer will be familiar with the most thermal systems engineering that he needs to reach the optimal design of the chemical process.
2. That the student be able to distinguish between engineering thermal systems and the mechanism of linking them and their uses in the field of applied work.
3. The chemical engineer has the ability to differentiate between the laws of engineering thermodynamics and apply them mathematically and physically in the treatment and design of practical applications.
4. The engineer should be a pioneer in green engineering by choosing an economical and controlled Design without leaving an impact on the environment.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
As the design of the chemical process represents a productive and commercial goal, so we expect through this program that the engineer will be familiar with the thermal systems engineering that he needs to reach the optimal design of the chemical process.	Link	√	√					
	Assess	E,H,Q	E,H,Q					
That the student be able to distinguish between engineering thermal systems and the mechanism of linking them and their uses in the field of applied work.	Link	√	√				√	
	Assess	E,H,Q	E,H,Q					
The chemical engineer has the ability to differentiate between the laws of engineering thermodynamics and apply them mathematically and physically in the treatment and design of practical applications.	Link				√			
	Assess				**P**			
The engineer should be a pioneer in green engineering by choosing an economical and controlled Design without leaving an impact on the environment.	Link	√	√					
	Assess	E,H,Q	E,H,Q					

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	WHAT IS THERMAL SYSTEMS ENGINEERING?	1 Lecture	1-4
2.	GETTING STARTED IN THERMODYNAMICS: INTRODUCTORY CONCEPTS AND DEFINITIONS	1 Lecture	1-4
3.	CONCEPTS OF UNIT AND DIMENTION AND FUNDEMENTAL VARIABLES	1 Lecture	1-4
4.	USING ENERGY AND THE FIRST LAW OF THERMODYNAMICS/Mechanical Concepts of Energy	1 Lecture	1-4
5.	ENERGY AND THE FIRST LAW OF THERMODYNAMICS/Broadening Our Understanding of Mechanical Work	1 Lecture	1-4
6.	EVALUATING PROPERTIES OF PURE SUBSTANCE	1 Lecture	1-4
7.	THE FIRST LAW OF THERMODYNAMICS FOR CLOSED SYSTEMS	1 Lecture	1-4
8.	THE FIRST LAW OF THERMODYNAMICS FOR OPEN SYSTEMS (（Introduction, Conservation of Mass for a Control Volume Open Systems）	1 Lecture	1-4
9.	THE FIRST LAW OF THERMODYNAMICS FOR OPEN SYSTEMS Conservation of Energy for a Control Volume Open Systems)	1 Lecture	1-4
10.	GENERAL APPLICATIONS of THE FIRST LAW OF THERMODYNAMICS FOR OPEN SYSTEMS（nozzles and diffusers, turbines, compressors and pumps）	1 Lecture	1-4
11.	GENERAL APPLICATIONS of THE FIRST LAW OF THERMODYNAMICS FOR OPEN SYSTEMS （throttling devices, heat exchangers Evaporator, Condenser, and Boiler）	1 Lecture	1-4
12.	THE IDEAL GASE LAWS AND IDEAL GAS MIXTURES（The Ideal Gas Laws	1 Lecture	1-4
13.	THE REAL GASE LAWS AND REAL GAS MIXTURES（Compressibility）	1 Lecture	1-4
14.	THE REAL GASE LAWS AND REAL GAS MIXTURES （Equation of State）	1 Lecture	1-4
15.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Assignment 1-8	-	Different date
Quiz 1-4	-	Different date
Oral Test 1-4	-	Different date

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	From 15/10/2022 To 15/01/2023	10%
Examinations (1)	28-11-2022	15%
Examinations (2)	28-12-2022	15%
Final Exam.	15/01/2023	60%
Total		100%

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
As the design of the chemical process represents a productive and commercial goal, so we expect through this program that the engineer will be familiar with the thermal systems engineering that he needs to reach the optimal design of the chemical process.	- Power point Lec. - Pdf lecture - Quizzes - Oral Exam. - Midterm Exam.	- Semester activities. These include quizzes, classroom interactions - Examinations (1+2) - Final Exam.	50% pass
That the student be able to distinguish between engineering thermal systems and the mechanism of linking them and their uses in the field of applied work.	- Power point Lec. - Pdf lecture - Quizzes - Oral Exam. - Midterm Exam.	- Semester activities. These include quizzes, classroom interactions - Examinations (1+2) - Final Exam.	50% pass
The chemical engineer has the ability to differentiate between the laws of engineering thermodynamics and apply them mathematically and physically in the treatment and design of practical applications.	- Power point Lec. - Pdf lecture - Quizzes - Oral Exam. - Midterm Exam.	- Semester activities. These include quizzes, classroom interactions - Examinations (1+2) - Final Exam.	50% pass

The engineer should be a pioneer in green engineering by choosing an economical and controlled Design without leaving an impact on the environment.	- Power point Lec. - Pdf lecture - Quizzes - Oral Exam. - Midterm Exam.	- Semester activities. These include quizzes, classroom interactions - Examinations (1+2) - Final Exam.	50% pass

Teaching and Learning Resources:

Text Book(s):

Smith, Van Ness, Abbott, 2001," **Introduction to chemical Engineering Thermodynamics**", 7th Edition, McGraw-Hill, Inc., New york.

Recommended Readings:

Other Resources:

J. Moran, N. Shapiro, R. Munson, P. DeWitt**,** 2003," **Introduction to Thermal Systems Engineering**", John Wiley & Sons, Inc.

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

ENGLISH LANGUAGE II

CHE 1105

1st Semester, 2022 / 2023

COURSE SYLLABUS

Course Title	English Language II		
Course Code	CHE1105		
Credit Hours	2		
Pre-requisite(s)	CHE1102		
Co-requisite(s)	/		
Semester	1	**Year**	2022 - 2023
Instructors Name	Khaled Jamal Hamid		
Office Location	Room 2, Chemical & Petrochemical Eng. Dpt.		
Tel. No.	00964 7823237037		
Email	Khaled.j.h@uoanbar.edu.iq		
Lecture Times	Monday 10:30-12:30		
Office Hours	Mondays, Tuesdays 9:00-2:00		

Course Description (as in the catalogue):

This course is designed to enable the students to communicate effectively in English by concentration on many of the most useful language and grammar points. They will learn and practice these essential grammar points by using all four skills: reading, writing, listening, and speaking. Students, in this course, will improve their speaking and listening skills, build their English vocabulary and develop their ability to maintain conversations in English. Moreover, they will be able to talk about themselves, their interests and ask questions to others. Regarding writing skills, students will learn the basics of writing, begin with writing simple compound to complex sentences which make them able to use these kinds of sentences to write different kinds of paragraphs.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. read and understand basic expressions, short and simple texts.
2. integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.
3. demonstrate limited control of essential grammatical structures.
4. recognize and use properly ancient and modern dictionaries to look up words and meanings.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1. read and understand basic expressions, short and simple texts.	Link			5				
	Assess			H,Q,E				
2. integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.	Link			5				
	Assess			Q,E				
3. demonstrate limited control of essential grammatical structures.	Link			5				
	Assess			Q,E				
4. recognize and use properly ancient and modern dictionaries to look up words and meanings.	Link			5				
	Assess			H,Q,E				

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	• **Grammar** (Present, past, and future tenses, Questions & questions words) • **Vocabulary** (Parts of speech, Words with more than one meaning) • **Everyday English** (Social expressions I) • **Reading** (people, the main communicators'- the many ways we communicate)		1,3,4
2.	• **Speaking** (Information gap, Discussion, Role-play) • **Listening** (Neighbors) • **Writing** (Informal Letter)		**1,2**
3.	• **Grammar** (Present tenses) • **Vocabulary** (Describing countries, Collocation-Daily life) • **Everyday English** (Making Conversation) • **Reading** (Living in the USA)		1,3,4
4.	• **Speaking** (Information gap, Exchanging information about immigrants to the USA) • **Listening** ("You drive me mad", but I love you) • **Writing** (Linking words, Describing a person)		**1,2**
5.	• **Grammar** (Past tenses) • **Vocabulary** (Irregular verbs, Noun, verbs, and adjectives, Making negatives) • **Everyday English** (Time expressions, At, on, in) • **Reading** (The burglars' friend, The thief, his mother, and $2 billion, Teenager goes on spending spree, Sherlock Holmes- the three students)		1,3,4
6.	• **Speaking** (Telling stories) • **Listening** (An extract from the three students) • **Writing** (Linking words, Writing a story 1)		**1,2**
7.	**Progressive Exam**		1,2,3,4
8.	• **Grammar** (Quantity, Articles) • **Vocabulary** (Buying things) • **Everyday English** (Prices and shopping) • **Reading** (Markets around the world)		1,3,4
9.	• **Speaking** (Survey-the good things and bad things about living in your city, Discussion) • **Listening** ('My uncle's a shopkeeper') • **Writing** (Filling in forms)		**1,2**
10.	**Midterm Exam**		**1,2,3,4**
11.	• **Grammar** (Verb patterns-1, Future intentions) • **Vocabulary** (Hot verbs) • **Everyday English** (How do you feel?)		**1,3,4**

Week	Topic	Comments*	Course SLO
	• **Reading** (Hollywood kids- growing up in Los Angles isn't easy)		
12.	• **Speaking** (What are your plans and ambitions? Being a teenager) • **Listening** (A song- you've got a friend) • **Writing** (Writing a postcard)		1,3,4
13.	• **Grammar** (What's it like?, Comparative and superlative adjectives) • **Vocabulary** (Talking about cities, Money, Synonyms and antonyms) • **Everyday English** (Directions) • **Reading** ('A tale of two millionaires'- one was mean and one was generous)		**1,2**
14.	• **Speaking** (Information gap, Discussion- the rich and their money) • **Listening** (Living in another country) • **Writing** (relative cluses1, describing a place)		1,3,4
15.	**Practical session (speaking)**		**1,2**
16.	**Final Exam**		1,2,3,4

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
15.	**Practical session (speaking)**	

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
/	/	/

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week-15	10
Progressive exam	Week-7	10
Mid semester exam	Week-10	15
Practical session (speaking)	Week-15	5
Final Exam	Week-16	60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. read and understand basic expressions, short and simple texts.	Lectures	H, Q, E	50% pass
2. integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.	Lectures	H, Q	50% pass
3. demonstrate limited control of essential grammatical structures.	Lectures	H, Q	50% pass
4. recognize and use properly ancient and modern dictionaries to look up words and meanings.	Lectures	H, Q, E	50% pass

Teaching and Learning Resources:

- Raymond Murphy; "English Grammar in Use", 4th edition 2012

Text Book(s):

- John & Liz Soars, "New Headway Plus Beginner", 10th ed 2012

Recommended Readings:

-

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Prepared by:

Khaled Jamal Hamid

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COURSE SYLLABUS

COURSE TITLE
ENGLISH-II-
CHE 2104

1st Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	English –II-		
Course Code	CHE 2104		
Credit Hours	2		
Pre-requisite(s)	English-I- CHE1102		
Co-requisite(s)			
Semester	1st semester	**Year**	2021-2022
Instructors Name	Dr. Ayad Albadrany		
Office Location	Chemical and petrochemical Building, Room No.2		
Tel. No.	00964 7818518166		
Email	ayadaied@uoanbar.edu.iq		
Lecture Times	Wednesday 10:30-12:30		
Office Hours	Sunday, 10:30-1:00		

Course Description (as in the catalogue):

This course is designed to enable students to achieve academic oral and written communication to the standard required for English language at university level. The course integrates all the language skills with emphasis on writing. It stimulates students' imagination, and promotes personal expression. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings in petrochemical engineering.

Course Objectives/Goals (optional):

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Develop academic writing
2. Apply reading skills.
3. Expand academic vocabulary through reading
4. Ability to speak through group discussions and debates

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Develop academic writing	Link			×				
	Assess			H Q E				
Apply reading skills.	Link			×				
	Assess			H Q E				
Expand academic vocabulary through reading	Link			×				
	Assess			H Q E				
Ability to speak through group discussions and debates	Link			×				
	Assess			H Q E				

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PRy:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Getting to know you: Question forms – Tenses - Vocabulary (Jobs) – English everyday		1
2.	Getting to know you: Reading (communication) and writing		1
3.	The way we live: Present simple - Present continuous -Have/have to - Writing (informal letter) - Writing (Linking words +Describing a person)		1
4.	The way we live: Reading (Living in the USA), Writing (informal letter) - Writing (Linking words +Describing a person)		1
5.	It all went wrong; Past simple - Past continuous - Have + noun - Writing (a story 1		1
6.	It all went wrong, reading Sherlock Holmes, Writing (filling in forms) -		1
7.	Let's go shopping,) -Count and uncount nouns – Articles - Expression of quantity - Vocabulary (clothes) -		1
8.	Let's go shopping, reading Market around the world, writing (articles)		1
9.	What do you want to do?, Verb patterns - Will and going to - Writing (postcard) - Would like and like - Vocabulary		1

Week	Topic	Comments*	CLO
10.	What do you want to do? Reading, Hollywood kids, writing		1
11.	Tell me what's it like? Comparative and superlatives - Writing (relative closes) - What... like?		1
12.	Tell me what's it like, reading A tale of two millionaires, writing directions and synonyms, antonyms		1
13.	Fame: - Present perfect-Vocabulary (men and women)- Tense revision - have to & got to -biography		1
14.	Fame: reading celebrity interview, writing		1
15.	Progress Exam		
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
H.W1	12/10/2022	
H.W2	26/10/2022	
H.W3	9/11/2022	
H.W4	16/11/2022	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Through 15 weeks	16%
1st semester exam	Week-8	12%
2nd semester exam	Week-13	12%
Final Exam	Week-16	60%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
Develop academic writing	Lectures	H, Q, E	50% pass
Apply reading skills.	Lectures	H, Q, E	50% pass
Expand academic vocabulary through reading	Lectures	H, Q, E	50% pass
Ability to speak through group discussions and debates	Lectures	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

1. **John & Liz Soars, ,,New Headway plus- pre_Intemediate Student,s Book,,, I0th 2012**

Recommended Readings:

Other Resources: www.youtube.com

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

COURSE TITLE

ENGINEERING NUMERICAL METHODS

Course Code

ME 3202

2nd Semester, 2021 / 2022

COURSE SYLLABUS

Course Title	Engineering Numerical Methods		
Course Code	ME 3202		
Credit Hours	3		
Pre-requisite(s)	ME1201 Calculus I, ME1202 Physics I, ME1205 Calculus II, ME1202 Physics II, ME2201 Calculus III, ME2202 Calculus IV.		
Co-requisite(s)			
Semester	2nd	**Year**	2021/2022
Instructors Name	Dr. Ghalib R. Ibrahim		
Office Location	ME Building, Room No. 4		
Tel. No.	07830985755		
Email	ghalib.ibrahim@uoanbar.edu.iq		
Lecture Times	Monday, 08:30am-10:30am Tuesday, 10:30am-11:30am		
Office Hours	Monday, 10:30am-12.30am		

Course Description (as in the catalogue)

The numerical methods course involves solving engineering problems drawn from all fields of engineering. The numerical methods include: error analysis, roots of nonlinear algebraic equations, solution of linear and transcendental simultaneous equations, matrix and vector manipulation, curve fitting and interpolation, numerical integration and differentiation, solution of ordinary and partial differential equations.

Course Objectives/Goals (optional)

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. To gain experience in error analysis.

2. Understanding the different numerical methods to solve systems of linear and nonlinear equations.
3. Understanding the different numerical methods for differentiation, integration, and solving a set of ordinary differential equations.
4. Understanding how numerical methods can be implemented in MATLAB software.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
To gain experience in error analysis.	Link	4						
	Assess	H, Q, E						
Understanding the different numerical methods to solve systems of linear and nonlinear equations.	Link	4						
	Assess	H, Q, E						
Understanding the different numerical methods for differentiation, integration, and solving a set of ordinary differential equations.	Link	5						
	Assess	H, Q, E						
Understanding how numerical methods can be implemented in MATLAB software	Link	5						
	Assess	H, Q, E ,PT						

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course CLO
1	Error Analysis		1
2	Error Analysis		1
3	Roots of equations		1
4	Roots of equations		2
5	Roots of equations		2
6	Solving system of linear equations		2
7	Solving system of linear equations		2

Week	Topic	Comments*	Course CLO
8	Integration and differentiation		3
9	Integration and differentiation		3
10	Integration and differentiation		3
11	Integration and differentiation		3
12	Ordinary differential equations		4
13	Ordinary differential equations		4
14	Ordinary differential equations		4
15	Ordinary differential equations		4
	Final Exam		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
HW	Week 3	
HW	Week 6	
HW	Week 9	
HW	Week 12	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Exams		24
Quizzes		10
Homework		6
Lab		10
Final Exam		50
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Threshold
To gain experience in error analysis.	Lectures and tutorials	**E,H,Q**	50% pass
Understanding the different numerical methods to solve systems of linear and nonlinear equations.	Lectures and tutorials	**E,H,Q**	50% pass
Understanding the different numerical methods for differentiation, integration, and solving a set of ordinary differential equations.	Lectures and tutorials	**E,H,Q**	50% pass
Understanding how numerical methods can be implemented in MATLAB software	Lectures and tutorials	**E,H,Q**	50% pass

Teaching and Learning Resources:

Text Book(s):

1. Numerical Methods for Engineers, S. C. Chapra and R. P Canale, McGraw-Hill, 6th edition 2010.

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

All lecture notes will be posted in the google classroom. Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work will not be accepted beyond the due date. Written work must be done independently and must accurately represent the work of the student. All exams and quizzes are to be completed independently.

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COURSE SYLLABUS

COMPOSITE MATERIALS

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CHE 3322

1st (Fall) Semester, 2021/ 2022

COURSE SYLLABUS

Course Title	Composite Materials		
Course Code	CHE 3322		
Credit Hours	2		
Pre-requisite(s)	General Chemistry, CHE1204		
Co-requisite(s)	Petrochemical Industry, CHE 1310		
Semester	1 (Fall)	**Year**	2022-2023
Instructors Name	Abbas Hasan Faris, PhD		
Office Location	-		
Tel. No.			
Email	abbashaan@uoanbar.edu.iq		
Lecture Times	8:30AM-10:30AM Sunday, Thursday		
Office Hours	11:00AM-1:00PM Sunday, 8:30AM-10:30AM Thursday		

Course Description (as in the catalogue):

Composite materials are materials comprising two or more material phases with different physical properties. Because they usually exhibit remarkable physical properties, in general, superior to the properties of their individual components, they appear pervasively in engineering applications (e.g., reinforced concrete in construction, fiber-reinforced materials for aircraft structures, reinforced rubber in car tires, …). Despite being comprised of multiple material phases with different physical properties, these materials may be considered for practical purposes as homogeneous materials with physical material-like effective properties.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1. Define a composite, enumerate the advantages and drawbacks of composites over monolithic materials, and discuss factors that influence the mechanical properties of a composite.
2. Classify composites, introduce common types of fibers and matrices, and manufacture, mechanical properties, and applications of composites.

3. to understand the manufacturing processes of reinforcement fibers and matrices for composites.
4. Discuss recycling of composites.
5. to extend knowledge of applications and selection of different composites in consideration of the properties and characteristics.

Course Learning Outcomes (CLO):

By the end of successful completion of this course, the student will be able to:

1. Identify, describe and evaluate the properties of fiber reinforcements, polymer matrix materials, and commercial composites.
2. Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for the manufacture of fiber-reinforced composite products.
3. Analyze the elastic properties and simulate the mechanical performance of composite laminates, and understand and predict the failure behavior of fiber-reinforced composites.
4. Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project
5. Critique and synthesise literature and apply the knowledge gained from the course in the design and application of fiber-reinforced composites.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. Identify, describe and evaluate the properties of fiber reinforcements, polymer matrix materials, and commercial composites..	Link	**5**	**3**					
	Assess	**H, Q, E**	**H, Q, E**					
2. Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for the manufacture of fiber-reinforced composite products..	Link	5	3					
	Assess	**H, Q, E**	**H, Q, E**					
3. Analyze the elastic properties and simulate the mechanical performance of composite laminates, and understand and predict the failure behavior of fiber-reinforced composites.	Link	**2**	**5**					
	Assess	**H, Q, E**	**H, Q, E**					
4. Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project.	Link	**3**	**4**					**4**
	Assess	**H, DP**	**H ,DP**					**H, DP**
	Link		**3**					**3**

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
5. Critique and synthesize literature and apply the knowledge gained from the course in the design and application of fiber-reinforced composites.	Assess		H, Q, E					H, Q, E

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Course Topics/Contents

Week	Topic	Comments*	Course CLO
1.	**Introduction to composite materials**		**1, 2**
2.	**filler materials and classification of the composite materials**		**1, 2, 3**
3.	**Reinforcement; Types of Fiber Reinforced and Composites;**		**1, 2,3**
4.	**Fiber Materials and Mechanical behaviour of fibre reinforced composites**		**3,4,5**
5.	**Effect of fiber length and Elastic behavior Longitudinal loading (continuous and aligned fiber composite)**		**3,4,5**
6.	**Elastic behavior - Transverse loading (continuous and aligned fiber composite) and Longitudinal Tensile Strength**		**2,3,4**
7.	**Discontinuous and aligned-fiber composites and Discontinuous and randomly oriented-fiber composites.**		**1,2**
8.	**Manufacturing Techniques and Manufacturing Process Selection Criteria.**		**1,2**
9.	**Product Fabrication Needs and Basic Steps in a Composites Manufacturing Process.**		**3,4,5**
10.	**Manufacturing Processes for Thermoset Composites**		**3,4,5**
11.	**Hand lay-up process and Methods of Applying Heat and Pressure**		**3, 4, 6,7**
12.	**Filament Winding Process; Making of the Part**		**3, 4, 6,7**
13.	**Basic Raw Materials characterization of composite materials**		**3,4,5**
14.	**Pultrusion Process**		**3,4**
15.	**Evaluate the effects of water and drainage provisions**		**3, 4, 6,7**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Site characterization design submittal	Week 7	
Shallow foundation design submittal	Week 11	
Retaining walls design submittal	Week 15	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week 15	25
First attempt Mid-semester exam	Week 7	15
second attempt Mid-semester exam	Week 13	-
Final Exam	Week 16	60
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	Lectures and tutorials	E, H, Q	50% pass
2	Lectures and tutorials	E, H, Q	50% pass
3	Lectures and tutorials	E, H, Q	50% pass
4	Design submittals	H	50% pass
5	Lectures and tutorials	E, H, Q	50% pass
6	Design submittals	E, H, Q	50% pass
7	Lectures and design submittals	E, H, Q	50% pass

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Teaching and Learning Resources:

Text Book(s):

Materials science and engineering: an introduction by Callister, W. D., & Rethwisch, D. G. (2018), (Vol. 9). New York: Wiley.

Recommended Readings:

Other Resources:

Course supplements will be used to present extra information not covered in the textbook.

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination being affected prior to the due date. Students in this course with a disability requiring accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

COURSE TITLE
PRINCIPLES OF HEAT TRANSFER

Course Code

First Semester, 2022 / 2023

COURSE SYLLABUS

Course Title	Principles of heat transfer		
Course Code			
Credit Hours	4		
Pre-requisite(s)	Calculus-I, Calculus-II-, Calculus-III-, Fluid-I- and Fluid-II-,		
Co-requisite(s)			
Semester	1st semester	**Year**	2022-2023
Instructors Name	Dr. Mustafa B. Al-hadithi		
Office Location	Chemical and petrochemical Building, Room No.2		
Tel. No.	009647809655472		
Email	Mustafaalhadithi@uoanbar.edu.iq		
Lecture Times	Sunday, 10:30-12:30, Tuesday , 10:30-12:30		
Office Hours	Monday, 9:00-1:00		

Course Description (as in the catalogue):

The course contains 5 modules divided into thirty lectures. A couple of solved examples are provided during discussion in the lecture. At the end of each of the module, a few of the frequently asked questions along with problems for practice are provided. In the first module, mode of heat transfer is discussed along with some of the material properties relevant to heat transfer is discussed. The second module contains one dimensional conduction process through constant and variable heat transfer area. The heat conduction in bodies with heat sources is also covered for different geometries like slab, cylinder and sphere. The third module is devoted to one dimensional convective heat transfer, which covers principle of heat flow in fluids and concept of heat transfer coefficient. The concept of overall heat transfer coefficient with the temperature profile is also discussed in detail. The concept of fins is introduced and general relations are elaborated for different cases using suitable boundary conditions and assumptions. The brief knowledge of thermal insulation is also covered in the third module. The module four is about the forced convection heat transfer, where the flow of the fluid is in or on the surface of different geometries along with various correlation. The module also covers the various useful analogies. The module five contains heat transfer by natural convection and covers the correlation for different geometries

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

The course material on Heat Transfer Operations is designed for the undergraduate students of Chemical and petrochemical Engineering. The course provides an elementary knowledge of the heat transfer operations. The course is primarily developed for the students those who need the fundamental knowledge in the heat transfer operations.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Calculate the rate equations and the conservation laws may be used to solve numerous heat transfer problems.
2. The student should learn to evaluate the heat flow through a 1-D, SS system with no heat sources for rectangular and cylindrical geometries. Many other geometries exist in nature or in common engineering designs. The student, using a similar development, should be able to develop an appropriate equation to describe systems of arbitrary, simple geometry.
3. The student should learn to evaluate Composite thermal resistances for 1-D, Steady state heat transfer with no heat sources placed in parallel or in series may be evaluated in a manner similar to electrical resistances placed in parallel or in series.
4. Students should be able to write boundary conditions for (a) very long fins, (b) insulated tip fins, (c) convective tip fins and (d) fins with a specified tip temperature.
5. Students should be able to apply the temperature profile to the Fourier Law to obtain a heat flow through the fin.
6. The student should appreciate the inherent nature of the *discretization process*, and know how to formulate the finite difference equations for the discrete points of a nodal network. Although one may find it convenient to solve these equations using hand calculations for a coarse mesh, one should be able to treat fine meshes using standard computer algorithms involving direct or iterative techniques.
7. The student must be able to perform engineering calculations that involve an energy balance and appropriate convection correlations. The methodology involves determining whether the flow is laminar or turbulent and establishing the length of the entry region. After deciding whether one is interested in local conditions (at a particular axial location) or in average conditions (for the entire tube), the convection correlation may be selected and used with the appropriate form of the energy balance to solve the problem.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1. Calculate the rate equations and the conservation laws may be used to solve numerous heat transfer problems.	Link	×						
	Assess	H, Q, E						
2. The student should learn to evaluate the heat flow through a 1-D, SS system with no heat sources for rectangular	Link	×						
	Assess	H, Q,						

CLOs		SOs (ABET) / NGOs (INAC)						
and cylindrical geometries. Many other geometries exist in nature or in common engineering designs. The student, using a similar development, should be able to develop an appropriate equation to describe systems of arbitrary, simple geometry.		**E**						
3. The student should learn to evaluate Composite thermal resistances for 1-D, Steady state heat transfer with no heat sources placed in parallel or in series may be evaluated in a manner similar to electrical resistances placed in parallel or in series.	Link	×						
	Assess	**H, Q, E**						
4. Students should be able to write boundary conditions for (a) very long fins, (b) insulated tip fins, (c) convective tip fins and (d) fins with a specified tip temperature.	Link	×						
	Assess	**H, Q, E**						
5. Students should be able to apply the temperature profile to the Fourier Law to obtain a heat flow through the fin.	Link	×						
	Assess	**H, Q, E**						
6.The student should appreciate the inherent nature of the *discretization process*, and know how to formulate the finite difference equations for the discrete points of a nodal network. Although one may find it convenient to solve these equations using hand calculations for a coarse mesh, one should be able to treat fine meshes using standard computer algorithms involving direct or iterative techniques.	Link	×						
	Assess	**H, Q, E**						
7. The student must be able to perform engineering calculations that involve an energy balance and appropriate convection correlations. The methodology involves determining whether the flow is laminar or turbulent and establishing the length of the entry region. After deciding whether one is interested in local	Link	×	×	×	×	×	×	×
	Assess	**H, Q, E**						

CLOs		SOs (ABET) / NGOs (INAC)						
conditions (at a particular axial location) or in average conditions (for the entire tube), the convection correlation may be selected and used with the appropriate form of the energy balance to solve the problem.								
	Link							
	Assess							

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Rate equations: conduction, convection, and radiation.		1
2.	Heat diffusion equation, boundary and initial conditions, One dimensional steady state conduction		
3.	Heat transfer through composite walls for different shape		1,2,3
4.	Critical thickness of insulation for cylinder and sphere.		
5.	Applications. And quiz		1,2,3
6.	1st term exam		1,2,3,4
7.	Steady state heat conduction through fins of uniform cross section, fin effectiveness and fin efficiency.		4,5,6
8.	Applications, Two-dimensional steady state conduction, analytical solution		1,2,3,4,5,6
9.	Finite difference method: explicit and implicit formulation, applications.		2,3,4
10.	Transient conduction in solids with negligible internal temperature gradients, Biot number and Fourier number.		1,2,3,4
11.	Applications. And quizz		4,5
12.	Flow over a body, velocity and thermal boundary layers, drag-co-efficient and heat transfer coefficient, Flow inside a duct; hydrodynamics and thermal entry lengths; fully developed and developing flow.		1,2,3
13.	Free convection heat transfer from vertical surface and vertical cylinder, horizontal surface and horizontal cylinders.		2,3

Week	Topic	Comments*	CLO
14.	Applications. And quizz		3,4,5
15.	2 nd term Exam.		5,6
16.	Final Exam.		1,2,3,4,5,6,7

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Through 15 weeks	15%
1st semester exam	Week-8	10%
2nd semester exam	Week-13	15%
Final Exam	Week -16	60%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. The rate equations and the conservation laws may be used to solve numerous heat transfer problems.	Lectures and tutorials	H, Q, E	50% pass
2.The student should learn to evaluate the heat flow through a 1-D, SS system with no heat sources for rectangular and cylindrical geometries. Many other geometries exist in nature or in common engineering designs. The student, using a similar development, should be able to develop an appropriate equation to describe systems of arbitrary, simple geometry.	Lectures and tutorials	H, Q, E	50% pass
3. The student should learn to evaluate Composite thermal resistances for 1-D, Steady state heat transfer with no heat sources placed in parallel or in series may be evaluated in a manner similar to electrical resistances placed in parallel or in series.	Lectures and tutorials	H, Q, E	50% pass
4. Students should be able to write boundary conditions for (a) very long fins, (b) insulated tip fins, (c) convective tip fins	Lectures and tutorials	H, Q, E	50% pass

and (d) fins with a specified tip temperature.			
5. Students should be able to apply the temperature profile to the Fourier Law to obtain a heat flow through the fin.	Lectures and tutorials	H, Q, E	50% pass
6.The student should appreciate the inherent nature of the *discretization process*, and know how to formulate the finite difference equations for the discrete points of a nodal network. Although one may find it convenient to solve these equations using hand calculations for a coarse mesh, one should be able to treat fine meshes using standard computer algorithms involving direct or iterative techniques**.**	Lectures and tutorials	H, Q, E	50% pass
7. The student must be able to perform engineering calculations that involve an energy balance and appropriate convection correlations. The methodology involves determining whether the flow is laminar or turbulent and establishing the length of the entry region. After deciding whether one is interested in local conditions (at a particular axial location) or in average conditions (for the entire tube), the convection correlation may be selected and used with the appropriate form of the energy balance to solve the problem	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

1- Fundamentals of Heat and Mass Transfer ,by THEODORE L. BERGMAN, ADRIENNE S. LAVINE and FRANK P. INCROPERA, 7th edition**.**
2- Heat and mass transfer, by Yunus and Gengel. 5th edition.
3- Heat transfer by Holman. 10th edition.

Recommended Readings:

Estimation content

Engineering Topics 100% 4 credit

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

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Academic Accreditation Committee

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COURSE SYLLABUS

COURSE TITLE

TECHNOLOGY OF NATURAL GAS

Course Code

CHE 3320

2nd Semester, 2022/ 2023

COURSE SYLLABUS

Course Title	Technology of Natural Gas		
Course Code	CHE 3320		
Credit Hours	2		
Pre-requisite(s)	CHE 3316		
Co-requisite(s)			
Semester	2nd	**Year**	2022-2023
Instructors Name	Dr. Omar Al-Kubaisi		
Office Location			
Tel. No.	+9647810484458		
Email	omalkuba@uoanabr.edu.iq		
Lecture Times			
Office Hours			

Course Description (as in the catalogue):
This course deals mainly with the study of concept of gas processing, the principal types of natural gas, its applications both as feedstock in petrochemicals industries and as an energy source. The course also discusses the main low temperatures process such as liquefaction cycles, and separations process related to natural gas. It also introduces recent advanced technology related to LNG, storage and transport equipment.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

- Identify the geological origins of petroleum reservoirs and reservoir fluids;
- Describe the history of the oil and gas industry;
- Explain the structure of the modern oil and gas industry;
- List the various disciplines that make up the petroleum engineering profession;
- Illustrate the differences between conventional and unconventional reservoirs;
- Analyze rudimentary engineering methods;
- Interpret semi-log and log-log plots;

• Apply linear interpolation and regression;

• Analyze statistical descriptions of reservoir data;

• Identify and solve problems requiring simple iteration; and

• Discuss the role of environmental stewardship in the petroleum engineering profession

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Able to demonstrate an understanding the origin of natural gas

2. Able to demonstrate an understanding of natural gas processing and

3.Be able to formulate and solve the separation process.

4.

5.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		**SOs (ABET) / NGOs (INAC)**						
		1/i	**2/ii**	**3/iv**	**4/v**	**5/vii**	**6/iii**	**7/vi**
An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and Mathematics.	Link	**x**						
	Assess	**E; H; Q**						
An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Link	x						
	Assess	**E; H**						
An ability to create and carry out proper measurement and tests with quality assurance, analyze and interpret results, and utilize engineering judgment to make inferences.	Link						**x**	
	Assess						**E; H; Q**	

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Natural Gas background (History- Development- Properties)		**1,2**
2.	Types of natural gas (Resources, Rich gas, lean gas)		
3.	Principal uses of natural gas (Natural gas industry- Petrochemicals- Energy- calorific values)		**1,2,3**
4.	Transport –storage and distribution of natural gas		
5.	Principles of low temperature processes: relative volatility, boiling points, component mixtures.		**1,2**
6.	Purification of natural gas - Low temperatures distillation (single column-double column): McCaBe Thiele method, PanchonSavarit method		**1,2**
7.	Principles of liquefaction natural gas cycles (classical cycles and recent advanced cycles), Partial and total condensation principles		**1,2**
8.	Swing adsorption used in natural gas processing: Definition, principles and applications		**1,2**
9.	Swing adsorption used in natural gas processing: Definition,		**1,2**
10.	Swing adsorption used in natural gas processing: Principles		**1,2**
11.	Swing adsorption used in natural gas processing: Applications		
12.	Membrane separation applied to natural gas purification: Description, theories and applications		**1,2**
13.	Membrane separation applied to natural gas purification: theories		**1,2**
14.	Membrane separation applied to natural gas purification: theories		**1,2**
15.	Membrane separation applied to natural gas purification: applications		**1,2**
16.	Final Exam		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Assignment	**Every two week**	
Quizzes	**Every two week**	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions		10%
Mid semester exam	1- Midterm 1 2- Midterm 2	35%
Practical sessions		5%
Final Exam		50%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and Mathematics.			

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.			
An ability to create and carry out proper measurement and tests with quality assurance, analyze and interpret results, and utilize engineering judgment to make inferences.			

Teaching and Learning Resources:

Text Book(s):

A.J. Kidnap, Parish, D.Mc Carty: Fundamental of Natural Gas, 2nd edition

Recommended Readings:

Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

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COURSE SYLLABUS

UNIT OPERATION I

Course Code

CHE 3315

1st Semester
2022 - 2023

COURSE SYLLABUS

Course Title	Unit Operation I		
Course Code	CHE 3315		
Credit Hours	3		
Pre-requisite(s)	CHE 1312 Mass Transfer I		
Co-requisite(s)	-		
Semester	First	**Year**	2022-2023
Instructors Name	Badoor M. Kurji		
Office Location	Chemical & Petrochemical Eng. Building, 2nd floor, Room No.3		
Tel. No.	07902388522		
Email	@uoanbar.edu.iq		
Lecture Times	Thursdays, 8:30-11:30		
Office Hours	Thursdays, 11:30-02:30		

Course Description (as in the catalogue):

This course deals mainly with the study and concept of the operations involving particulate solids: properties, modification, separation, settling and flow through porous media.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

1.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be:

1. Study the different physical separation processes based on mechanical unit operations, with emphasis on a physical understanding of these processes.
2. Provide the necessary tools to obtain quantitative solutions to engineering problems involving basic separation operations.
3. Study the properties of particulate solids.
4. Understand Solid handling: size reduction and screen analysis.
5. Understand principles of size reduction.
6. Understand principles of Flow through Packed Beds, and fluidization.
7. Understand principles of mechanical physical separations processes such as filtration, screening, gravity settling, and centrifugal settling.
8. Expose students to open-ended problem solving

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
	Link							
	Assess							
	Link							
	Assess							
	Link							
	Assess							
	Link							
	Assess							

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Pre-Requisites by Topic

Distribution of Course Topics/Contents (Hours):	
	1 Lecture
	4 Lectures
	4 Lectures
	2 Lectures
	2 Lectures
	2 Lectures
	4 Lectures
	2 Lectures
	2 Lectures
	7 Lectures

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	**Distillation:** vapor-liquid equilibrium, method of distillation		
2.	flash and differential		
3.	rectifications continuous, Lewis Sorel method		
4.	McCabe Thiele method, feed condition, reflux ratio		
5.	Quiz 1 + enthalpy concentration diagram		
6.	Steam distillation		
7.	multi component distillation		
8.	batch distillation		
9.	Mid exam. 1		
10.	liquid- liquid equilibrium, single stage extraction		
11.	liquid solid extraction (leaching)		
12.	equipment for leaching, equilibrium relations and single stage calculation		
13.	Counter current multi stage leaching, constant underflow in counter current multistage leaching		
14.	variable and constant underflow in counter current multistage leaching		
15.	Mid exam. 2		
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
/	/	/

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Presentations (***or*** posters)	Week 14	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions, Presentations.	Week-15	10%
Progress Exam 1	Week-6	15%
Progress Exam 2	Week-13	15%
Final Exam	Week-16	60%
Total		**100%**

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1.	Lectures and tutorials	Q, E	**50% pass**
	Lectures and tutorials	Q, E	**50% pass**
	Lectures and tutorials	Q, E	**50% pass**
	Lectures and tutorials	Q, E	**50% pass**

Teaching and Learning Resources:

Text Book(s):

- W. L. McCabe, J. C. Smith and P. Harriot, Unit Operations of Chemical Engineering, 6th ed., McGraw-Hill, Inc., New York, 2001.

Recommended Readings: -

Other Resources:

Estimated Content

Engineering Topics	%34	1 Credit
Engineering Science	%66	2 Credit
Engineering Design		0 Credit

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive final warning notice. A student missing 10% will be forced to withdraw and considered failed for this course and the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

CHEMICAL REACTO DESIGN.

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CHE 3318

1st (Fall) Semester, 2022/ 2023

COURSE SYLLABUS

Course Title	Chemical reactor design		
Course Code	CHE 3318		
Credit Hours	4		
Pre-requisite(s)	Principles of chemical engineering, Thermodynamic		
Co-requisite(s)	-		
Semester	1 (Fall)	**Year**	2022-2023
Instructors Name	Suha Akram, PhD		
Office Location	Mechanical Eng. Bulding,2nd floor		
Tel. No.			
Email	suha-elzein@uoanbar.edu.iq		
Lecture Times			
Office Hours			

Course Description (as in the catalogue):

This course provides a detailed and in-depth analysis to the principles of chemical kinetics, and reactor analysis and design. The topics in chemical kinetics include: rate constants, reaction order, rate equations for elementary and complex reactions, kinetic data analysis, and product distribution for constant and variable volume of reaction. In reactor analysis and design, discussion is focused on ideal reactor systems and arrangements, including batch reactors, plug flow reactors, continuous stirred tank reactors, and recycle reactors. The design component consists of how to make an appropriate choice of reactor type and operating conditions to optimize a desired product; sizing such reactors and determining conversion levels under various conditions of temperature and pressure; determination of reaction kinetics from experimental data.. Multiple reactor connected in series and parallel, same and different size, and type

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

To provide the student with principles and kinetic tools useful in analyzing the rates of chemical reactions for homogeneous reactions. And to increase the student's ability to do chemical reactor design by providing the knowledge and tools required to obtain, evaluate, and improve rate equations for use in design, operation and optimization of chemical reactors.

Course Learning Outcomes (CLO):

By the end of successful completion of this course, the student will be able to:

1. Define process variables and parameters of chemical reactors
2. Implement the kinetic models based on the physical picture of the process or conducted kinetic experiment
3. Vary the reaction kinetics in homogeneous systems and apply mathematical numerical and / or analytical methods in estimation of the kinetic model parameters
4. Set up the mathematical models of the processes with chemical reaction in various types of reactors (kinetic and reactor model) **and** apply the methodology of chemical engineering when choosing a reactor for the implementation of certain types of reactions
5. Apply the acquired knowledge in modeling and design of chemical reactors and apply mathematical methods, models and techniques in solving case studies

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	6/iii	3/iv	4/v	7/vi	5/vii
1. Define process variables and parameters of chemical reactors	Link	**5**	**3**					
	Assess	**H, Q, E**	**H, Q, E**					
2.. Implement the kinetic models based on the physical picture of the process or conducted kinetic experiment	Link	5	4					
	Assess	**H, Q, E**	**H, Q, E**					
3.. Vary the reaction kinetics in homogeneous systems and apply mathematical numerical and / or analytical methods in estimation of the kinetic model parameters	Link	**4**	**5**					
	Assess	**H, Q, E**	**H, Q, E**					
4. Set up the mathematical models of the processes with chemical reaction in various types of reactors (kinetic and reactor model) **and** apply the methodology of chemical engineering when choosing a reactor for the implementation of certain types of reactions	Link	**5**	**4**			**4**		
	Assess	**H, DP**	**H ,DP**			**H, DP,T**		
5. Apply the acquired knowledge in modeling and design of chemical reactors and apply mathematical	Link	**2**	**5**			**4**		**3**
	Assess	**E,Dp**	**H, Q, E**			**H,Q,E**		**H, Q, E**

CLOs		SOs (ABET) / NGOs (INAC)						
methods, models and techniques in solving case studies								

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Course Topics/Contents

Week	Topic	Comments*	Course CLO
1.	**define the chemical reactor as the basic unit of chemical processes, define the process space, system boundaries, and input and output variables of the process , define the basic division and classification of chemical reactors**		**1, 2**
2.	**Types of reaction, single and multiple reaction , in parallel, series, reversible, and catalytic reactions**		**1, 2, 3**
3.	**define the dependence of reaction rate on temperature**		**1, 2,3**
4.	**define the dependence of reaction rate on temperature**		**3,4,5**
5.	**Define the integral method of the kinetic model parameters estimation**		**3,4,5**
6.	**Progress Exam 1**		**2,3,4**
7.	**define the reactor model for batch reactor**		**1,2**
8.	**define the reactor model for CSTR reactor - define the reactor model for plug-flow reactor**		**1,2**
9.	**Single reactor design batch , plug, and mixed flow reactor**		**3,4,5**
10.	**Select the best reactor that give best conversion**		**3,4,5**
11.	**Multiple-Reactor Systems in series and in parallel, choosing same type of reactors**		**3, 4,**
12.	**Progress Exam 2**		**1,2,3, 4,**
13.	**Multiple-Reactor Systems in series and in parallel, choosing different type of reactors, Recycle Reactor**		**3,4,5**
14.	**Multiple-Reactor Systems in series and in parallel, choosing shape type of reactors Autocatalytic Reactions**		**2,3,4**
15.	**Size Comparison of Single Reactors and multiple reactors**		**1,3, 4,**
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week 15	25
Mid semester exam	Week 6 and 12	15
Practical sessions	-	-
Final Exam	Week 16	60
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1	Lectures and tutorials	E, H, Q	50% pass
2	Lectures and tutorials	E, H, Q	50% pass
3	Lectures and tutorials	E, H, Q	50% pass
4	Lectures and tutorials	E,T,H, DP	50% pass
5	Lectures and tutorials	E, H, Q, DP	50% pass

E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Teaching and Learning Resources:

Text Book(s):

Text Book(s):

Chemical reaction engineering by Octane leavenspiel

Recommended Readings:

Essentials of chemical reaction by H. Scott Fogler

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Daily homework will be due at the beginning of the next class after it is assigned unless otherwise noted in class. All homework assignments should be turned in before class begins. Work turned in late will be penalized in increments of 10% per day. Work will not be accepted beyond two days late without special coordination affected prior to the due date. Students in this course with disability requiring an accommodation should contact the professor as soon as possible or contact the head of the department.

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COURSE SYLLABUS

COURSE TITLE

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Course Code

CHE1310

Petrochemical Industry

First Semester, 2022/ 2023

COURSE SYLLABUS

Course Title	Petrochemical industry		
Course Code	CHE1310		
Credit Hours	2		
Pre-requisite(s)	General Petrochemical industry		
Co-requisite(s)			
Semester	First	**Year**	2022-2023
Instructors Name	Suha Mahdi Salih		
Office Location	Mechanical Eng. Building, 2nd floor, Room No.2		
Tel. No.	07802094281		
Email	Suhamahdi82@uoanbar.edu.iq		
Lecture Times			
Office Hours			

Course Description (as in the catalogue):

Getting to know the industries that produce petroleum, how are the production processes in the factories? How to control the production process. The study of how interactions between substances and compounds take place. The effect of pressure and temperature on the petrochemical industries

Course Objectives/Goals (optional):

Characteristics of petrochemical industries, classification of petrochemical compound according to their source (methane, ethylene, propylene, and aromatics hydrocarbons) methane and their derivatives, (acetylene and methanol) ethylene and derivatives (ethylene oxide, and poly-ethylene), propylene and derivatives (isopropyl alcohol, Phenol and poly propylene) aromatics cyclic hydrocarbons. Introduction of benzene derivatives (ethylbenzene, styrene, cumene, nitro benzene, cyclohexane, toluene derivatives (benzoic acid, xylene derivatives, teretholic acid), polymers (LDPE, HDPE, PP, PVC, PS) synthetic fibers, industrial rubber

Course Learning Outcomes:

Students can:

Clarify the petrochemical industries and their products and consider them as raw materials for the various chemical industries.

Knowing the forms and types of equipment needed for each industry and how to choose and deal with them.

The ability to know the advantages and disadvantages of each industry and how to deal with them and choose the best.

The ability to determine the necessary and required equipment for each industry and know what is best to give better and more productivity.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Clarify the petrochemical industries and their products and consider them as raw materials for the various	Link	1	3	0	0	0	0	0
	Assess	Q,E	Q,E	-	-	-	-	-

CLOs		SOs (ABET) / NGOs (INAC)						
Knowing the forms and types of equipment needed for each industry and how to choose and deal with them.	Link	1	3	0	0	0	0	0
	Assess	-	**H,Q,E**	-	-	-	-	-
The ability to know the advantages and disadvantages of each industry and how to deal with them and choose the best.	Link	**1**	**3**	**0**	**0**	**0**	**0**	**0**
	Assess	-	**H,Q,E**	-	-	-	-	-
The ability to determine the necessary and required equipment for each industry and know what is best to give better and more productivity.	Link	**1**	**3**	**0**	**0**	**0**	**0**	**0**
	Assess	-	**H,Q,E**	-	-	-	-	-

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	**Petrochemical engineering,feed stock,intermediate,finished product**		1
2.	**Naptha cracking**		2
3.	**Primary fractionator or stabilizers, hydrogen separator**		1,2
4.	**Conversion process of selected petrochemical, polyethylene,low density polyethylene**		1,2,3
5.	**High density polyethylene,linear low density polyethylene**		1,2,3
6.	**Polypropylene, polypropylene terephthalate,**		1,2,3

Week	Topic	Comments*	CLO
	terephthalic acid		
7.	**Ethylene glycol**		1,2,3
8.	**Polyvinyl chloride,polysterene,polybutadiene,acrylontrile butidene sterene ,styerene butidene rubber**		1,4
9.	**Poly methyl beta acrylate , polterafuoroetelene,nylons,**		1,4
10.	**Phenol formaldehyde, urea formaldehyde ,melamine formaldehyde**		1,4
11.	**melamine formaldehyde**		5
12.	**Phenol formaldehyde, urea formaldehyde ,melamine formaldehyde**		1,2,3,6
13.	**Polyurethane,tolune diisconate,slicone**		1,2,3,6
14.	**Petrochemical complex, downstream units, petrochemical hubs,processing of plastic ,rubber and fibre, moulding of plastic**		1,2,3,6
15.	**Extrusion modeling ,blow modeling ,thermal modeling, injection modeling**		1,2,3,6
16.	**Final Exam**		1,2,3,6

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
	/	/	/
	/	/	/
	/	/	/
	/	/	/
	/	/	/
	/	/	/
	/	/	/
	/	/	/
	/	/	/

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Writing reports	Week 1,2,3,4,5,6,7	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week 5	10
Mid semester exam	Week 7	30
Practical sessions		/
Final Exam		60
Total		**100**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
Clarify the petrochemical industries and their products and consider them as raw materials for the various	Lectures	Q,E	50% pass
Knowing the forms and types of equipment needed for each industry and how to choose and deal with them.	Lectures	Q,E	50% pass
The ability to know the advantages and disadvantages of each industry and how to deal with them and choose the best.	Lectures	Q,E	50% pass
The ability to determine the necessary and required equipment for each industry and know what is best to give better and more productivity.	Lectures	Q,E	50% pass

Teaching and Learning Resources:

Text Book(s):

Fundamentals of Petroleum and Petrochemical Engineering Uttam Ray Chaudhuri

Recommended Readings:

Other Resources:

There is no other resource

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

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COURSE SYLLABUS

COURSE TITLE
HEAT TRANSFER WITH PHASE CHANGE

Course Code

2nd Semester, 2022 / 2023

COURSE SYLLABUS

Course Title	heat transfer with phase change		
Course Code			
Credit Hours	3		
Pre-requisite(s)	Calculus-I, Calculus-II-, Calculus-III-, Fluid-I- and Fluid-II-, Heat-I		
Co-requisite(s)			
Semester	2nd semester	year	2022-2023
Instructors Name	Dr. Mustafa B. Al-hadithi		
Office Location	Chemical and petrochemical Building, Room No.2		
Tel. No.	009648909655472		
Email	mustafaalhadithi@uoanbar.edu.iq		
Lecture Times	Tuesday , 8:30-10:00, Thursday, 11:30-12:30		
Office Hours	Monday, 9:00-1:00		

Course Description (as in the catalogue):

The course contains 5 modules divided into thirty lectures. A couple of solved examples are provided during discussion in the lecture. At the end of each of the module, a few of the frequently asked questions along with problems for practice are provided. In the first module, heat exchanger is discussed along with some of the material properties relevant to heat transfer is discussed. The second module Different regimes of boiling, Mechanism of condensation, Nusselt's theory of film condensation on a vertical surface, use of correlations in solving film wise condensation on plane surfaces, horizontal tubes and tube banks. The third module is the radiation heat transfer, Definitions, concept of a black body, Kirchoff's law, Lambert's Cosine Law, Stefan-Boltzman's law, Plank's distribution law, Wein's displacement law and configuration factor. The forth module is the mass transfer, Fick's law of diffusion, Mass transfer coefficient, Evaporation of water into air, Schmidt number and Sherwood number.

Course Objectives/Goals (optional):

The goals of this course are to enable students to:

The course material on Heat Transfer Operations is designed for the undergraduate students of Chemical and petrochemical Engineering. The course provides an elementary knowledge of the heat transfer operations. The course is primarily developed for the students those who need the these knowledge in the heat transfer operations and design the heating equipment.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. One of the most common applications of heat transfer is to design equipment for exchanging heat from one fluid to another. Such devices are generally called Heat Exchangers. Because there are many important applications, heat exchanger research and development has had a long history. Such activity is by no means complete, however as many talented workers continue to seek ways of improving deign and performance.

2. The focus is on convection processes associated with the change in phase of a fluid, particularly those processes that can occur at a solid-liquid interface, namely, boiling and condensation.
3. The student should learn to evaluate phase change, heat transfer to and from the fluid can occur without influencing the fluid temperature. Hence, in boiling and condensation, large heat transfer rates may be achieved with small temperature differences.

4. The heat transfer coefficient associated with boiling and condensation depends on several parameters, such as surface tension between liquid-vapour interface, latent heat, density difference between liquid and vapour, length scale, specific heat and viscosity.

5. It is apparent that boiling and condensation are complicated processes for which the existence of generalized relations in somewhat limited. This chapter identifies the essential physical features of the processes and presents correlations suitable for the approximate engineering calculations.

6 It is apparent that boiling and condensation are complicated processes for which the existence of generalized relations in somewhat limited. This chapter identifies the essential physical features of the processes and presents correlations suitable for the approximate engineering calculations.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1. One of the most common applications of heat transfer is to design equipment for exchanging heat from one fluid to another. Such devices are generally called Heat Exchangers. Because there are many important applications, heat exchanger research and development has had a long history. Such activity is by no means complete, however as	Link	×						
	Assess	H,Q						

CLOs		SOs (ABET) / NGOs (INAC)						
many talented workers continue to seek ways of improving deign and performance.								
2. The focus is on convection processes associated with the change in phase of a fluid, particularly those processes that can occur at a solid-liquid interface, namely, boiling and condensation.	Link	×						
	Assess	H,Q						
3. The student should learn to evaluate phase change, heat transfer to and from the fluid can occur without influencing the fluid temperature. Hence, in boiling and condensation, large heat transfer rates may be achieved with small temperature differences.	Link	×						
	Assess	H,Q						
4 The heat transfer coefficient associated with boiling and condensation depends on several parameters, such as surface tension between liquid-vapour interface, latent heat, density difference between liquid and vapour, length scale, specific heat and viscosity.	Link	×						
	Assess	H,Q,E						
5. It is apparent that boiling and condensation are complicated processes for which the existence of generalized relations in somewhat limited. This chapter identifies the essential physical features of the processes and presents correlations suitable for the approximate engineering calculations.	Link	×				×		
	Assess	H,Q,E						
6. It is apparent that boiling and condensation are complicated processes for which the existence of generalized relations in somewhat limited. This chapter identifies the essential physical features of the processes and presents correlations suitable for the approximate engineering	Link	×		×		×	×	×
	Assess	H,Q,E						

CLOs		SOs (ABET) / NGOs (INAC)						
calculations.								
	Link							
	Assess							
	Link							
	Assess							

Assessment Key- **E:** Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	1- Heat exchanger types and flow arrangement, Overall heat transfer coefficient, fouling factor and LMTD for parallel flow and counter flow.		1
2.	effectiveness-NTU method, parallel and counter flow heat exchanger, Heat exchanger design and multi-pass cross flow.		1,2
3.	Applications. Quizz		1,2,3
4.	Different regimes of boiling and mechanism of condensation. The boiling curve, Pool boiling correlations		2,3
5.	Condensation heat transfer phenomena, Film condensation inside horizontal tube.		3,4
6.	Applications. And quiz		2,3,4
7.	1st term exam.		1,2,3,4
8.	Definitions, concept of a black body, Kirchoff's law, Lambert's Cosine Law, Stefan-Boltzman's law		2,3,4
9.	Plank's distribution law, Wein's displacement law, configuration factor.		3,4,5
10.	Radiation heat exchange between two parallel plates.		2,3,4
11.	Shielding, radiation heat exchange in an enclosure.		3,4,5
12.	Applications. Quiz		4,5
13.	Fick's law of diffusion, Mass transfer coefficient		3,4,5,6
14.	Evaporation of water into air, Schmidt number, Sherwood number		4,5,6
15.	**Applications**		5,6
16.	**Final Exam**		1,2,3,4,5,6

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Presentations (***or*** posters)	Week 15	

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Through 15 weeks	15%
Progress Exam-1	Week-6	15%
Progress. Exam-2	Week-13	20%
Final Exam	Week-16	50%
Total		**100%**

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators

1. One of the most common applications of heat transfer is to design equipment for exchanging heat from one fluid to another. Such devices are generally called Heat Exchangers. Because there are many important applications, heat exchanger research and development has had a long history. Such activity is by no means complete, however as many talented workers continue to seek ways of improving deign and performance.	Lectures and tutorials	H, Q, E	50% pass
2. The focus is on convection processes associated with the change in phase of a fluid, particularly those processes that can occur at a solid-liquid interface, namely, boiling and condensation.	Lectures and tutorials	H, Q, E	50% pass
3. The student should learn to evaluate phase change, heat transfer to and from the fluid can occur without influencing the fluid temperature. Hence, in boiling and condensation, large heat transfer rates may be achieved with small temperature differences.	Lectures and tutorials	H, Q, E	50% pass
4 The heat transfer coefficient associated with boiling and condensation depends on several parameters, such as surface tension between liquid-vapour interface, latent heat, density difference between liquid and vapour, length scale, specific heat and viscosity.	Lectures and tutorials	H, Q, E	50% pass
5. It is apparent that boiling and condensation are complicated processes for which the existence of generalized relations in somewhat limited. This chapter identifies the essential physical features of the processes and presents correlations suitable for the	Lectures and tutorials	H, Q, E	50% pass

approximate engineering calculations.			
6. It is apparent that boiling and condensation are complicated processes for which the existence of generalized relations in somewhat limited. This chapter identifies the essential physical features of the processes and presents correlations suitable for the approximate engineering calculations.	Lectures and tutorials	H, Q, E	50% pass

Teaching and Learning Resources:

Text Book(s):

1- Fundamentals of Heat and Mass Transfer ,by THEODORE L. BERGMAN, ADRIENNE S. LAVINE and FRANK P. INCROPERA, 7th edition**.**
2- Heat and mass transfer, by Yunus and Gengel. 5th edition.
3- Heat transfer by Holman. 10th edition.

Recommended Readings:
Other Resources:
Estimation content
Engineering Topics 100% 4 credit

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

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COURSE SYLLABUS

ENGLISH LANGUAGE IV

CHE 4107

2nd Semester, 2022 / 2023

COURSE SYLLABUS

Course Title	English Language IV		
Course Code	CHE4107		
Credit Hours	2		
Pre-requisite(s)	CHE1102 , CHE1105 , CHE3106		
Co-requisite(s)			
Semester	2	**Year**	2022 - 2023
Instructors Name	Khaled Jamal Hamid		
Office Location	Room 2, Chemical & Petrochemical Eng. Dpt.		
Tel. No.	00964 7823237037		
Email	Khaled.j.h@uoanbar.edu.iq		
Lecture Times	Monday 10:30-12:30		
Office Hours	Mondays, Tuesdays 9:00-2:00		

Course Description (as in the catalogue):

This course is an upper intermediate level leading for higher improvement in all English skills. It further improves language proficiency at B2 level of the Common European Framework of Reference (CEFR). It is a 15 weeks module course with 2 hours of instructions each week. This course is designed to enable academic writing course which provides an opportunity for the students to learn and practice the skills needed for handling topics related to the field of study. In addition, they will be familiar with writing a CV, a cover letter and formal emails. They will also learn skills for reading analysis, such as comprehension and inference.

Students, in this course, will be confident to talk about themselves, their interests, ask questions to others and talk about their academic subjects and what they have been learned during the four years. Moreover, they will be able to build their English vocabulary and develop their ability to maintain conversations in English.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. give a clear presentation on a familiar topic, and answer predictable or factual questions.
2. scan texts for relevant information and grasp main point of view.
3. understand detailed instructions or advice.
4. make notes while someone is talking.
5. write a CV, a cover letter and formal letters or emails.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1. give a clear presentation on a familiar topic, and answer predictable or factual questions.	Link			5				
	Assess			H,Q,E				
2. scan texts for relevant information and grasp main point of view.	Link			5				
	Assess			Q,E				
3. understand detailed instructions or advice.	Link			5				
	Assess			Q,E				
4. make notes while someone is talking.	Link			5				
	Assess			H,Q,E				
5. write a CV, a cover letter and formal letters or emails.	Link			5				
	Assess			H,Q,E				

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	Course SLO
1.	• **Grammar:** The tense system (simple, continuous, perfect), Active and passive, and spoken English (Informal language). • **Vocabulary** (Compound words)		6
2.	• **Reading** (reading the passage: A Home from Home) • **Listening** (Things I miss from home)		6
3.	• **Speaking** (conversations about Exchanging information) • **Everyday English** (Social expressions) • **Writing** (Applying for a job)		6
4.	• **Grammar:** The present tenses (perfect, simple, and continuous), and spoken English (Being imprecise, Filters). • **Vocabulary**: Hot verbs (with get, make, do, take, and put)		6
5.	• **Reading:** (reading the passage: Paradise Lost) • **Listening** (An interview with Tashi Wheeler)		6
6.	• **Speaking:** (Information gap and roleplay, Dreams come true) • **Everyday English:** (Exclamations) • **Writing** (Informal letters)		6
7.	**Progressive Exam-1**		6
8.	• **Grammar:** Narrative tenses (all past tenses such as simple, continuous, and perfect) • **Vocabulary:** (Books and Films) • **Reading:** (reading the passage: Jane Austen) • **Listening:** (The money jigsaw)		6
9.	• **Speaking:** (retelling a news story and talking about your favorite book or film) • **Everyday English:** (Showing interest and surprise) • **Writing:** (Narrative writing 1)		6
10.	**Progressive Exam-2**		6
11.	• **Grammar:** Questions and Negatives, and spoken English (the question How come?) • **Vocabulary** (Prefixes, Antonyms in context)		6
12.	• **Reading** (reading the passage: Diana and Elvis shot JFK!) • **Listening** (My most memorable lie!)		6
13.	• **Speaking** (Discussion and Exchanging information about conspiracy theories) • **Everyday English** (Being polite) • **Writing** (Linking ideas and conjunctions)		6

Week	Topic	Comments*	Course SLO
14.	• **Grammar:** Future forms and spoken English (the word Thing) • **Vocabulary** (Hot verbs- take, put) • **Reading** (reading the passage: Today's Teenagers are just fine) • **Listening** (Arranging to meet) • **Speaking** (Future possibilities in your life and Exchanging information about people arranging to meet) • **Everyday English** (Telephone conversations) • **Writing** (writing emails)		6
15.	**Practical session (speaking)**		6
16.	**Final Exam**		6

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments
15.	**Practical session (speaking)**	

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
/	/	/

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	Week-15	10
Progressive exam	Week-7	10
Mid semester exam	Week-10	15
Practical session (speaking)	Week-15	5
Final Exam	Week-16	60
Total		100

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

Course SLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. give a clear presentation on a familiar topic, and answer predictable or factual questions.	Lectures	H, Q, E	50% pass
2. scan texts for relevant information and grasp main point of view.	Lectures	H, Q	50% pass
3. understand detailed instructions or advice.	Lectures	H, Q	50% pass
4. make notes while someone is talking.	Lectures	H, Q, E	50% pass
5. write a CV, a cover letter and formal letters or emails.	Lectures		

Teaching and Learning Resources:

- Raymond Murphy; "English Grammar in Use", 4th edition 2012

Text Book(s):

- John & Liz Soars, "New Headway Plus Beginner", 10th ed 2012

Recommended Readings:

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Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

Students are expected to do their own work. You are allowed to work on assignments in teams only if specified by the instructor. In other words, students are encouraged to communicate about general principles of the course, but all assigned homework must be done on an individual basis. The instructor is available to provide any assistance that you may need. Cheating is considered a serious offense by the university. You should be aware of the severe penalty for cheating.

Notes:

Prepared by:

Khaled Jamal Hamid

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COURSE SYLLABUS

PROCESS CONTROL

Course Code

CHE 4328

1ST Semester, 2022/ 2023

COURSE SYLLABUS

Course Title	Process Control		
Course Code	4328		
Credit Hours	3		
Pre-requisite(s)	Calculus IV, Physics, Fluid Mechanic, Heat transfer, Vibration		
Co-requisite(s)			
Semester	1st	**Year**	2022-2023
Instructors Name	Dr. Ayad Aied Albadrany		
Office Location	Chemical Engineering Department		
Tel. No.	+9647818518166		
Email	ayadaied@uoanbar.edu.iq		
Lecture Times	Tuesday : 8:30am-10:30AM		
Office Hours	Thursday: 8;30-2:00PM		

Course Description (as in the catalogue):

Process control is the ability to monitor and adjust a process to give a desired output. It is used in industry to maintain quality and improve performance. An example of a simple process that is controlled is keeping the temperature of a room at a certain temperature using a heater and a thermostat. Other examples, material and energy balances are used to model unsteady state (dynamic) process systems where control algorithms are required to bring the process back to equilibrium. Therefore, this course applies the key concepts of automatic control and instrumentation to process plants.

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Course Objectives/Goals (optional):

The objectives of control system design are

1. To apply the models of physical techniques with equations to derive and analyze the transfer functions of open and closed loop control systems.

2. To able the student is responsible for designing, developing, and implementing solutions that control dynamic systems. Dynamic systems are systems that constantly change. The main aim of a control systems engineer is to bring stability to these constantly changing systems to produce the desired outcome.

3.To construct a system that has a desirable response to standard inputs. A desirable transient response is one that is sufficiently fast without excessive oscillations. A desirable steady-state response is one that follows the desired output with sufficient accuracy.

4. To make a plant stable that operates in a predictable way, either by eliminating the error or by regulating the error bounded within the tolerance band, which ultimately leads to safety (for users & environments), reliability (for operators), and profitability (for stakeholders).

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to

1. Identify open and closed loop control system and formulate mathematical model for physical systems.

2. Interpret and apply block diagram representations of control systems and design PID controllers based on empirical tuning rules

3. Compute stability of linear systems using the Routh array test and use this to generate control design constraints

4. Use Evans root locus techniques in control design for real world systems

5. Analyze performance characteristics of system using Frequency response methods

6. Learn the measurement systems, errors of measurement, as well as explain working principles of sensors and transducers.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
1.Identify open and closed loop control system and formulate mathematical model for physical systems.	Link	3	2	1				
	Assess	Q,E,H	Q,E,H	Q,E,H				
2.Interpret and apply block diagram representations of control systems and design PID controllers based on empirical tuning rules	Link	3	2	2				
	Assess	Q,E,H,	Q,E,H,	Q,E,H,				
3.Compute stability of linear systems using the Routh array test and use this to generate control design constraints	Link	2	3					
	Assess	Q,E,H	Q,E,H					
4.Use Evans root locus techniques in control design for real world systems	Link	1	-	2	1	-	-	1
	Assess	Q,E,H		Q,E,H	Q,E,H			Q,E,H
5.Analyze performance characteristics of system using Frequency response methods	Link	1	-	1	2			
	Assess	Q,E,H		Q,E,H	Q,E,H			
6.Learn the measurement systems, errors of measurement, as well as explain working principles of sensors and transducers.	Link	2	3					
	Assess	Q,E,H	Q,E,H					

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction to automatic control		1,2,6
2.	Representation of control components		1,2
3.	Representation of control systems: Mass, spring damper system.		1, 4, 6
4.	Representation of control systems: Hydraulic system		1, 4, 6
5.	Representation of control systems: Pneumatic system		1, 4, 6
6.	Representation of control systems: Electrical system		1, 4, 6
7.	Representation of control systems: Thermal system		1, 4, 6
8.	Steady-state operation		2,4
9.	Laplace transformer		1,2,4,6
10.	Transient and steady-state responses		1,4,6
11.	Steady-state errors in control systems		2,6
12.	Stability of control systems		1,2,4,6
13.	The rout locus method		1,4, 6
14.	The rout locus method		1,4, 6
15.	Progress Exam		1,2,4,6
16.	**Final Exam**		1,2,4,6

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Exercises	Week 1 – Week 15	Exercises

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	1-11-2022	10%
Mid semester exam	28-11-2022 1-1-2023	15% 15%
Practical sessions	-	-
Final Exam	18-1-2023	60%
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
Quizzes	Week 1-15	10%	
Homework	Week 1-15	10%	
Progressive exams	Week-14	20%	
Final Exam	Week-16	60%	

Teaching and Learning Resources:

Text Book(s):

1. Modern Control Engineering, Fifth Edition 2010, Katsuhiko Ogata

Recommended Readings:

1.Modern Control Systems, Twelfth Edition 2011, by Richard C. Dorf and Robert H. Bishop, Prentice Hall.

2.Automatic Control Systems, Ninth Edition 2010, by Farid Golnaraghi and Binjamin C. Kuo, John Wiley.

3.Measurement Systems Applications and Design, 5th edition 2003, by E. Doebelin, McGraw Hill.

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Other Resources:

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

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Notes:

College of Engineering
Academic Accreditation Committee

CHE 4327

UNIVERSITY OF ANBAR
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COURSE SYLLABUS

ENVIRONMENTAL ENGINEERING

CHE4327

1st Semester, 2022 / 2023

COURSE SYLLABUS

Course Title		Environmental Engineering		
Course Code		CHE4327		
Credit Hours		2		
Pre-requisite(s)		General chemistry, organic chemistry, water treatment		
Co-requisite(s)				
Semester		1st	**Year**	2022-2023
Instructors Name		Dr. Omar Mustafa Hussein Al-Kubaisi		
Office Location		Chemical Engineering Department		
Tel. No.		+9647810484458		
Email		omalkuba@uwaterloo.ca-omalkuba@uoanbar.edu.iq		
Lecture Times		Thursday:- 10:30- 12:30		
Office Hours		Thursday:-8:30-10:30am		

Course Description (as in the catalogue):

Introduction-Environment, environmental Engineering, environmental Engineering Rule, Pollution, pollution types, Wastewater, wastewater characteristics, wastewater sources, Effluent wastewater quality, wastewater treatment plant, Air pollution, Air pollutant types, Air pollution effects, Air quality Standards, dispersion equations, Air pollution treatment Solid Waste Management: Types, characteristics, sources and quantities of solid waste; Collection disposal and recycling. Environmental Legislation and Regulations Sustainable environmental engineering Sustainability, Sustainable Engineering, and Sustainable Engineering Design

Course Objectives/Goals (optional):

The objective of this course is to provide the plant supervisor and process controller

with sufficient knowledge and insight to:

1. **Assess raw water quality as well as the quality of water from individual unit processes and the treatment plant as a whole to ensure that final water of the required quality is produced.**

2. **Understand the implications to consumers and other stakeholders if sub-standard water is produced and supplied.**
3. **Understand the pollutant sources and their classification according to different aspects**
4. **Understand the forms of pollution**
5. **Equipment assessment and design of air pollution treatments**
6. **Industrial safety**

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. Demonstrate the ability to distinguish and evaluate the forms of pollution and their sources.
2. An ability to develop and conduct appropriate experimentation, analyze and interpret data of the air quality required for the engineering judgment to draw conclusions.
3. Demonstrate the ability to design and approximate the equipment sizing required for air quality management.

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Demonstrate the ability to distinguish and evaluate the forms of pollution and their sources.	Link	•						
	Assess	H, Q, E						
An ability to develop and conduct appropriate experimentation, analyze and interpret data of the air and water quality required for the engineering judgment to draw conclusions.	Link						•	
	Assess						H, Q, E	
Demonstrate the ability to design and approximate the equipment sizing required for air quality management.	Link		•					
	Assess		H, Q, E					
	Link							
	Assess							
	Link							
	Assess							
	Link							
	Assess							
	Link							
	Assess							
	Link							
	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction-Environment, environmental Engineering, environmental Engineering Rule		
2.	Pollution, pollution types,		
3.	Introduction to Air pollution,		
4.	Air pollutant types, Air pollution effects,		
5.	Air quality Standards, dispersion equations, Air pollution treatment		
6.	Air Pollution management and Control: Types and Design		
7.	Solid Waste Management: Types,		
8.	Solid Waste Management: characteristics,		
9.	Solid Waste Management: sources and quantities of solid waste;		
10.	Collection disposal and recycling.		
11.	Environmental Legislation and Regulations		
12.	Sustainable environmental engineering Sustainability,		
13.	Sustainable Engineering,		
14.	Sustainable Engineering Design		
15.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Assignment 1	**15-11-2021**	
Assignment 2	**10-12-2021**	
1st Exam	**15-12-2021**	**Can be differed**
2nd Exam	**3-1-2021**	**Can be differed**
Quiz 1	**Chosen on different date**	
Quiz 2		
Quiz 3		
Oral Test 1		
Oral Test 2		

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	26-12-2019	10%
Mid semester exam	28-11-2019 19-12-2019	10% 15%
Practical sessions		5%
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
Demonstrate the ability to distinguish and evaluate the forms of pollution and their sources.	**Lecture Slides and tutorial**	**Q, E, H**	
An ability to develop and conduct appropriate experimentation, analyze and interpret data of the air and water quality required for the engineering judgment to draw conclusions.	**Lecture Slides and tutorial**	**Q,E,H**	
Demonstrate the ability to design and approximate the equipment sizing required for air quality management.	**Lecture Slides and tutorial**	**Q,E, H**	

Teaching and Learning Resources:

Lee, C. C., & Lin, S. D. (2007). *Handbook of environmental engineering calculations*. McGraw-Hill Education.

Text Book(s):

Davis, M. L., & Cornwell, D. A. (2008). *Introduction to environmental engineering*. McGraw-Hill.

Recommended Readings:

Other Resources:

1- **www.youtube.com**

Attendance policy:

Attendance is compulsory. A student missing 3% of the total allocated course hours will receive 1st warning notice and a student missing 7% will receive 2nd warning notice. A student missing 10% will be forced to withdraw and considered failed for the current academic year (in accordance with the university regulations).

Plagiarism/Cheating:

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Notes:

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Academic Accreditation Committee

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COURSE SYLLABUS

EQUIPMENT DESIGN

CHE 4326

1St Semester, 2022 / 2023

COURSE SYLLABUS

Course Title		Equipment Design		
Course Code		CHE4326		
Credit Hours		2		
Pre-requisite(s)		General chemistry, organic chemistry, water treatment		
Co-requisite(s)				
Semester		1st	**Year**	2022-2023
Instructors Name		Dr. Omar Mustafa Hussein Al-Kubaisi		
Office Location		Chemical Engineering Department		
Tel. No.		+9647810484458		
Email		omalkuba@uoanbar.edu.iq		
Lecture Times		Thursday:- 10:30- 12:30		
Office Hours		Thursday:-8:30-10:30am		

Course Description (as in the catalogue):

In this course, the student will look deeply into the main parts of the chemical equipment, and how these parts will work together for desired product. The course covers the steps to design a heat exchanger; a distillation column, and a vessel (time permit). The course will cover the optimization for each equipment.

Course Objectives/Goals (optional):

The objective of this course is to provide the plant supervisor and process controller

with sufficient knowledge and insight to:

1- Describe a process an engineer will begin to sketch equipment, show how it is interconnected, and show the process flows and operating conditions.

2- Basic concept of heat transfer are reviewed in this course and applied primarily to heat exchangers

3- Practiced separation method in chemical, petroleum, and related process industries.

Course Learning Outcomes:

By the end of successful completion of this course, the student will be able to:

1. read and understand the projects from their flowsheets and plot it.

2. differentiate the types of process flowsheets

3. choose the optimum pipe diameter according to the cost, safety work pressure, and performance

4. understand the purposes of each part in the heat exchanger and be able to design the heat exchanger from initial process conditions

5. understand the purposes of each part in the distillation column and be able to design the distillation column from initial process conditions

Alignment of Course Student Learning Outcomes to Program Student Learning Outcomes

CLOs		SOs (ABET) / NGOs (INAC)						
		1/i	2/ii	3/iv	4/v	5/vii	6/iii	7/vi
Design a heat exchanger, and distillation column required for a specified process. Optimize the design according to different parameters.	Link	●						
	Assess	Q, E, H						
An ability to distinguish, identify, define, the heat exchanger, distillation column components, and piping system according to the parameters and condition given.	Link		●					
	Assess		Q, E, H					
	Link							
	Assess							
	Link							
	Assess							
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	Assess							
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	Assess							
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	Assess							

Assessment Key- E: Exam, **H:** Homework, **Q:** Quiz, **P:** Project, **DP:** Design Project, **R:** Research, **T**: Teamwork, **PT**: Practical Training, **FW:** Field Work, **PR:** Presentation, **RE:** Report, **S:** Survey, **SE:** Seminar, **W:** Workshop, **C:** Conference, **O:** Other

Weekly Distribution of Course Topics/Contents

Week	Topic	Comments*	CLO
1.	Introduction to design; nature of design		1,2
2.	Codes and standards		1,2
3.	Flow -Sheeting		1,2
4.	Separation columns (Distillation)		1,2
5.	Distillation considerations		1,2
6.	Design methods for binary systems (Reviewing Unit Operation Courses)		1,2
7.	Approximate column Sizing		1,2
8.	Plate hydraulic design		1,2
9.	Heat transfer Equipment: Basic design Procedure and Theory		1,2
10.	Overall heat transfer coefficients		1,2
11.	Shell and tube heat exchangers: Construction details		1,2
12.	Mean temperature difference (Temperature driving force)		1,2
13.	Shell and tube exchangers: Design consideration		1,2
14.	Shell side and tube side heat transfer coefficients		1,2
15.	Shell side and tube side heat transfer coefficients		1,2
16.	**Final Exam**		

* In the comments, you can add the relevant chapter or notes, etc.

Scheduling of laboratory and other non-lecture sessions, including online sessions, as appropriate (if applicable)

Week	Topic	Comments	CLO
	No lab for this course		

Information on out-of-class assignments with due dates for submission

Assignment/Activity	Due Date	Comments
Assignment 1	**1-11-2022**	**Develop and distinguish the flow sheet types**
Assignment 2	**15-11-2022**	**Flash distillation calculation**
Assignment 3	**1-12-2022**	**Reviewing McCabe methods**
Assignment 4	**15-12-2022**	**Approximate column sizing.**
Assignment 5	**27-12-2022**	**Applying the procedure for designing the shell and tube heat exchanger**

Students' Assessment:

Students are assessed as follows:

Assessment Tool(s)**	Date	Weight (%)
Semester activities. These include quizzes, classroom interactions	26-12-2019	10%
Mid semester exam	28-11-2019 19-12-2019	20% 20%
Practical sessions		
Final Exam		40%
Total		

** You can modify / add other tools relevant to the course.

Course Outcome Assessment Plan:

CLOs	Teaching/Learning Method(s)	Assessment Tool(s)	Performance Indicators
1. able to demonstrate an understanding of equipment design using different equations of fluid flow, mass transfer and heat applications	Lectures and tutorials	Q,E,H	50% pass

2. able to demonstrate an understanding of heat exchanger principles and design.	Lectures and tutorials	Q,E,H	50% pass
3. able to demonstrate knowledge separation column: distillation. Main principles of mass transfer and its design	Lectures and tutorials	E	50% pass

Teaching and Learning Resources:

Text Book(s):

Chemical Engineering, Volume 6, Fourth edition, Chemical Engineering Design, R. K. Sinnott

Recommended Readings:

Other Resources:

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Notes: