University of Petra

Faculty of Science and Arts
Department of Chemistry

جامعة البترا

جامعة البترا - عقود عاما
Petra University Anniversary

كلية الاداب والعلوم
قسم الكيمياء

Course Syllabus

Year : 2019/2020 **Semester: Second**

Course No.	Course Title	Prerequisite	Co-requisite	Credit Hours Lectures / Lab.	ECTS: European Credit Transfer System
101321	Physical Chemistry (1)	101102 & 103102	None	3/0	6

Instructor's Name	e-mail	Office No.	Office ext.	Office Hours
Dr Mohammed Alomari	Mohammed.alomari@uop.edu.jo	7111	7111	Sun.,Thu.:10-11, Tue.:1:30-2:30, Mon., Tues: 9:30-11

Coordinator's Name: (if applicable)	

Short Course Description	The course will cover the following contents: Kinetic-Molecular theory of ideal gases; molecular collisions. Equilibrium states and reversibility, Energy, heat, and work Thermochemistry, Ideal gas relationships, Real gases, Van der waals gases, The Carnot cycle, Irreversible processes, Entropy and molecular interpretation, The calculation of entropy changes, Third law of Equilibrium conditions, The Gibbs energy , Some thermodynamic relationships, Maxwell relations, fugacity and activity,The Gibbs-Helmholtz equation, Equilibrium involving ideal gases,Non-ideal gaseous systems, Chemical equilibrium in solution, Heterogeneous equilibrium, Tests and shifts of equilibria, Coupling of reactions , Temperature and pressure dependence of equilibrium constants, Phase recognition, vapor pressure relations, the Clausius-Clapeyron equation, classification of phase transitions, Raoult's and Henry's laws, Partial molal quantities, The Chemical potential , Thermodynamics of solutions , Colligative properties,Equilibrium between Phases , One component system , Binary systems involving vapor , Condensed binary systems, Thermal analysis and ternary phase diagram.

Course Objectives

1. To inspire in students a sense of interest for physical chemistry, an appreciation of its application in different contexts and to involve them in an intellectually stimulating and satisfying experience of learning and studying.
2. To develop in students the ability to apply their chemical knowledge and skills to the solution of theoretical and practical problems in chemistry.
3. To provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas of physical chemistry or multi-disciplinary areas involving physical chemistry.

4. To create in students a positive reception of the importance of physical chemistry in an industrial, economic, environmental and social context.

Course Intended Learning Outcomes (ILOs) and their Alignment with Program ILOs, Teaching and Learning Methods, and Assessment Methods:

Upon successful completion of this course, students are expected to achieve the following learning outcomes:

Course ILOs	Program ILOs	Teaching and Learning Method	Assessment Method
Knowledge (K)			
1. Describe the physical meaning of all topics mentioned in the course contents.	**K (1)**	Lectures & Data show	First, Second and Final Exams and quizzes
2. Express phase diagram of one, two and three components system.	**K (1)**	Lectures & Data show	First, Second and Final Exams and quizzes
Intellectual Skills (I)			
3. Explain the physical meaning of all topics mentioned in the course contents	**I(1)**		
4. Perform calculations related to molecular collisions, Equilibrium states and reversibility, Energy, heat, and work Thermochemistry, The Carnot cycle,The calculation of entropy changes, The Gibbs energy, Chemical equilibrium,Temperature and pressure dependence of equilibrium constants, the Clausius-Clapeyron equation, classification of phase transitions, Thermodynamics of solutions, Equilibrium between Phases , One component system, Binary systems involving vapor, phase diagram	**I (2)**	Lectures & Data show	First, Second and Final Exams and quizzes
5. **Derive equations related** Kinetic-Molecular theory; molecular collisions. Equilibrium states and reversibility, Ideal gas relationships, The Carnot cycle, Entropy, Third law of Equilibrium conditions, The Gibbs energy , Some thermodynamic relationships, Maxwell relations,The Gibbs-Helmholtz equation, Temperature and pressure dependence of equilibrium constants, The Chemical potential , Thermodynamics of solutions.	**I (2)**	Lectures & Data show	First, Second and Final Exams and quizzes
Practical skills (P)			
Practical skills is achived through goals mentioned in ILOs (1-4)			
Transferable Skills (T)			
Practical skills is achived through goals mentioned in ILOs (1-4)			

Course Schedule:

Week	Topic Details	Course ILO number	Reference
1	Introduction to physical chemistry	K(1), I(1) & I(2)	1
2	1.9 Kinetic-Molecular theory of ideal gases; molecular collisions	K(1), I(1) & I(2)	1
3	2.3 Equilibrium states and reversibility 2.4 Energy, heat, and work	K(1), I(1) & I(2)	1
4	2.5 Thermochemistry 2.6 Ideal gas relationships 2.7 Real gases, Van der waals gases.	K(1), I(1) & I(2)	1
5	3.1 The Carnot cycle 3.2 Irreversible processes 3.3	K(1), I(1) & I(2)	1
6	**First Exam:**		
7	Entropy and molecular interpretation 3.4 The calculation of entropy changes 3.5	K(1), I(1) & I(2)	1

8	Third law of thermodynamics 3.6 Equilibrium conditions 3.7 The Gibbs energy 3.8 Some thermodynamic relationships, Maxwell relations, fugacity and activity 3.9 The Gibbs-Helmholtz equation.	K(1), I(1) & I(2)	1
9	4.1 Equilibrium involving ideal gases 4.2-4.6 Non-ideal gaseous systems, Chemical equilibrium in solution,	K(1), I(1) & I(2)	1
10	Heterogeneous equilibrium, Tests and shifts of equilibria, Coupling of reactions 4.8+4.9 Temperature and pressure dependence of equilibrium constants.	K(1), I(1) & I(2)	1
11	5.1 Phase recognition 5.2 vapor pressure relations, the Clausius-Clapeyron equation 5.3 classification of phase transitions 5.4	K(1), I(1) & I(2)	1
12	**Second Exam:**		
13	Raoult's and Henry's laws 5.5 Partial molal quantities 5.6 The Chemical potential 5.7 Thermodynamics of solutions 5.8 Colligative properties.	K(1), I(1) & I(2)	1
14	6.1 Equilibrium between Phases 6.2 One component system 6.3	K(1), I(1) & I(2)	1
15	Binary systems involving vapor	K(1), I(1) & I(2)	1
16	6.4 Condensed binary systems 6.5 Thermal analysis, ternary phase diagram	K(1), I(1) & I(2)	1

Assessment Methods and Grading System:

Assessment method	Grade	Comments
First Exam	30	
Second Exam	30	
quizzes	If needed	
Final Exam	40	
Total	100	

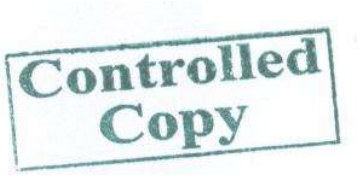
Learning References:

1- Textbook (s):
Physical Chemistry by: K.J. Laidler, J. H. Meiser, and B. C. Sanctuary, 4th Ed., Houghton Mifflin (2003).
2- References:
3- Other Resources: << a lecture rooms with data show facility>>

Course Policies[1]

- Attendance Policy: University regulations apply to attendance.
- Academic Honesty: Academic dishonesty is an unacceptable mode of conduct, and will not be tolerated in any form at University of Petra. All persons involved in academic dishonesty and plagiarism in any form will be disciplined in accordance with University rules and regulations.

Approved by	Name	Date	Signature
Head of Department	Dr. Abdelmnim Altwaiq	25/02/2020	
Faculty Dean/	Prof. Rami Abdel-Rahem	25/02/2020	



[1] Additional information may be added in this section according to the nature of the course.