



Course Syllabus
According to JORDAN National Qualification
Framework (JNQF)

Course Name: Instrumental Analysis Laboratory

Course Number: 11013236

General Course Information:

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|---|----------------------------------|
| Course title | Instrumental Analysis Laboratory |
| Course number | 11013236 |
| Credit hours | 1 Credit hours |
| Education type | 3 hours [Face-to-Face] |
| Prerequisites/corequisites | 11012132 + 11013235 أو مترامن |
| Academic Program | Bachelor |
| Program code | 01 |
| Faculty | Faculty of science |
| Department | Department of Chemistry |
| Level of course | 3 rd year |
| Academic year /semester | First semester 2022/2023 |
| Awarded qualification | BSc degree of chemistry |
| Other department(s) involved in teaching the course | None |
| Language of instruction | English |
| Date of production/revision | 2022/2023 |

Course Coordinator:

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| Coordinator's name | Ms. Ghada Idrees |
| Office No | |
| Office Phone extension number | 2754 |
| Office Hours | |
| Email | gada.edris@iu.edu.jo |

Other Instructors:

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

Course Description (English/Arabic):

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|---------|--|
| English | Experiments in qualitative and quantitative analysis using a number of different chemical analysis instruments including conductivity meter, pH meter, atomic absorption, atomic emission, UV-visible spectrophotometer, gas chromatograph, and high-performance liquid chromatography |
| Arabic | تجارب في التحليل النوعي و الكمي باستخدام عدد من اجهزة التحليل الكيميائي المختلفة منها جهاز قياس الموصلية الكهربائية, جهاز قياس الحموضة, جهاز الامتصاص الذري, جهاز الانبعاث الذري, جهاز امتصاص الاشعة المرئية و فوق البنفسجية, جهاز كروماتوغرافيا الغاز, جهاز كروماتوغرافيا السائل عالية الاداء |

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

1. Instrumental Analysis Laboratory manual, Isra University 2018-2019

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

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| <p>Required book (s), assigned reading and audio-visuals:</p> <p>Collected Manual, Instrumental Chemistry</p> <ul style="list-style-type: none"> - Fundamentals of Analytical Chemistry: by Skoog; West; Holler; and Crouch, 8th Edition, Thomson, Brooks/Cole, (2004) - Principles of instrumental analysis. Fifth edition, SkoogHooler, Niemen. - Calibration methods in instrumental analysis/ regression and correlation - An introduction to optical atomic spectroscopy, atomic absorption, and atomic emission spectroscopy - Components of optical instruments - An introduction to ultraviolet/ visible molecular spectroscopy - Introduction to chromatographic separations |
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Course Educational Objectives (CEOs):

| | |
|----|--|
| 1. | To enhance the theoretical knowledge a acquired in Instrumental chemistry classes and to give the student the chance to apply what they have learned practically |
| 2. | To provide the students with good experience on handling an advanced instruments in chemical analysis |
| 3. | The student will learn how to write a lab report in a professional manner. |
| 4. | Able to design work both individually and as part of team |

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 | Student will be able to describe the principles of quantitative and qualitative chemical analysis using different instrumental techniques. | 1 | a | 1 | k |
| 4. B | Intellectual skills: | | | | |
| 5. B1 | Student will be able to estimate chemical data by performing calculations and presenting the results | 3 | g | 4 | s |

| | | | | | |
|-------|---|-----|------|-----|-----|
| 6. C | Subject specific skills: | | | | |
| 7. C1 | Student will be able to handling (spectrophotometric instrument and its application and differentiating between spectroscopy techniques, chromatography method and recognize electrochemical Methods and its application) | 1,2 | d, e | 3,4 | s,c |
| 8. D | Transferable skills: | | | | |
| 9. D1 | Student will be learn how to work individually and with partners effectively | 4 | f | 3 | c |

***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). | ✓ | | |
| 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 | Three Hours (face- to -face) | Second Lecture | Third Lecture | Ach. ILOs | Ach. PLOs | Descriptors** |
|------|----------------------------------|----------------|---------------|-------------------|------------|---------------|
| 1 | Conductometric Titrations | 10. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |
| 2 | Potentiometric Titrations | 11. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |
| 3 | Refractometry | 12. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |
| 4 | Polarimetry | 13. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |
| 5 | Flame Photometric Analysis (FES) | 14. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |

| | | | | | | |
|----|---|-----|--|-------------------|------------|---|
| 6 | Atomic Absorption Spectroscopy (AAS) | 15. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |
| 7 | Midterm Exam | 16. | | | | |
| 8 | Spectrophotometric Determination of Ferrous Ion Concentration | 17. | | A1 & B1 & C1 & D1 | a,d,e ,g,f | s |
| 9 | Spectrophotometric Determination of the concentration of NiSO ₄ solution by standard addition method | 18. | | A1 & B1 & C1 & D1 | a,d, e,g,f | s |
| 10 | Introduction to Chromatography | 19. | | A1 & C1 | a,d, e | k |
| 11 | Gas Chromatography, Identification of compounds using gas chromatography | 20. | | A1 & B1 & C1 & D1 | a,d, e,g,f | s |
| 12 | Column Efficiency in High-Performance Liquid Chromatography "HPLC" | 21. | | A1 & B1 & C1 & D1 | a,d, e,g,f | s |
| 13 | Ion Exchange Chromatography | 22. | | A1 & B1 & C1 & D1 | a,d, e,g,f | s |
| 14 | Final Exam | 23. | | | | |

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

Teaching Methods and Assignments:

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

- (3 hrs Face – To - Face)
- 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
- Practice Labs
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching

Responsible Persons and their Signatures:

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|--|----------------------------|-----------------------|------------------------|
| Course Coordinator | M.Sc. Ghada Idrees | Completed Date | 16/ 10 /2022 |
| | | Signature | <i>Ghada idrees</i> |
| Received by (Department Head) | Dr. Manal Al Khabas | Received Date | 17/10/2022 |
| | | Signature | <i>Manal Al Khabas</i> |