# Jordan University of Science and Technology

## Faculty of Science & Arts

## Chemistry Department

CHEM347 Physical Chemistry (2)

Summer Semester 2019-2020

| Course Catalog |
|---|
| 3 Credit Hours. This course in Physical chemistry deals mainly with electrochemistry and chemical kinetics subjects. The course begins by outlining the meaning of electrochemistry and electrolysis (Faradays laws, conductivity, weak and strong electrolytes). Then Titles related to weak electrolytes (Arrhenius theory and Ostwalds dilution law), and others related to strong electrolytes (Debye-Huckel theory, Ionic atmosphere, mechanisms of conductivity and some methods to measure conductivity) will be discussed in details. Also, thermodynamics of ions and theories of ions in solution (Born model, Debye-Huckel limiting Law "DHLL "and deviation from DHLL, ionic equilibria and Donan equilibrium) will be discussed. Types of Electrochemical cells and their reactions will be considered, and then the thermodynamics of the cells (Nerst equations, Nernst potentials and temperature coefficient) will be discussed. The second subject in this course deals with chemical kinetics: elementary reactions and composite reaction mechanism. In elementary reactions the course deals with rate, rate equations, orders and rate constants. Then the concern will be in analysis of the kinetic data (integration and differential methods), molecularity, Arrhenius law and theories (collision theory and transition state theory). The second part in chemical kinetics will concentrate on composite reaction mechanisms, types of composite reactions, steady state approximation, rate and equilibrium constants, free radical and chain reactions. Also, the photochemical reactions, radiation chemical reactions and catalysis will be considered. |

| Text Book | |
|---|---|
| **Title** | Physical Chemistry |
| **Author(s)** | Laidler, K.J.; Meiser, J.H.; Sanctuary, B. C |
| **Edition** | 4th Edition |
| **Short Name** | Ref#1 |
| **Other Information** | |

| Instructor | |
|---|---|
| Name | **Prof. Jamil Malkawi** |
| Office Location | N2L0 |
| Office Hours | Sun : 14:00 - 16:00<br>Mon : 13:00 - 15:00<br>Tue : 13:00 - 14:00<br>Wed : 14:00 - 16:00 |

| | |
|---|---|
| Email | malkawi@just.edu.jo |

| Class Schedule & Room |
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| Section 1:<br>Lecture Time: Sun, Mon, Tue, Wed : 08:30 - 10:00<br>Room: منصة الكترونية |

| Prerequisites | | |
|---|---|---|
| **Line Number** | **Course Name** | **Prerequisite Type** |
| 912470 | CHEM247 Physical Chemistry (1) | Prerequisite / Pass |
| 921020 | PHY102 General Physics (2) | Prerequisite / Pass |

| Tentative List of Topics Covered | | |
|---|---|---|
| **Weeks** | **Topic** | **References** |
| Weeks 1, 2, 3, 4, 5 | Solutions of Electrolytes (chapter 7) | |
| Weeks 6, 7, 8, 9, 10 | Electrochemical Cells (Chapter 8) | |
| Weeks 11, 12, 13 | Chemical Kinetics I. The basic ideas (Chapter 9) | |
| Weeks 15, 16 | Chemical Kinetics II. Composite mechanisms (Chapter 10) | |

| Mapping of Course Outcomes to Program Student Outcomes | Course Outcome Weight (Out of 100%) | Assessment method |
|---|---|---|
| Exhibit a basic knowledge of electrochemistry and electrolysis and the laws Related to strong and weak electrolytes (Faradays law, Deby-Huckel theory), and understands some concepts like migration of ions, mobility of ions, transport numbers and some methods to measure these terms. [1a, 1c, 1e, 1i] | 35% | |
| Exhibit a basic knowledge of the Daniell Cell, Standard Electrode Potentials, Thermodynamics of Electrochemical Cells, Types of Electrochemical Cells, Applications of EMF Measurements. Understand the rate of reactions, all related parameters, factors affecting rates, methods of analysis data. [1a, 1e, 1i, 1k] | 35% | |
| Use the Arrhenius equation for the temperature dependence of a chemical reaction and understand its significance. Describe rate of composite reactions, Types of mechanisms, photochemical reactions and radiation chemical reactions. [1a, 1b, 1c] | 30% | |

| Relationship to Program Student Outcomes (Out of 100%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g | h | i | j | k |
| 27.50 | 10 | 18.75 | | 17.50 | | | | 17.50 | | 8.75 |

| Evaluation | |
|---|---|
| **Assessment Tool** | **Weight** |
| Exam1 | 30% |
| Exam 2 | 30% |
| Final | 40% |

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