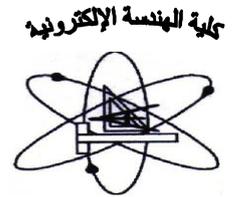




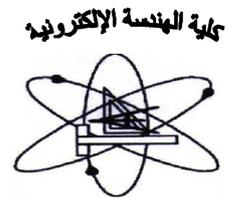
Department offering the program: Electronics and Electrical Communications  
Department offering the course: Physics and Engineering Mathematics

### Course Specification

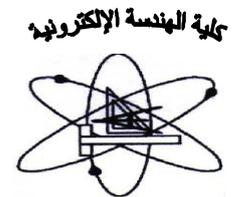
1- Course basic information :			
Course Code: PME 013 Department requirement	Course Title: Chemistry	Academic year: 2015 / 2016 Level ( 0 ) – Semester : 1 <sup>st</sup>	
Field: Mathematics and Basic Science	Teaching hours: Lecture	3	Tutorial 0 Lab 2
2- Course Objectives	<ol style="list-style-type: none"><li>1. To teach students the essential principles and applications of physical chemistry and its role in industry, the economy and the environment.</li><li>2. To introduce students to the concepts of Electrochemistry.</li><li>3. To provide students with Solids types and its Crystal structure.</li><li>4. To teach students the physical construction of Semiconductor materials.</li><li>5. To recognize the state gases, and its physical properties.</li><li>6. To be familiar with laws of thermodynamics.</li><li>7. To get the basics of nuclear chemistry, know the types of radioactive rays, and nuclear reactions.</li></ol>		
3- Intended Learning Outcomes: ARS	Course ILOs		



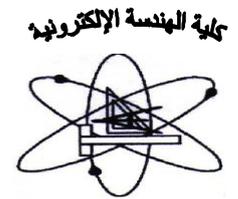
<b>A- Knowledge and Understanding:</b>	<p>A.1 Explain Concepts and theories of mathematics and sciences appropriate to Engineering Chemistry.</p>	<p>A1.1 Explain concepts of Faraday's law and Ionic theory.  A1.2 Explain concepts and theories of Electrochemistry, Equilibrium in Redox systems and Electrochemical cells.  A1.3 Explain concepts of Chemical equilibrium, Equilibrium law, Equilibrium constant and Le Chatelier's Principle  A1.4 Explain concepts of Semi-conductivity.  A1.5 Explain concepts of Gaseous State, Laws of Gases, Kinetic theory of Gases, and Liquefaction of Gases.  A1.6 Explain concepts of Solutions and Raoult's Law.  A1.7 Explain concepts of polymers and Organic electronics.  A1.8 Explain concepts of Phase Rule, Phase-Component, and Gibb's Rule.  A1.9 Explain concepts of Thermo chemistry, the first law of thermodynamics, Hess's law of constant heat summation, Spontaneous Process Entropy and the second law of thermodynamics.  A1.10 Explain concepts of Nuclear Chemistry, Radioactivity, Nuclear Fission and Nuclear Fusion.</p>
	<p>A.3 Define Characteristics of engineering materials related to Engineering Chemistry.</p>	<p>A3.1 Define the characteristics of Metallic conductors.  A3.2 Define the characteristics of solids, Crystal structure, Common structure of salts, Crystal structure of Metals and Crystal system.  A3.3 Define the characteristics of Semiconducting elements, Boron, Silicon and Germanium-Arsenic, Antimony, Selenium and Tellurium.</p>
	<p>A.8 Describe Current engineering technologies as related to Engineering Chemistry.</p>	<p>A3.4 Define the characteristics of Gases.  A3.5 Define the characteristics of liquids and solid solutions, Distillation of liquids, and Dilute Solution of Non-electrolytes.  A3.6 Define the characteristics of polymers and Organic electronics.</p> <p>A8.1 Describe the current engineering technologies related to Electrochemical cells.  A8.2 Describe the current engineering technologies related to applications of gases in industry.  A8.3 Describe the current engineering technologies related to polymers in electronics industries.  A8.4 Describe the current engineering technologies related to Nuclear Reactions, Nuclear Fission, Nuclear Fusion and Nuclear applications.</p>



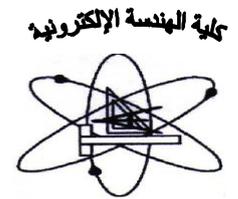
<b>B- Intellectual Skills</b>	<p>B.5 Assess and evaluate the characteristics and performance of components, systems and processes.</p>	<p>B5.1 Assess and evaluate the characteristics and performance of metallic conductors. B5.2 Assess and evaluate the characteristics and performance of Redox systems. B5.3 Assess and evaluate the characteristics and performance of Chemical equilibrium process. B5.4 Assess and evaluate the characteristics and performance of Crystal systems. B5.5 Assess and evaluate the characteristics and performance of Compounds of semiconducting elements. B5.6 Assess and evaluate the characteristics and performance of Liquefaction of Gases process. B5.7 Assess and evaluate the characteristics and performance of Distillation of liquids processes. B5.8 Assess and evaluate the characteristics and performance of Polymers. B5.9 Assess and evaluate the characteristics and performance of Endothermic and exothermic Reaction and Spontaneous Process. B5.10 Assess and evaluate the characteristics and performance of Nuclear, Nuclear Fission and Nuclear Fusion.</p>
	<p>B.9 Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.</p>	<p>B9.1 Judge engineering decisions considering safety and environmental impact for applications of gases in industry. B9.2 Judge engineering decisions considering safety and environmental impact for applications of Nuclear Chemistry.</p>



<b>C- Professional Skills</b>	<p>C.5 Use computational facilities and techniques, measuring instruments, and laboratory equipment to design experiments, collect, analyze and interpret results.</p> <p>C.8 Apply safe systems at work and observe the appropriate steps to manage risks.</p> <p>C.12 Prepare and present technical reports.</p>	<p>C5.1 Use measuring instruments, and laboratory equipment to design experiments, collect, analyze and interpret results related to Standardization of Hydrochloric acid with Anhydrous Sodium Carbonate.</p> <p>C5.2 Use measuring instruments, and laboratory equipment to design experiments, collect, analyze and interpret results related to Standardization of Aqueous Sodium Hydroxide Solution.</p> <p>C5.3 Use measuring instruments, and laboratory equipment for the determination of a Mixture of Carbonate and Bicarbonate</p> <p>C5.4 Use measuring instruments, and laboratory equipment for the determination of the percentage of Purity of Sodium Hydroxide Sample</p> <p>C5.5 Use measuring instruments, and laboratory equipment for the determination of the Atomic Weight of a Metal Exists in an Alkali Carbonate Salt with the Form <math>M_2CO_3</math></p> <p>C8.1 Apply safe systems at work at Laboratory and observe the appropriate steps to manage risks.</p> <p>C12.1 Prepare and present technical reports appropriate to laboratory experiments.</p>
<b>D- General Skills</b>	<p>D.1 Collaborate effectively within multidisciplinary team.</p> <p>D.2 Work in stressful environment and within constraints.</p> <p>D.3 Communicate effectively.</p> <p>D.5 Lead and motivate individuals.</p> <p>D.6 Effectively manage tasks, time, and resources.</p>	<p>D1.1 Collaborate effectively within multidisciplinary team in Chemistry laboratory.</p> <p>D2.1 Work in stressful environment and within constraints while doing tasks in Chemistry laboratory, and exams.</p> <p>D3.1 Communicate effectively with his colleagues.</p> <p>D5.1 Lead and motivate individuals in experimental work.</p> <p>D6.1 Effectively manages tasks, time, and resources in laboratory and exams.</p>
<b>4- (a) Course Contents</b>	<p>Ions in Solution: Metallic conductors – Faraday’s law – Ionic theory – Measurement of conductivity. Electrochemistry (Equilibrium in Redox systems): Electrochemical cells- e.m.f of cells – standard hydrogen electrode - Measurement of pH. Chemical equilibrium: Equilibrium law – Equilibrium constant- Le Chatelier's Principle- Acids &amp; Bases – Ionic product of H<sub>2</sub>O &amp; pH.-Buffer solutions-Hydrolysis of salts. Solids: Types of solids – X-ray diffraction – Crystal structure - Types of Crystal structures- Common structure of salts- Crystal structure of Metals-Crystal system. Semiconducting elements: Boron-Silicon and Germanium-Arsenic – Antimony – Selenium – Tellurium – Semi-conductivity – Compounds of semiconducting elements- applications. The Gaseous State: Physical Properties of Gases - The Laws of Gases -The Kinetic Theory of Gases - Deviation</p>	



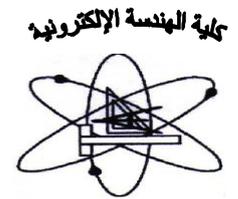
	from the ideal Gas Laws - Liquefaction of Gases- applications of gases in industry. Solutions: Gases in liquids and solid solutions -Liquids in liquids solutions - Raoult's Law - Distillation of liquids - Solids in liquids solutions - Dilute Solution of Non-electrolytes -Solids in solids solutions. Polymers: Organic electronics - Types and classification of polymers - Addition polymer - Condensation polymer – application of polymers in electronics industries. Phase Rule: Phase-Component-Degree of Freedom- Gibb's Rule - Phase diagram of water, Phase diagram of carbon dioxide. Thermo chemistry: Endothermic and exothermic Reaction -the first law of thermodynamics Heat content or enthalpy - Enthalpies of reaction -Thermo chemical equations: Hess's law of constant heat summation - Spontaneous Process Entropy and the second law of thermodynamics. Nuclear Chemistry: What Is Radioactivity- Nuclear Reactions vs. Normal Chemical Reactions, Nuclear Reactions - Types of Radioactive Decay- Nuclear Fission - A nuclear power plant- Nuclear Fusion - applications
<b>4-(b)Laboratory experiments</b>	EXP. 1 Standardization of Hydrochloric acid with Anhydrous Sodium Carbonate EXP. 2 Standardization of Aqueous Sodium Hydroxide Solution EXP. 3 Determination of a Mixture of Carbonate and Bicarbonate EXP. 4 Determination of the % of Purity of Sodium Hydroxide Sample EXP. 5 Determination of the Atomic Weight of a Metal Exists in an Alkali Carbonate Salt with the Form $M_2CO_3$
<b>5- Teaching and Learning Methods</b>	- White board - power point presentation (data show) - Practical (chemistry laboratory) - lectures
<b>6- Teaching and Learning Methods for disable students</b>	<ul style="list-style-type: none"> <li>• Official low cost special classes for developing student skills, arranged by the faculty administration.</li> <li>• Assign a portion of the office hours for those students.</li> <li>• Face-to-face intermediate solving the problems and quizzes during the Laboratory time.</li> <li>• Give them specific tasks.</li> <li>• Repeat the explanation of some of the material in lectures and Labs.</li> </ul>
<b>7- Student Assessment</b>	
<b>a- Assessment Methods</b>	- Weekly sheet exercises at class room - Quizzes - Labs and/or case study for more demonstration. - Midterm, and final exams
<b>b- Assessment Schedule</b>	- Exercise sheet/ Lab assignment: Weekly - Quizz-1: Week <u>no</u> 4 - Mid-Term exam: Week <u>no</u> 8 - Quizz-2: Week <u>no</u> 12 - Lab exam: Week <u>no</u> 15 - Final – term examination: Week <u>no</u> 16
<b>c- Weighting of Assessment</b>	- Class tutorial and quizzes: 5 % - Mid-term examination: 10 % - Oral and/or practical exam: 20 % - Final – term examination: 60 %



	- Other types of assessment:	5 %
	Total	100 %
<b>8- List of text books and references:</b>		
<b>a- Course notes</b>	Engineering chemistry notes authorized by department council	
<b>b- Text books</b>	1. S. S. Zumdahl and S. A. Zumdahl: Chemistry. 8 <sup>th</sup> edition. Cengage learning (2008) 2. M. S. Silberberg: Principles of general chemistry. 1st edition. McGraw Hill (2007)	
<b>c- Recommended books</b>	1. T. E. Brown, H. LeMay, B. E. Bursten, C. Murphy and P. Woodward: Chemistry, the central science. 12th edition. Pearson education international (2012) 2. S. S. Zumdahl and D. J. DeCoste: Chemical principles. 5th edition. Houghton mifflid company, Boston, New York (2005)	
<b>d- Periodicals, Web sites .....etc</b>	Web Sites related to physical, organic and analytical chemistry such as: 1. www.en.wikibooks.org /wiki/general chemistry 2. www.chem1.com/acad/webtext/virtualtextbook.htm	

#### Course contents - ILOs Matrix

Content Topics	Week	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Ions in Solution: Metallic conductors – Faraday’s law – Ionic theory – Measurement of conductivity.	1	A1.1, A3.1	B5.1	C5, C8	D.3
Electrochemistry (Equilibrium in Redox systems) - Electrochemical cells - e.m.f of cells – standard hydrogen electrode - Measurement of pH.	2	A1.2, A8.1	B5.2	C5, C8	D.3
Chemical equilibrium: Equilibrium law – Equilibrium constant- Le Chatelier's Principle- Acids & Bases – Ionic product of H <sub>2</sub> O & pH.- Buffer solutions-Hydrolysis of salts.	3	A1.3	B5.3	C5, C8	D.3
Solids: Types of solids – X-ray diffraction – Crystal structure - Types of Crystal structures- Common structure of salts- Crystal structure of Metals-Crystal system.	4	A3.2	B5.4	C5, C8	D3
Semiconducting elements: Boron-Silicon and Germanium-Arsenic – Antimony – Selenium – Tellurium – Semi-conductivity – Compounds of semiconducting elements- applications.	5	A1.4, A3.3	B5.5	C5, C8	D3
The Gaseous State: Physical Properties of Gases - The Laws of Gases -The Kinetic Theory of Gases - Deviation from the ideal Gas Laws - Liquefaction of Gases- applications of gases in industry.	6	A1.5, A3.4, A8.2	B5.6, B9.1	C5, C8	D3
Solutions: Gases in liquids and solid solutions - Liquids in liquids solutions -Raoult’s Law - Distillation of liquids - Solids in liquids solutions - Dilute Solution of Non-electrolytes -	7-8	A1.6, A3.5	B5.7	C5, C8	D.3



Solids in solids solutions.					
Polymers: Organic electronics - Types and classification of polymers - Addition polymer - Condensation polymer – application of polymers in electronics industries.	9	A1.7, A8.3, A3.6	B5.8	C5, C8	D3
Phase Rule: Phase-Component-Degree of Freedom- Gibb's Rule - Phase diagram of water, Phase diagram of carbon dioxide.	10	A1.8		C5, C8	D3
Thermo chemistry: Endothermic and exothermic Reaction -the first law of thermodynamics Heat content or enthalpy - Enthalpies of reaction -Thermo chemical equations: Hess's law of constant heat summation - Spontaneous Process Entropy and the second law of thermodynamics.	11-12	A1.9	B5.9	C5, C8	D3
Nuclear Chemistry: What Is Radioactivity- Nuclear Reactions vs. Normal Chemical Reactions, Nuclear Reactions - Types of Radioactive Decay- Nuclear Fission - A nuclear power plant- Nuclear Fusion - applications	13-14	A1.10, A8.4	B5.10, B9.2	C5, C8	D3
EXP. 1 Standardization of Hydrochloric acid with Anhydrous Sodium Carbonate	3-4	A1, A3	B5	C5.1, C8.1, C12.1	D1.1, D2.1, D3.1, D5.1, D6.1
EXP. 2 Standardization of Aqueous Sodium Hydroxide Solution	5-6	A1, A3	B5	C5.2, C8.2, C12.2	D1.1, D2.1, D3.1, D5.1, D6.1
EXP. 3 Determination of a Mixture of Carbonate and Bicarbonate	9-10	A1, A3	B5	C5.3, C8.3, C12.3	D1.1, D2.1, D3.1, D5.1, D6.1
Exp. 4 Determination of the % of Purity of Sodium Hydroxide Sample	11-12	A1, A3	B5	C5.4, C8.4, C12.4	D1.1, D2.1, D3.1, D5.1, D6.1
Exp. 5 Determination of the Atomic Weight of a Metal Exists in an Alkali Carbonate Salt with the Form $M_2CO_3$	13-14	A1, A3	B5	C5.5, C8.5, C12.5	D1.1, D2.1, D3.1, D5.1, D6.1

#### Teaching and Learning Methods - ILOs Matrix

Teaching and Learning Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Lectures	A1, A3, A8	B5, B8	C5, C8	D3
Labs	A1, A3	B5, B8	C5, C8	D1, D2, D3, D5, D6
Research assignments	A1, A3, A8	B5, B8	C5, C8, C12	D2, D6



#### Assessment Methods - ILOs Matrix

Assessment Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Case study/Labs	A1, A3	B5, B8	C5, C8, C12	D1, D2, D3, D5, D6
Quizzes	A1, A3, A8	B5, B8	C5, C8	D6
Midterm, and Final Written exams	A1, A3, A8	B5, B8	C5, C8	D6

Authorized from department board at 15/05/2016

Authorized from college board at 05/06/2016

**Course coordinator:**

Prof. Dr. Mahmoud Mahfouz Ramiz

**Head of Department:**

Prof. Fathi El-Sayed Abd El-Samie

