



Course Syllabus
According to JORDAN National Qualification
Framework (JNQF)

Course Name: Physical chemistry (I)

Course Number: 11012241

General Course Information:

| | |
|---|------------------------------|
| Course title | Physical chemistry (1) |
| Course number | 11012241 |
| Credit hours | 3 |
| Education type | [Face-to-Face] |
| Prerequisites/corequisites | 11011202 & 11032164 |
| Academic Program | Bachelor |
| Program code | 01 |
| Faculty | Science |
| Department | Chemistry |
| Level of course | Second year |
| Academic year /semester | 2022/2023- Second semester |
| Awarded qualification | Bachelor degree in chemistry |
| Other department(s) involved in teaching the course | - |
| Language of instruction | English |
| Date of production/revision | 1/10/2022 |

Course Coordinator:

| | |
|-------------------------------|---|
| Coordinator's name | Dr. Alaa Al-Ma'abreh |
| Office No | 4204 |
| Office Phone extension number | 2527 |
| Office Hours | 10-11 Sunday, 8:30-9:30 Monday, 2-3 Tuesday, 11:00-12:30 Wednesday, 1-2 Thursday |
| Email | alaa.almaabreh@iu.edu.jo alaamabreh@yahoo.com |

Other Instructors:

| | |
|-------------------------------|---|
| Instructor name | Dr. Alaa Al-Ma'abreh |
| Office No | 4204 |
| Office Phone extension number | 2527 |
| Office Hours | 10-11 Sunday, 8:30-9:30 Monday, 2-3 Tuesday, 11:00-12:30 Wednesday, 1-2 Thursday |
| Email | alaa.almaabreh@iu.edu.jo alaamabreh@yahoo.com |

Course Description (English/Arabic):

| | |
|---------|--|
| English | The nature of physical chemistry and the kinetic theory of gases, The first law of thermodynamics, The Second and Third Laws of Thermodynamic, Chemical Equilibrium, Phases and Solution, Phase Equilibria |
| Arabic | طبيعة الكيمياء الفيزيائية و النظرية الحركية للغازات; القانون الاول في الديناميكا الحرارية; القانون الثاني و القانون الثالث في الديناميكا الحرارية; الاتزان الكيميائي في الاطوار البسيطة و المحاليل; الاتزان بين الاطوار. |

Textbook: Author(s), Title, Publisher, Edition, Year, Book website.

K.J. Laidler & J.H. Meiser, Houghton Mifflin, Physical Chemistry, 4th edition, 2002

References: Author(s), Title, Publisher, Edition, Year, Book website.

Peter Atkins & Julio De Paula, Physical chemistry, 10th edition, 2012

Course Educational Objectives (CEOs):

| | |
|----|--|
| 1. | Indicate properties for a gaseous system and their behavior based on kinetic molecular theory. |
| 2. | Recognize the basic principles of thermodynamics, thermodynamic systems and processes, and chemical equilibria |
| 3. | Solving problems concern with the three laws of thermodynamic. |
| 4. | Recognize chemical equilibria correlated to thermodynamic systems. |
| 5. | Recognize phase diagram and phase transitions and correlates to thermodynamic parameters |
| 6. | Construct and interpret phase diagram for binary and tertiary systems. |

Intended Learning Outcomes (ILO's):

| | Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the course. These outcomes are related to the knowledge, skill and competence that students acquire: | Relationship to CEOs | Contribution to PLOs | Bloom Taxonomy Levels* | Descriptors** |
|-----------|---|----------------------|----------------------|------------------------|---------------|
| A | Knowledge and Understanding: | | | | |
| A1 | Student will be able to recognize basics and fundamental concepts related to the nature of physical chemistry, gaseous systems, kinetic theory of gases, laws of thermodynamic, chemical equilibrium, phases and solutions, and phase equilibria. | 1, 2, 4 | a | 1 | K |
| B | Intellectual skills: | | | | |
| B1 | Students will be able to solve problems related to gaseous systems, the kinetic theory of gases, laws of thermodynamic, equilibrium constant, phases and solutions, and phase equilibria in chemistry. | 3, 4, 5 | d | 3 | S |
| B2 | Student will be able to construct phase diagrams given sufficient information. | 5,6 | c | 4 | C |
| C | Subject specific skills: | | | | |
| C1 | | | | | |
| D | Transferable skills: | | | | |

| | | | | | |
|-------|--|--|--|--|--|
| 1. D1 | | | | | |
|-------|--|--|--|--|--|

***Bloom Taxonomy Levels**

| Level # | 1 | 2 | 3 | 4 | 5 | 6 |
|------------|-----------|---------------|-------------|----------|------------|-----------|
| Level Name | Knowledge | Comprehension | Application | Analysis | Evaluation | Synthesis |

**** Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

| Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (Bachelor in chemistry) program will demonstrate: | | Descriptors** | | |
|--|--|---------------|---|---|
| | | K | S | C |
| 1. | Describe the fundamental scientific principles and theories across the four subfields of chemistry (Organic, inorganic, analytical and physical). | √ | | |
| 2. | Identify and confirm chemical compounds structures as well as determine chemical composition. | √ | | |
| 3. | Establish and concludes mechanisms of physical and chemical processes in addition to the ability of mastering qualitative and quantitative determination. | | | √ |
| 4. | Solve the scientific problems using different mechanisms and procedures based on critical thinking. | | √ | |
| 5. | Conduct scientific experiments in chemistry. | | | √ |
| 6. | Commitment and interest in lifelong learning, and collaborate effectively with other people in a team. | | | √ |
| 7. | Prepare logical, organized and concise written reports, and oral and poster presentations that effectively communicate chemical content to other scientists. | | √ | |
| 8. | Commitment to the ethical principles of chemical research. | | | √ |
| 9. | Find information about chemistry through databases and information | | √ | |
| 10. | Evaluation of calculations in chemistry experiments and information analysis using computer software. | | | √ |
| 11. | Demonstrate safety laboratory techniques. | | √ | |

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule (please choose the type of teaching)

Face to Face

Hybrid (2 Lectures Face – To - Face +1 Lecture Asynchronous)

Hybrid (1 Lectures Face – To - Face +1 Lecture Asynchronous)

Online (2 Lectures Synchronous +1 lecture Asynchronous)

| Week | First Hour (face to face) | Second Hour (face to face) | Third Hour (face to face) | Ach. ILOs | Ach. PLOs | Descriptors* |
|------|---------------------------|----------------------------|---------------------------|-----------|-----------|--------------|
|------|---------------------------|----------------------------|---------------------------|-----------|-----------|--------------|

| | | | | | | |
|----|--|--|--|---------|---|---|
| 1 | The nature of physical chemistry and the kinetic theory of gases | 2. The nature of physical chemistry and the kinetic theory of gases | The nature of physical chemistry and the kinetic theory of gases | 1, 2 | a | K |
| 2 | The nature of physical chemistry and the kinetic theory of gases | 3. The nature of physical chemistry and the kinetic theory of gases | The nature of physical chemistry and the kinetic theory of gases | 1, 2 | a | K |
| 3 | The nature of physical chemistry and the kinetic theory of gases | 4. The nature of physical chemistry and the kinetic theory of gases | The nature of physical chemistry and the kinetic theory of gases | 1, 2 | d | S |
| 4 | The first law of thermodynamic | 5. The first law of thermodynamic | The first law of thermodynamic | 1, 2 | a | K |
| 5 | The first law of thermodynamic | 6. The first law of thermodynamic | The first law of thermodynamic | 1, 2 | d | S |
| 6 | The second and third law of thermodynamic | 7. The second and third law of thermodynamic | The second and third law of thermodynamic | 1, 2 | a | K |
| 7 | The second and third law of thermodynamic | 8. The second and third law of thermodynamic | The second and third law of thermodynamic | 1, 2 | d | S |
| 8 | The second and third law of thermodynamic | 9. The second and third law of thermodynamic | The second and third law of thermodynamic | 1, 2 | a | K |
| 9 | The second and third law of thermodynamic | 10. The second and third law of thermodynamic | The second and third law of thermodynamic | 1, 2 | d | S |
| 10 | The equilibrium constant | 11. The equilibrium constant | The equilibrium constant | 1, 2 | a | K |
| 11 | The equilibrium constant | 12. The equilibrium constant | The equilibrium constant | 1, 2 | d | S |
| 12 | Phases and solutions | 13. Phases and solutions | Phases and solutions | 1, 2, 3 | a | K |
| 13 | Phases and solutions | 14. Phases and solutions | Phases and solutions | 1, 2, 3 | c | C |
| 14 | Phases equilibria | 15. Phases equilibria | Phases equilibria | 1, 2, 3 | a | K |
| 15 | Phases equilibria | 16. Phases equilibria | Phases equilibria | 1, 2, 3 | c | C |

Teaching Methods and Assignments:

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

- Interactive videos
- Practice Labs
- Discussion Forums
- Quizzes
- Other Interactive online activities
- Reports

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20 %**
- Midterm **30 %**
- Final Exam **50 %**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required equipment:

- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: <https://elearn.iu.edu.jo/>**
- **E-learning plan**
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools implemented in the course:

- √ Final Exam
- √ Midterm Exam
- Quizzes
- √ Homework
- Practice Labs
- Discussion Forums

- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching
- Others:.....

Responsible Persons and their Signatures:

| | | | |
|--|-----------------------------|-----------------------|---|
| Course Coordinator | Dr. Alaa Al-Ma'abreh | Completed Date | 20/10 / 2021 |
| | | Signature | Alaa Al-Ma'abreh |
| Received by (Department Head) | Dr. Manal AlKhabbas | Received Date | / / |
| | | Signature |  |