University of Petra

Faculty of Arts & Sciences
Department of Chemistry

جامعة البترا - خمسة وعشرون عاما
University of Petra Anniversary

كلية الآداب والعلوم
قسم الكيمياء

Course Syllabus

Year : 2019/2020 **Semester: First**

Course No.	Course Title	Prerequisite	Co-requisite	Credit Hours Lectures / ECTS: European Credit Transfer System
101322	Physical Chemistry (ii)	***101321***	None	3/6

Instructor Name	e-mail	Office No.	Office ext.	Office Hours
Prof. Rami Abdel-Rahem	rabdelrahem@uop.edu.jo	*7115*	6500	Sun., Tue. Thu. Mon., Wed.(12:00-13:00)

Coordinator's Name: (if applicable)	

Course Description	**This course will cover the following topics: Chemical Kinetics (Basic Ideas),** Rate of Reaction, Empirical rate Equations, Analysis of kinetic results, Method of integration, Half-life of a chemical reaction, Methods of determination of reaction order, The Arrhenius equation, activation energy, The Preexponential Factor, Hard-sphere collision theory, Transition-state theory, Reactions in solution, Influence of Ionic Strength, Influence of hydrostatic pressure, Reaction Dynamics. **Chemical Kinetics (Composite Mechanisms),** Types of composite reactions, Rate equations for composite mechanisms, Consecutive Reaction, Steady state Treatment, Rate Determining Steps, Free radical reactions, chain reactions, Photochemical Reactions, Catalysis, Enzyme Catalysis, **Solutions of Electrolytes,** Faraday's law of electrolysis, Molar conductivity, Arrhenius theory, Ostwald's dilution law, Debye-Huckel theory, Migration of ions, Transport numbers, Ion conductivities, Activity coefficients, Ionic equilibria, **Electrochemical cells,** The Daniel cell, Standard electrode potentials, Thermodynamics of electrochemical cells, The Nernest Equation, temperature coefficient of cell emfs, Types of electrochemical cells, concentration cells, redox cells, Applications of emf measurements; activity coefficients, equilibrium constants, solubility products, and potentiometric titration, **Surface chemistry,** Adsorption 18.2 Adsorption of isotherms, The Langmuir isotherm, Adsorption with dissociation, Competitive Adsorption, other isotherms,Chemical reactions on Surfaces.

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 and environmental 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. **Explain the physical meaning of all topics mentioned in the course contents.**	K(1)	White board, discussions.	Exams, Quizzes
Intellectual Skills (I)			
2. **Perform calculations related to Chemical Kinetics,** , Reactions in solution, Influence of Ionic Strength, Influence of hydrostatic pressure, Rate equations for composite mechanisms, Photochemical Reactions, Faraday's law of electrolysis, Molar conductivity, Arrhenius theory, Ostwald's dilution law, Debye-Huckel theory, Ion conductivities, **Electrochemical cells,** The Daniel cell, Standard electrode potentials, Thermodynamics of electrochemical cells, The Nernest Equation, , concentration cells, redox cells, , solubility products, Adsorption of isotherms, Adsorption with dissociation.	I(2)	White board, discussions.	Exams, Quizzes
3. **Derive equations that represent rate laws** and Half-life, Arrhenius equation, activation energy, The Preexponential Factor, Hard-sphere collision theory, Transition-state theory, Reactions in solution, **Chemical Kinetics (Composite Mechanisms),** Types of composite reactions, Rate equations for composite mechanisms, Consecutive Reaction, Steady state Treatment, Rate Determining Steps, Free radical reactions, chain reactions, Enzyme Catalysis, Ostwald's dilution law, Debye-Huckel theory, Applications of emf measurements; activity coefficients, equilibrium constants, solubility products, and potentiometric titration, Adsorption of isotherms.	I(2)	White board, discussions.	Exams, Quizzes
Transferable Skills (T)			
This skill is already achieved through ILOs (1-3)			
Practical Skills (P)			
This skill is already achieved through ILOs (1-3)			

Course Schedule:

Week	Topic Details	Course ILO number	Reference
1	Rate of Reaction, Empirical rate Equations, Analysis of kinetic results, Method of integration, Half-life of a chemical reaction, Methods of determination of reaction order.	K(1), I (2)	Textbook
2	The Arrhenius equation, activation energy, The Preexponential Factor, Hard-sphere collision theory,	K(1), I (2)	Textbook
3	Transition-state theory, Reactions in solution, Influence of Ionic Strength, Influence of hydrostatic pressure, Reaction Dynamics.		Textbook
4	Types of composite reactions, Rate equations for composite mechanisms, Consecutive Reaction, Steady state Treatment, Rate Determining Steps,	K(1), I (2)	Textbook
5	Free radical reactions, Chain reactions,Photochemical Reactions, Catalysis, Enzyme Catalysis,	K(1), I (2)	Textbook
6	**First Exam**		
7	Faraday's law of electrolysis, Molar conductivity, Arrhenius theory, Ostwald's dilution law,	K(1), I (2)	Textbook
8	Debye-Huckel theory, Migration of ions, Transport numbers, Ion conductivities,	K(1), I (2)	Textbook
9	Activity coefficients, Ionic equilibria,	K(1), I (2)	Textbook
10	The Daniel cell, Standard electrode potentials, Thermodynamics of electrochemical cells, The Nernest Equation,	K(1), I (2)	Textbook
11	Temperature coefficient of cell emfs, Types of electrochemical cells, concentration cells, redox cells,	K(1), I (2)	Textbook
12	**Second Exam**		
13	Applications of emf measurements; activity coefficients, equilibrium constants, solubility products, and potentiometric titration,	K(1), I (2)	Textbook
14	Adsorption, Adsorption of isotherms, The Langmuir isotherm, Adsorption with dissociation.	K(1), I (2)	Textbook
15	Competitive Adsorption, other isotherms,Chemical reactions on Surfaces.	K(1), I (2)	Textbook
16	All through	K(1), I (2)	Textbook

Assessment Methods:

Assessment method	Grade	Comments
First Exam	25	
Second Exam	25	
Homework and Quizes	10	
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:
Atkins' Physical Chemistry (8th Edition) - Peter Atkins & Julio de Paula
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.
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Approved by	Name	Date	Signature
Head of Department	Dr. Abdelmnim Altwaiq	24/10//2019	
Faculty Dean	Prof. Dr. Rami Abdel-Rahem	24/10/2019	

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