جامعة الإسراء
ISRA UNIVERSITY

# Course Syllabus

***According to JORDAN National Qualification Framework (JNQF)***

# Course Name: Analytical Chemistry

# Course Number: 11012131

## General Course Information:

| | |
|---|---|
| Course title | **Analytical Chemistry** |
| Course number | **11012131** |
| **Credit hours** | **3** |
| **Education type** | **[Online (Synchronous, Asynchronous)], [Hybrid (Face-to-Face, Online (Synchronous, Asynchronous)], OR [Face-to-Face]** |
| Prerequisites/corequisites | **General Chemistry (2) 1101102** |
| Academic Program | **Bachelor** |
| Program code | **01** |
| Faculty | **Science** |
| Department | **Chemistry** |
| Level of course | **Second - year students** |
| Academic year /semester | **2021/2022- Second semester** |
| Awarded qualification | **Bachelor degree in chemistry** |
| Other department(s) involved in teaching the course | **N/A** |
| Language of instruction | **English** |
| Date of production/revision | **October, 2022** |

## Course Coordinator:

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|---|---|
| **Coordinator's name** | **Dr. Abed Abdel Qader** |
| **Office No** | **Basement of Engineering Building** |
| **Office Phone extension number** | **2607** |
| **Office Hours** | **11:00-1:00 Sunday, Tuesday, Thursday.** |
| **Email** | **abed.abdelqader@iu.edu.jo** |

## Other Instructors:

| | |
|---|---|
| **Instructor name** | |
| **Office No** | |
| **Office Phone extension number** | |
| **Office Hours** | |
| **Email** | |

## Course Description *(English/Arabic)*:

| | |
|---|---|
| **English** | The nature of analytical chemistry; calculations used in analytical chemistry; errors in chemical analysis; statistical data processing and evaluation; gravimetric analysis methods; Titration in analytical chemistry; Neutralization titration principles (acids and bases); Compeliximetric titration, Precipitation titration. |
| **Arabic** | |

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

1. D.A. Skoog, D.M.West, F.J. Holler, S.R. Crouch. Fundamentals of Analytical Chemistry,Brooks Cole, New York.2013.9 th Edition

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

1. D.C. Harris, *Quantitative Chemical Analysis*, 9th Ed., W.H. Freeman and Co., New York, NY, 2015.

## Course Educational Objectives (CEOs):

| | |
|---|---|
| **1.** | **A review of basic Chemistry and classic methods of analysis** |
| **2.** | **Study the chemical calculation** |
| **3.** | **Analysis the chemical data** |
| **4.** | **To understand all the analytical terms and expressions used in analytical methods** |
| **5.** | **To learn about all types of chemical reactions and the mathematical steps involved in quantitative analytical methods** |

## Intended Learning Outcomes (ILO's):

| **1.** | **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**** |
|---|---|---|---|---|---|
| **2. A** | **Knowledge and Understanding:** | | | | |
| **3. A1** | **Demonstrate knowledge and understanding of data handling, concentration expressions, titration, volumetric analysis, gravimetric analysis, acid and bases definitions, solubility, complexemtric titration, redox titration and precipitation titration.** | **1,4** | **1,4** | **1-6** | **K** |
| **4. A2** | **Apply the scientific process, including statistical treatment of data, in the conduct and reporting of chemical analysis.** | **3** | **3** | **4** | **S** |
| **5. B** | **Intellectual skills:** | | | | |
| **6. B1** | **To develop the skills needed to solve analytical problems in a quantitative manner** | **2** | **4** | **3** | **C** |
| **7. C** | **Subject specific skills:** | | | | |
| **8. C1** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **9. D** | **Transferable skills:** | | | | |
| **10. 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 (_____) 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). | **K** | | |
| **2.** | Identify and confirm chemical compounds structures as well as determine chemical composition. | **K** | | |
| **3.** | Establish and concludes mechanisms of physical and chemical processes in addition to the ability of mastering qualitative and quantitative determination. | | | **C** |
| **4.** | Solve the scientific problems using different mechanisms and procedures based on critical thinking. | | **S** | |
| **5.** | Conduct scientific experiments in chemistry. | | | **C** |
| **6.** | Commitment and interest in lifelong learning, and collaborate effectively with other people in a team. | | | **C** |
| **7.** | Prepare logical, organized and concise written reports, and oral and poster presentations that effectively communicate chemical content to other scientists. | | **S** | |
| **8.** | Commitment to the ethical principles of chemical research. | | | **C** |
| **9.** | Find information about chemistry through databases and information | | **S** | |
| **10.** | Evaluation of calculations in chemistry experiments and information analysis using computer software. | | | **C** |
| **11.** | Demonstrate safety laboratory techniques. | | **S** | |

**** 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 Lecture (*Face to Face*) | Second Lecture (*Face to Face*) | Third Lecture (*Face to Face*) | Ach. | Ach. | Descriptors** |
|---|---|---|---|---|---|---|

| | | | | ILOs | PLOs | |
|---|---|---|---|---|---|---|
| 1 | **Introduction** | **Introduction** | | A1 | 1 | S |
| 2 | **Calculation Used in Analytical Chemistry**<br>– Some Important Units of Measurement<br>– Solutions and Their Concentrations<br>– Chemical Stoichiometry | **Calculation Used in Analytical Chemistry**<br>– Some Important Units of Measurement<br>– Solutions and Their Concentrations<br>– Chemical Stoichiometry | **Calculation Used in Analytical Chemistry**<br>– Some Important Units of Measurement<br>– Solutions and Their Concentrations<br>– Chemical Stoichiometry | B1 | 1,4 | K |
| 3 | **Calculation Used in Analytical Chemistry**<br>– Some Important Units of Measurement<br>– Solutions and Their Concentrations<br>– Chemical Stoichiometry | **Calculation Used in Analytical Chemistry**<br>– Some Important Units of Measurement<br>– Solutions and Their Concentrations<br>– Chemical Stoichiometry | **Calculation Used in Analytical Chemistry**<br>– Some Important Units of Measurement<br>– Solutions and Their Concentrations<br>– Chemical Stoichiometry | B1 | 1,4 | S |
| 4 | **Errors in Chemical Analyses**<br>– Some Important Terms<br>– Systematic Errors | **Errors in Chemical Analyses**<br>– Some Important Terms<br>– Systematic Errors | **Errors in Chemical Analyses**<br>– Some Important Terms<br>– Systematic Errors | A2 | 3 | K |
| 5 | **Random Errors in Chemical Analysis**<br>– The Nature of Random Errors<br>– Statistical Treatment of Random Errors<br>– Standard Deviation of | **Random Errors in Chemical Analysis**<br>– The Nature of Random Errors<br>– Statistical Treatment of Random Errors<br>– Standard Deviation of | **Random Errors in Chemical Analysis**<br>– The Nature of Random Errors<br>– Statistical Treatment of Random Errors<br>– Standard Deviation of | A2 | 3 | K |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Calculated Results<br>– Reporting Computed Data | Calculated Results<br>– Reporting Computed Data | Calculated Results<br>– Reporting Computed Data | | | |
| 6 | **Statistical Data Treatment and Evaluation**<br>– Confidence Intervals<br>– Detection of Gross Errors | **Statistical Data Treatment and Evaluation**<br>– Confidence Intervals<br>– Detection of Gross Errors | **Statistical Data Treatment and Evaluation**<br>– Confidence Intervals<br>– Detection of Gross Errors | A2 | 3 | S |
| 7 | **Titrations in Analytical Chemistry**<br>– Some Terms Used in Volumetric Titrations<br>– Standard Solutions<br>– Volumetric Calculations<br>– Gravimetric Titrations<br>– Titration Curves | **Titrations in Analytical Chemistry**<br>– Some Terms Used in Volumetric Titrations<br>– Standard Solutions<br>– Volumetric Calculations<br>– Gravimetric Titrations<br>– Titration Curves | **Titrations in Analytical Chemistry**<br>– Some Terms Used in Volumetric Titrations<br>– Standard Solutions<br>– Volumetric Calculations<br>– Gravimetric Titrations<br>– Titration Curves | B1 | 1 | K |
| 8 | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | A1 | 4 | S |
| 9 | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for | A1 | 1 | S |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | | | |
| 10 | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | **Principles of Neutralization Titrations**<br>– Solutions and Indicators for Acid/Base Titrations<br>– Titration of Strong Acids and Bases<br>– Titration Curves for Weak Acids<br>– Titration Curves for Weak Bases | A1 | 1 | S |
| 11 | **Complexation and Precipitation Reactions and Titrations**<br>– The formation of complexes<br>– Titrations with inorganic complexing agents<br>– Organic complexing agents<br>– Aminocarbo xylic acid titrations | **Complexation and Precipitation Reactions and Titrations**<br>– The formation of complexes<br>– Titrations with inorganic complexing agents<br>– Organic complexing agents<br>– Aminocarbo xylic acid titrations | **Complexation and Precipitation Reactions and Titrations**<br>– The formation of complexes<br>– Titrations with inorganic complexing agents<br>– Organic complexing agents<br>– Aminocarbo xylic acid titrations | A1 | 1 | C |
| 12 | **Gravimetric Methods of Analysis**<br>– Precipitation Gravimetry | **Gravimetric Methods of Analysis**<br>– Precipitation Gravimetry | **Gravimetric Methods of Analysis**<br>– Precipitation Gravimetry | A1 | 1 | K |

| | | | | | | |
|---|---|---|---|---|---|---|
| | – Calculation of Results from Gravimetric Data<br>– Applications of Gravimetric Methods | – Calculation of Results from Gravimetric Data<br>– Applications of Gravimetric Methods | – Calculation of Results from Gravimetric Data<br>– Applications of Gravimetric Methods | | | |
| 13 | **Gravimetric Methods of Analysis**<br>– Precipitation Gravimetry<br>– Calculation of Results from Gravimetric Data<br>– Applications of Gravimetric Methods | **Gravimetric Methods of Analysis**<br>– Precipitation Gravimetry<br>– Calculation of Results from Gravimetric Data<br>– Applications of Gravimetric Methods | **Gravimetric Methods of Analysis**<br>– Precipitation Gravimetry<br>– Calculation of Results from Gravimetric Data<br>– Applications of Gravimetric Methods | A1 | 1 | K |
| 14 | | | | | | |
| 15 | Final Exam | | | | | |

* **K: Knowledge, S: Skills, C: Competency**

## 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) ___%
- Midterm ___%
- Final Exam ___%

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

## Required equipment:

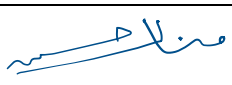
- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: https://elearn.iu.edu.jo/**
- **E-learning plan**
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

## 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. Abed Abdel Qader** | **Completed Date** | **25/10/2022** |
| | | **Signature** |  |

| | | | |
|---|---|---|---|
| **Received by** (Department Head) | **Dr. Manal khabbas** | **Received Date** | **26/10/2022** |
| | | **Signature** |  |