Sana'a University
Faculty of Engineering
Mechanical Engineering Department
Mechanical Engineering Program

15. Course Specification of Engineering Chemistry

I. Course Identification and General Information:							
1.	Course Title:	Engineering Chemistry.					
2.	Course Code & Number:	BR005.					
3.	Credit hours:	C.H				TOTAL CR HRS	
		Th.	Seminar/Tu	Pr	Tr.		
		2	2	-	-	3	
4.	Study level/ semester at which this course is offered:	First Year-Second Semester.					
5.	Pre –requisite (if any):	None.					
6.	Co –requisite (if any):	None.					
7.	Program (s) in which the course is offered:	Mechanical Engineering Program.					
8.	Language of teaching the course:	English Language.					
9.	Location of teaching the course:	Mechanical Engineering Department.					
10.	Prepared By:	Assoc. Prof. Dr. Riyad A. Muharram.					
11.	Date of Approval						

II. Course Description:

This course will focus on the concepts of theoretical and practical in the field of engineering chemistry and highlighted the theories which is based in this field are gases laws and gases liquefactions, thermodynamic's laws and energetics, engineering materials & applications, fuels and combustion. It also aims to define the student in corrosion & corrosion control, lubricants and environmental pollution and it's control.

III. Course intended learning outcomes (CILOs) alignments of the course		Referenced PILOs
a. 1	Recall the principles of chemistry science and its applications in the Mechanical Engineering subject.	A1
a. 2	Classify the principles of different engineering materials and their effects on environment via engineering chemistry knowledge.	A3

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b. 1	Combine the fundamental chemical parameters and standards to construct Mechanical processes or systems.	B1
c1	Implement standard chemical engineering specifications while integrating Mechanical Engineering practices.	C1
d. 1	Evaluate acquisition of new knowledge as a part of life- long learning strategy.	D3

(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-. Recall the principles of chemistry science in the Mechanical Engineering subject**.**	Lecture Tutorial	Written Examinations
a2- Classify the principles of different engineering materials and their effects on environment via engineering chemistry knowledge.	Lecture Tutorial Demonstration Discussions	Problem Set Partial and Total Work Assessment

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Combine the fundamental chemical parameters and standards to construct Mechanical processes or systems.	Lecture Demonstration	Problem set – Assignment Partial and Total Work Assessment

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1 - Implement standard chemical engineering specifications while integrating Mechanical Engineering practices.	Lecture Demonstration	Problem set – Assignment Partial and Total Work Assessment

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(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Evaluate acquisition of new knowledge as a part of life-long learning strategy	Discussion Practical Classes	Write Reports and Essay Presentations

IV. 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,c1,d1	- Unit Conversions - Estimating - Stoichiometry	1	2
2.	Gases, Gas Liquefaction	a1,a2,b1,c1,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 carbon dioxide- CO_2	2	4
3.	Thermodynamics' Laws and Energetics	a1,a2,b1,c1,d1	- First Law of Thermodynamics - Entropy- Second Law of Thermodynamics - Hess's Law - Gibbs Free Energy ΔG - Third Law of Thermodynamics	2	4

4.	Engineering Materials & Applications	a1,a2,b1,c1,d1	- Atomic structure of materials - Nanostructure - Classification of Engineering Materials - Metallurgy and Alloys - Ceramics - Polymers - Composites	2	4
5.	Mid-Term Exam.	a1,a2,b1,c1,d1	-The First Six Chapters.	1	2
6.	Fuels and Combustions	a1,a2,b1,c1,d1	- Modern Concept of Fuel - Classification of Fuels -Solar Energy -New Energy Sources -Nonconventional Energy Sources -Combustions of oil	2	4
7.	Corrosion &Corrosion Control	a1,a2,b1,c1,d1	- Introduction - Theories of Corrosion - Factors Affecting Corrosion - Types of Corrosion - Corrosion Control - Passivity	2	4
8.	Lubricants	a1,a2,b1,c1,d1	- Introduction - Lubricants - Classification and mechanism - Lubricating oils - Types of lubricants -Properties and selection of lubricants	2	4
9.	Pollution and it's Control	a1,a2,b1,c1,d1	- Introduction - Pollutants - Classification of Pollutants	1	2

			- Air Pollution - Acid Rain - Ozone Chemistry		
10.	Final Exam	a1,a2,b1,c1,d1	- All Topics	1	2
Number of Weeks /and Units Per Semester				**16**	**32**

B – Tutorial Aspect:

Order	Topics List	Learning Outcomes	Week Due	Contact Hours
1	Measurements and Units	a1,a2,b1,c1,d1	2	4
2	Gas's Problems	a1,a2,b1,c1,d1	3	6
3	Thermodynamics Problems.	a1,a2,b1,c1,d1	3	6
4	Gepps Free Energy Problems	a1,a2,b1,c1,d1	3	6
5	Fuel's Problems	a1,a2,b1,c1,d1	3	6
Number of Weeks /and Units Per Semester			**14**	**28**

V. Teaching strategies of the course:

- Lecture
- Tutorial
- Demonstration
- Discussions
- Practical Classes

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Measurements and Units	a1,a2,b1,c1,d1	2nd and 3rd weeks	3
2	Gas's Problems	a1,a2,b1,c1,d1	4th and 7th weeks	3

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3	Thermodynamics Problems.	a1,a2,b1,c1,d1	8th and 9th weeks	3
4	Gepps Free Energy Problems	a1,a2,b1,c1,d1	10th and 12th weeks	3
5	Fuel's Problems	a1,a2,b1,c1,d1	13th week	3
Total				**15**

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	Assignments	Weekly	15	10 %	a1,a2,b1,c1,d1
2	Mid-Term Exam.	8th week	20	13,33 %	a1,a2,b1,c1,d1
3	Quizzes	4th,7th and 12th weeks	10	6.67 %	a1,a2,b1,c1,d1
4	Final-Exam.	16th	105	70 %	a1,a2,b1,c1,d1
Total			**150**	**100 %**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1- B.S.Chauhan – 2008-Engineering Chemistry-Third Edition-New Delhi –Laxmi Publications (P) LTD – India.
2- P.C Jain & Monica Jain, 2013, Engineering Chemistry, 14 th Edition, Dhanpatrai Publishing Company.

2- Essential References.

1- Bharathi Kumari and Jyotsna Cherukuri, 2013, Engineering Chemistry, VGS Techno Series.
2- Clausen C.A, 1992, Text Book of Engineering Chemistry, Oxford.
3- R.P. Mani, K.N. Mishra, B. Rama Devi, 2013, Engineering Chemistry, CENGAGE Learning.

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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	3- www.seciensedaily.com. 4- www.encyclopedia.com. 5- www.nasa,com 6- www.science.com

IX. Course Policies:

1.	**Class Attendance:** -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in 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**: - For cheating in exam, a student will be considered as failure. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

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Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Assoc.Prof. Dr. Khalil Al-Hatab**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

Head of Department Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

15. Template for Course Plan of Engineering Chemistry

I. Information about Faculty Member Responsible for the Course:

		Office Hours					
Name	Assoc. Prof. Dr. Riyad A.M. Muharam						
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:	BR005.				
3.	Credit hours:	C.H				TOTAL CR HRS
		Th.	Seminar/Tu	Pr	Tr.	
		2	2	-	-	3
4.	Study level/year at which this course is offered:	First Year-Second Semester.				
5.	Pre –requisite (if any):	None.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures and Tutorials.				
11.	Location of teaching the course:	Mechanical Engineering Department.				

III. Course Description:

This course will focus on the theoretical and practical concepts in the field of engineering chemistry and highlighted the theories which are based in this field such as gases laws and gases liquefactions, thermodynamic's laws and energetics, engineering materials &

applications, fuels and combustion. It also aims to introduce the students to corrosion & corrosion control, lubricants and environmental 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:

1. Recall the principles of chemistry science in the Mechanical Engineering subject.
2. Classify the principles of different engineering materials and their effects on environment via engineering chemistry knowledge.
3. combine fundamental chemical parameters and standards to construct Mechanical processes or systems.
4. Implement standard chemical engineering specifications while integrating Mechanical Engineering practices.
5. Evaluate acquisition of new knowledge as a part of life- long learning strategy.

V. Course Content:

Distribution of Semester Weekly Plan Of course Topics/Items and Activities.

Order	Units/Topics List	Sub Topics List	Week Due	Contact hours
1.	Measurements and Units	- Unit Conversions - Estimating - Stoichiometry	1st week	2
2.	Gases, Gas Liquefaction	- Pressure - The Gases Laws - Dalton's Law of Partial Pressure - The Kinetic Molecular Theory of Gases - Effusion and Diffusion - Gas liquefaction -Andrews isotherms of carbon dioxide- CO_2	2nd and 3rd weeks	4
3.	Thermodynamics' Laws and Energetics	- First Law of Thermodynamics - Entropy- Second Law of Thermodynamics - Hess's Law	4th and 5th weeks	4

		- Gibbs Free Energy ΔG - Third Law of Thermodynamics		
4.	Engineering Materials & Applications	- Atomic structure of materials - Nanostructure - Classification of Engineering Materials - Metallurgy and Alloys - Ceramics - Polymers - Composites	6th and 7th weeks	4
5.	Mid-Term Exam.	The first four chapters.	8th week	2
6.	Fuels and Combustions	- Modern Concept of Fuel - Classification of Fuels -Solar Energy -New Energy Sources -Nonconventional Energy Sources -Combustions of oil	9th and 10th weeks	4
7.	Corrosion &Corrosion Control	- Introduction - Theories of Corrosion - Factors Affecting Corrosion - Types of Corrosion - Corrosion Control - Passivity	11th and 12th weeks	4
8.	Lubricants	- Introduction - Lubricants - Classification and mechanism - Lubricating oils - Types of Lubricants -Properties and selection of lubricants	13th and 14th weeks	4
9.	Pollution and it's Control	- Introduction - Pollutants - Classification of Pollutants - Air Pollution - Acid Rain - Ozone Chemistry	15th week	2

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10.	Final Exam		16th week	**2**
Number of Weeks /and Units Per Semester			**16**	**32**

B – Tutorial Aspect:

Order	Topics List	Week Due	Contact Hours
1	Measurements and Units	1st& 2nd weeks	4
2	Gas's Problems	3rd&5th weeks	6
3	Thermodynamics Problems.	6th & 8th weeks	6
4	Gepps Free Energy Problems	9th & 11th weeks	6
5	Fuel's Problems	12th & 14th weeks	6
Number of Weeks /and Units Per Semester		**14**	**28**

VI. Teaching strategies of the course:

- Lecture
- Tutorial
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- Practical Classes

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Measurements and Units	a1,a2,b1,c1,d1	2nd and 3rd weeks	3
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	Total	**15**

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