



13 Course Specification of Engineering Chemistry

I. Course Identification and General Information:					
1	Course Title:	Engineering Chemistry			
2	Course Code & Number:	BR003			
3	Credit hours:	C.H			Credit Hours
		Th.	Tu.	Pr.	Tr.
		2	2		
4	Study level/ semester at which this course is offered:	First Level / 2 nd Semester			
5	Pre –requisite (if any):	Nil			
6	Co –requisite (if any):	Nil			
8	Program (s) in which the course is offered:	Civil Engineering Department			
9	Language of teaching the course:	English/Arabic			
10	Location of teaching the course:	Faculty of Engineering			
11	Prepared By:	Dr. Riyadh A. Muharam			
12	Date of Approval				

II. Course Description:
<p>This course focuses on the concepts of theoretical and practical in the field of engineering chemistry and highlights the theories which are based in this field as gases laws and gases liquefactions, engineering materials & applications, thermodynamic's laws and energetics. It also aims to introduce the students in chemical industries: silicate industry, refractories, cement, glasses and plastics, chemical power sources, fuels and combustions, water and water treatment, pollution and its control.</p>

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III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a.1	Define the principles of Chemistry science in the civil engineering subject.	A1
a.2	Define the role of the professional engineer in safety, environmental issues via engineering chemistry knowledge	A4
a.3	Describe the Chemical properties and behavior of construction materials.	A5
b.1	Demonstrate competence in defining and solving engineering problems through chemistry field.	B1
b.2	Consider environmental issue in civil engineering works.	B4
d.1	Work independently and in a team with realization of the importance of leadership.	D3
d.2	Engage in life-long learning and conduct searches of literature and use information resources.	D5

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1-. Define the principles of Chemistry science in the civil engineering subject.	Lecture Tutorial Reading	Written examination
a2- Define the role of the professional engineer in safety, environmental issues via engineering chemistry knowledge	Lecture Tutorial / demonstration Discussions	Partial and total work assessment Written examination
a3-Describe the Chemical properties and behavior of construction materials.	Lecture Tutorial / demonstration Discussions	Partial and total work assessment

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(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Demonstrate competence in defining and solving engineering problems through chemistry field.	Lecture Demonstration Discussions	Problem set – assignment Partial and total work assessment
b2- Consider environmental issue in civil engineering works.	lectures Demonstration Discussions	Presentations Partial and total work assessment

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d 1. Work independently and in a team with realization of the importance of leadership.	Lectures Discussion sessions Practical classes	Write reports and essay Presentations
d 2. Engage in life-long learning and conduct searches of literature and use information resources.	Small group Discussion sessions Practical classes	Tests and presentations. Scientific research work

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IV. Course Content:					
A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	No. of Weeks	contact hours
1	Measurements and units	a1, a2, b1, d1, d2	- Unit Conversions - Estimating - Stoichiometry	1	2
2	Gases, Gas liquefaction	a1, a2, b1, d1	- Pressure - The Gases Laws - Dalton's Law of Partial Pressure - The Kinetic Molecular Theory of Gases - Effusion and Diffusion - Gas liquefaction - Andrews isotherms of - CO ₂	2	4
3	Engineering materials & Applications	a 1, a2, a3, b1, d1, d2	- Atomic structure of materials - Nanostructure - Classification of Engineering Materials - Metallurgy and Alloys - Ceramics - Polymers - Composites	2	4
4	Thermodynamics' laws and Energetics	a 1, a3, b1, d1, d2	- First Law of Thermodynamics - Entropy- Second Law of Thermodynamics - Hess's Law - Gibbs Free Energy ΔG - Third Law of Thermodynamics	2	4

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5	Chemical Industry	a2, a3, b1, b2, d1, d2	<ul style="list-style-type: none"> - Silicate Industry - Refractories - Cement - Glass - Plastics 	2	6
6	Chemical Power Sources	a 1, a2, a3, b2, d1	<ul style="list-style-type: none"> - Solid, Liquid, Gaseous Sources - Batteries, Fuel cells - New Energy Sources - Biomass and Biomass Energy 	1	2
7	Fuels and Combustions	a2, a3, b1, b2, d1, d2	<ul style="list-style-type: none"> - Modern Concept of Fuel - Classification of Fuels -Solar Energy -Nonconventional Energy Sources -Combustions of oil 	1	2
8	Water and Water Treatment	a 2, a3, b1, b2, d2	<ul style="list-style-type: none"> -Sources and Characteristics of Water - Hardness of Water - Water Treatment - Sewage and Sewage Treatment 	1	2
9	Pollution and it's Control	a1, a2, a3, b1, b2, d2	<ul style="list-style-type: none"> - Introduction - Pollutants - Classification of Pollutants - Air Pollution - Acid Rain - Ozone Chemistry 	1	2
Number of Weeks /and Units Per Semester				14	28

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B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Measurements and units	2	4	a1, a2, b1, d1, d2
2	Gases Problems	3	6	a1, a2, b1, d1
3	Thermodynamics problems.	3	6	a 1, a3, b1, d1, d2
4	Cement problems	2	4	a2, a3, b1, b2, d1, d2
5	Glasses Problems	1	2	a2, a3, b1, b2, d1, d2
6	Fuels Problems	1	2	a2, a3, b1, b2, d1, d2
7	Water Treatment Problems	2	4	a 2, a3, b1, b2, d2
Number of Weeks /and Units Per Semester		14	28	8 units

V. Teaching strategies of the course:

- Class room Lectures.
- Power Point Lectures
- Solved Problems
- Tutorials
- Independent study

VI. Assignments:

No	Assignments	Aligned CILOs	Week Due	Mark
1	Problems solving	a1, a2, a3, b1, b2	2-9	0.5
2	Theory part	a1, a2, a3, b1, b2, d1, d2	6	1
3	Class activity	a3, b1, b2, d1	11	1
4	Research	b1, b2, d1, d2	13	5

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VII. Schedule of Assessment Tasks for Students During the Semester:					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Quizzes.	Two time randomly	7.5	5	a1, b1
2	Mid-term exam.	7th	30	20	a1, a2, a3, b1, b2
3	Assignments	2-9,12th	7.5	5	b1, d1, d2
4	Final-exam.	15	105	70	a1, a2, a3, b1, b2, d1, d2
	Sum		150	100%	

VIII. Learning Resources:	
<ul style="list-style-type: none"> Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher). 	
1- Required Textbook(s) (maximum two).	
	1- Dr. B.S.Chauhan – 2008-Engineering Chemistry-Third Edition-New Delhi – Laxmi Publications (P) LTD – India. 2- Clausen C.A Text Book of Engineering chemistry, oxford 1992. 3- McGraw-Hill Chemical Process Industries, fifth Edition, 1998 4- Clausen C.A. Willy Chemistry for Engineers, 1987
2- Essential References.	
	1. Teh Fu Yen, Chemistry for Engineers, USA-2008 2. 2- Zumdahl S., Chemistry, Seventh Edition USA -2007
3- Electronic Materials and Web Sites etc.	
	1. Periodicals and web sites of Chemical Engineering 2. http://www.chem.eng-online.org

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IX. Course Policies:	
1	Class Attendance: The students should have more than 75 % of attendance according to rules and regulations of the faculty.
2	Tardy: The students should respect the timing of attending the lectures. They should attend within 1 minutes from starting of the lecture.
3	Exam Attendance/Punctuality: The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for midterm exam and final exam.
4	Assignments & Projects: The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
5	Cheating: If any cheating occurred during the examination, the student is not allowed to continue and he/she has to face the examination committee for enquiries .
6	Plagiarism: The student will be terminated from the Faculty, if one student attends the exam on another behalf according to the policy, rules and regulations of the university.
7	Other policies: -All the teaching materials should be kept out the examination hall. -The mobile phone is not allowed. -There should be a respect between the student and his teacher.

Reviewed By	<u>Vice Dean for Academic Affairs and Post Graduate Studies</u> <u>Dr. Tarek A. Barakat</u> <u>Dr. Abdul-Malik Momin</u> <u>Dr. Mohammad Algorafi</u>
	<u>Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa</u> <u>Dr. Ahmed mujahed</u> <u>Dr. Munaser Alsubri</u>

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Template for Course Plan (Syllabus) of Engineering Chemistry

I. Information about Faculty Member Responsible for the Course:							
Name	Riyad A.M. Muharam	Office Hours					
Location& Telephone No.	Faculty of Engineering -Sana'a 770-521-271	SAT	SUN	MON	TUE	WED	THU
E-mail	DrRiyad@yahoo.com		2		2		

II. Course Identification and General Information:						
1-	Course Title:	Engineering Chemistry				
2-	Course Number & Code:	BR003				
3-	Credit hours:	C.H				Credit Hours
		Th.	Tu.	Pr.	Tr.	
		2	2			3
4-	Study level/year at which this course is offered:	First level / first year				
5-	Pre –requisite (if any):	Nil				
6-	Co –requisite (if any):	Nil				
7-	Program (s) in which the course is offered	Civil Engineering				
8-	Language of teaching the course:	English, Arabic				
9-	System of Study:	Regular				
10-	Mode of delivery:	Lecture				
11-	Location of teaching the course:	Class				

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III. Course Description:

This course **focuses** on **the theoretical and practical concepts in** the field of engineering chemistry and **highlights** the theories which **are** based in this field **as** gases laws and gases liquefactions, engineering materials & applications, thermodynamic's laws and energetics. It also aims to **introduce the students** in chemical industries: silicate industry, refractories, cement, glasses and plastics, chemical power sources, fuels and combustions, water and water treatment, pollution and its control.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop:
- a1-** Define the principles of Chemistry science in the civil engineering subject. A1
- a2-** Define the role of the professional engineer in safety, environmental issues via engineering chemistry knowledge. A4
- a3-** Describe the Chemical properties and behavior of construction materials. A5
- b1-** Demonstrate competence in defining and solving engineering problems through chemistry field. B1
- b2-** Consider environmental issue in civil engineering works. B4
- d 1-** Work independently and in a team with realization of the importance of leadership. D3
- d 2-** Engage in life-long learning and conduct searches of literature and use information resources. D5

V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	Measurements and units	a1, a2, b1, d1, d2	- Unit Conversions - Estimating - Stoichiometry	1	2
2	Gases, Gas liquefaction	a1, a2, b1, d1	- Pressure - The Gases Laws - Dalton's Law of Partial Pressure - The Kinetic Molecular Theory of Gases	2,3	4

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			<ul style="list-style-type: none"> - Effusion and Diffusion - Gas liquefaction - Andrews isotherms of carbon dioxide-CO_2 		
3	Engineering materials & Applications	a 1, a2, a3, b1, d1, d2	<ul style="list-style-type: none"> - Atomic structure of materials - Nanostructure - Classification of Engineering Materials - Metallurgy and Alloys - Ceramics - Polymers - Composites 	4,5	4
4	Thermodynamics' laws and Energetics	a 1, a3, b1, d1, d2	<ul style="list-style-type: none"> - First Law of Thermodynamics - Entropy- Second Law of Thermodynamics - Hess's Law - Gibbs Free Energy ΔG - Third Law of Thermodynamics 	6,7	4
5	Midterm Exam			8	2
6	Chemical Industry	a2, a3, b1, b2, d1, d2	<ul style="list-style-type: none"> - Silicate Industry - Refractories - Cement - Glass - Plastics 	9,11	6
7	Chemical Power Sources	a 1, a2, a3, b2, d1	<ul style="list-style-type: none"> - Solid, Liquid, Gaseous Sources - Batteries, Fuel cells - New Energy Sources - Biomass and Biomass Energy 	12	2
8	Fuels and Combustions	a2, a3, b1, b2, d1, d2	<ul style="list-style-type: none"> - Modern Concept of Fuel - Classification of Fuels - Solar Energy - Nonconventional Energy Sources - Combustions of oil 	13	2
9	Water and Water Treatment	a 2, a3, b1, b2, d2	<ul style="list-style-type: none"> - Sources and Characteristics of Water - Hardness of Water - Water Treatment 	14	2

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			- Sewage and Sewage Treatment		
10	Pollution and its Control	a1, a2, a3, b1, b2, d2	- Introduction - Pollutants - Classification of Pollutants - Air Pollution - Acid Rain - Ozone Chemistry	15	2
11	Final Exam			16	2
Number of Weeks /and Units Per Semester				16	32

B - Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Measurements and units	1,2	4	a1, a2, b1, d1, d2
2	Gases Problems	3,4,5	6	a1, a2, b1, d1
3	Thermodynamics problems.	6,7,8	6	a 1, a3, b1, d1, d2
4	Cement problems	9,10	4	a2, a3, b1, b2, d1, d2
5	Glasses Problems	11	2	a2, a3, b1, b2, d1, d2
6	Fuels Problems	12	2	a2, a3, b1, b2, d1, d2
7	Water Treatment Problems	13,14	4	a 2, a3, b1, b2, d2
Number of Weeks /and Units Per Semester		14	28	

VI. Teaching strategies of the course:

- Class room Lectures.
- Power Point Lectures
- Solved Problems
- Tutorials
- Independent study

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VII. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Problems solving	a1, a2, a3, b1, b2	2-9	0.5
2	Theory part	a1, a2, a3, b1, b2, d1, d2	6	1
3	Class activity	a3, b1, b2, d1	11	1
4	Research	b1, b2, d1, d2	13	5

VIII. Schedule of Assessment Tasks for Students During the Semester:					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Quizzes.	Two time randomly	7.5	5	a1, b1
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3	Assignments	2-9, 12 th	7.5	5	b1, d1, d2
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	Sum		150	100%	

IX. Learning Resources:	
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2- Essential References.	
	1- Teh Fu Yen, Chemistry for Engineers, USA-2008 2- Zumdahl S., Chemistry, Seventh Edition USA -2007
3- Electronic Materials and Web Sites etc.	
	1- Periodicals and web sites of Chemical Engineering

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2- <http://www.chem.eng-online.org>

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