



**The University of Jordan**

**Accreditation & Quality Assurance Center**

# **COURSE Syllabus**

1	Course title	Experimental physical chemistry I
2	Course number	0303246
3	Credit hours (theory, practical)	2 (1 theory, 1 practical)
	Contact hours (theory, practical)	56 (14 theory, 42 practical)
4	Prerequisites	Physical chemistry 1 (0303241)
5	Program title	BSc in chemistry
6	Program code	0303
7	Awarding institution	The University of Jordan
8	Faculty	Faculty of Science
9	Department	Department of Chemistry
10	Level of course	Undergraduate
11	Year of study and semester (s)	Second year, 1 <sup>st</sup> or 2 <sup>nd</sup> semester
12	Final Qualification	BSc in chemistry
13	Other department (s) involved in teaching the course	N/A
14	Language of Instruction	English
15	Date of production/revision	September 5, 2017

**16. Course Coordinator:**

Dr. Wissam Helal; Department of chemistry, 1st floor, office 107; Phone: +962-6-5355000, Ext: 2217; email: [wissam.helal@ju.edu.jo](mailto:wissam.helal@ju.edu.jo).

Office hours: Sun, Tue, Thur: 9:00-10:00; Mon, Wed: 10:00-12:00

**17. Other instructors:**

[NA](#)

**18. Course Description:**

Selected experiments in physical chemistry, particularly, the fields of chemical thermodynamics and chemical equilibrium, covering the following subjects: Heat of solution, heat of ionization, heat of vaporization, heat of combustion and heat of formation, partial molar volume, equilibrium constant, binary solid-liquid phase diagram, liquid-vapor equilibrium, ternary phase diagram, and equilibrium in solution.

**1. 19. Course aims and outcomes:****A- Aims:**

The lab work in this class of aims to

- 1- To reinforces the material the student have learned the physical chemistry 1 course (0303241) and to give the students the chance to apply what they have learned practically. In addition, the students will learn some new experimental techniques that are necessary for them to become an effective chemists and researchers.
- 2- The lab will give the chance to the students to explore more deeply in some topics in physical chemistry and perhaps to cover some topics that have not been included in the physical chemistry 1 course.
- 3- The student will learn how to write a lab report in a professional manner.

**B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to ...**

The intended outcome of this class can be categorized into to three major values:

**A. Knowledge:**

1. Recognize fundamentals of physical chemistry including chemical thermodynamics and chemical equilibrium.
2. Explain the essential facts, principles and theories across the physical chemistry.

**B. Intellectual Skills:**

1. Analyze and interpret experimental data, critically assess data in literature and extract useful results from it.
2. Carry out directed research by selecting appropriate topics and procedures, and presenting the results.

**C. Practical Skills:**

1. Evaluate and manage the risks of chemical substances and laboratory procedures.
2. Conduct standard laboratory procedures.
3. Operate a range of instrumentation.

**D. Transferable Skills**

1. learn how to work individually and with partners effectively.
2. learn how to write a lab reports in a professional manner.
3. to use computer skills to analyze obtained data from experiments and to demonstrate the results.

**20. Topic Outline and Schedule:**

2.

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
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In this lab the experiments are divided into two sets where six experiments are performed in each lab period and the students are *circulated* to finish the experiments.

The two sets includes

- Experiment set 1:

1. Heat of solution
2. Apparent enthalpy of proton ionization of a weak acid
3. Heat of vaporization
4. Heat of combustion and heat of formation
5. Partial molar volume
6. Indicator constant

- Experiment set 2:

1. Binary solid-liquid phase diagram
2. Liquid-vapor equilibrium in binary system
3. Phase diagram for three component mixture
4. Equilibrium constant of an esterification reaction
5. Chemical equilibrium in solution
6. Determination of enthalpy and equilibrium constant of enolization using NMR

After doing each experiment students have to write a lab report handed in the next lab period.

## 21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

1. 1 hour lecture before each laboratory period talking about one topic in this class
2. Handouts developed by the instructor of the class available to the students online
3. Using the computers to analyze data
4. monitoring the performance of the students in and outside the lab

**22. Evaluation Methods and Course Requirements:**

The students are evaluated by:

- Written exams (Midterm and final exams)
- Lab reports
- Participation and how good the students adhere to the regulations of lab work

**23. Course Policies:**

A- Attendance policies: Students should attend at least 85% of the lectures.

B- Absences from exams and handing in assignments on time: If an exam is missed for a documented serious and compelling reason, a make-up exam will be held at a time and place of the instructor's discretion. Final exam make-up is held according to university regulations.

C- Health and safety procedures: All students are expected to follow the safety rules of the lab work.

D- Honesty policy regarding cheating, plagiarism, misbehavior: Dealt with according to university regulations.

E- Grading policy: According to university regulations.

F- Available university services that support achievement in the course: Physical chemistry laboratory in the department of chemistry, equipped with the necessary instruments, chemicals, glassware, and other auxilliary materials. Moreover the central library, personal computer labs at different locations in the university, e-learning site, and faculty members website are all useful in supporting achievement in the course.

**24. Required equipment:**

Variety of instrumentations are need in this lab, including (but not exculsive)

- Calorimeters
- pH meters
- Refractometers
- Photometers
- Vacuum and pressure gauges
- In addition to various chemicals, glassware, and other auxilliary materials.

**25. References:**

A- Required book (s), assigned reading and audio-visuals:

A. Albawab; F. Odeh; A. Bozeya, Experimental Physical Chemistry I , 2nd ed., 2015, Jordan University Press.

B- Recommended books:

1. P. W. Atkins, and J. de Paula, Physical Chemistry , 10<sup>th</sup> ed., OUP, 2014.

2. T. Engel, P. Reid, Physical Chemistry , 3rd ed., Pearson Education, Inc., 2013.

3. K. J. Laidler, J. H. Meiser, and B. C. Sanctuary, Physical Chemistry , 4th ed., Houghton Mifflin Company, 2003.

4. I. N Levine, Physical Chemistry , 6th ed., the McGraw-Hill Companies, 2009.

5. D. P. Shoemaker, C. W. Garland, and J. W. Nibler, Experiments in Physical Chemistry , 8th ed., the McGraw-Hill Companies, 2011.

7. F. Daniels, J. W. Williams, P. Bender, R. A. Alberty, C. D. Cornwell, and J. E. Harriman, Experimental Physical Chemistry , 7th ed., McGraw-Hill, 1970.

**26. Additional information:**

N/A

**Name of Course Coordinator:** Dr Wissam Helal

**Signature:** Wissam Helal

**Date:** September 5, 2017

**Head of curriculum committee/Department:** Dr Firas Awwadi

**Signature:**

**Head of Department:** Dr Firas Awwadi

**Signature:**

**Head of curriculum committee/Faculty:** Prof. Sami Mahmoud

**Signature:**

**Dean:** Prof. Sami Mahmoud

**Signature:**

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