Course E-Syllabus

1	**Course title**	**Instrumental Pharmaceutical Analysis**
2	**Course number**	1201315
3	**Credit hours**	2 theory and a separate 1 hr practical course
	Contact hours (theory, practical)	2 theory and a separate 3 hr practical course per week
4	**Prerequisites/corequisites**	Chemical pharmaceutical Analysis 1201201
5	**Program title**	BSc Pharmacy, Pharm D
6	**Program code**	--
7	**Awarding institution**	The University of Jordan
8	**School**	Pharmacy
9	**Department**	Pharmaceutical Sciences
10	**Level of course**	Intermediate, 3rd year students
11	**Year of study and semester (s)**	First Semester, Academic Year 2021-2022
12	**Final Qualification**	Bsc in Pharmacy, Pharm D
13	**Other department (s) involved in teaching the course**	NA
14	**Language of Instruction**	English
15	**Teaching methodology**	☐Blended ☒On Campus + Online
16	**Electronic platform(s)**	☒Moodle ☒Microsoft Teams ☐Skype ☐Zoom ☐Others……
17	**Date of production/revision**	10th October 2021

18 Course Coordinator:

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Office Hours: Sun/Tue (9:30-10:30). Mon/Wed (9:00-10:30)

19 Other instructors:

Name: NA

20 Course Description:

As stated in the approved study plan.

The course is about understanding the merits of different instrumental analytical techniques and how they might be employed to analyze drugs in bulk raw material, dosage forms (mainly) and in other matrices (such as plasma). The course will cover;

A. Basic concepts of instrumental techniques of analysis

1- The theoretical principles behind each instrumental technique will be discussed

2- Details of how to employ the techniques for practical applied case of drug analysis as in pharmaceutical manufacturers or clinical trials.

B. Development and evaluation of analytical methods

1. Choice of the proper method of identification
2. Compare and contrasts between different spectroscopic techniques in identification and structure elucidation of unknowns.
3. Evaluate and criticize published analytical methods based on instrumental techniques.

21 Course aims and outcomes:

A- Aims:

The course aims to accomplish the following goals:
1. To provide students with sufficient knowledge regarding the employed instrumental analytical methodologies.
2. To provide students with a solid background in principles of pharmaceutical analysis.
3. To introduce students to a wide range of instrumental analytical techniques that are useful in modern pharmaceutical analysis, some of which they will gain hands on experience in the practical sessions accompanying the course.
4. To develop skills necessary to solve analytical problems related to instrumental techniques.

B- Intended Learning Outcomes (ILOs):

Upon successful completion of this course students will be able to

Develop, integrate, and apply knowledge from the foundational pharmaceutical sciences in separation, quantification and identification techniques (learner)

1. Define knowledge related to different instrumental techniques used for qualitative and quantitative analysis and separation
2. Recall basic calculations associated with the quantitative analysis of drugs based on instrumentations
3. Explain the mechanisms by which different instrumental techniques work and how they are utilized to analyze drug substances
4. Understand the main uses of the various analytical instruments.
5. Recognize the different techniques in terms of suitability for particular analytical problem and Choose a proper analytical method for the quantitative or qualitative analysis of certain drug in certain media
6. Interpret basic IR and NMR spectra and chromatogram for simple compounds
7. Apply the gained knowledge of different analytical methods for purpose of drug identification and assay

Exhibit behaviors and values that are consistent with the trust given to the profession by patients, other healthcare providers, and society (Professional)

8. Demonstrate integrity by not cheating and not committing plagiarism
9. Demonstrate respect to professors and classmates by observing active listening inside the classroom

22. Topic Outline and Schedule:

Week	Lecture	Topic	Teaching Methods*/platform	Evaluation Methods**	References
1	1.1	Basics of Analytical Chemistry	Synchronous lecturing (On campus, MS teams)	Quiz, Exam	1 and 2
	1.2	Introduction to spectroscopy	Synchronous lecturing (On campus, MS teams)	Quiz, Exam	1 and 2
2	2.1	Atomic Spectroscopy	Synchronous lecturing (On campus, MS teams)	Quiz, Exam	1, 2, 3 and 4
	2.2	Atomic Spectroscopy	Synchronous lecturing (On campus, MS teams)	Quiz, Exam	1, 2, 3 and 4
3	3.1	Molecular Spectroscopy (UV-Vis Spectroscopy) Theory and Principle	Synchronous lecturing (On campus, MS teams)	Exam	1 and 2
	3.2	Absorption Shifts	Synchronous lecturing (On campus, MS teams)	Exam	1 and 2
4	4.1	Beer's Lambert Law	Synchronous lecturing (On campus, MS teams)	Exam	1 and 2
	4.2	Spectrophotometric Mixture Analysis	Synchronous lecturing (On campus, MS teams)	Exam	1 and 2
5	5.1	UV-Vis Instrumentation	Synchronous lecturing (On campus, MS teams)	Exam	1 and 2
	5.2	Molecular Emission Spectroscopy	Synchronous lecturing (On campus, MS teams)	Exam	1, 2 and 4
6	6.1	Molecular Mass Spectrometry (MS)	Synchronous lecturing (On campus, MS teams)	Exam	1, 2, 3
	6.2	Molecular Mass Spectrometry (MS)	Synchronous lecturing (On campus, MS teams)	Exam	1, 2, 3
7	7.1	Infra-red Spectroscopy (Principles, Origin of IR bands, Modes of vibration	Synchronous lecturing (On campus, MS teams)	Exam, Assignment	1
	7.2	Infra-red Spectroscopy (IR spectrum interpretation)	Synchronous lecturing (On campus, MS teams)	Exam, Case Study	1
8	8.1	Application in the use of IR for structure elucidation	Synchronous lecturing (On campus, MS teams)	Exam, Case Study	1
	8.2	Instrumentation and sample preparation	Asynchronous lecturing-E-learning	Self-reading Material	1
9	9.1	Raman Spectroscopy (Principles and Origen of bands)	Asynchronous lecturing, E-learning	Exam	2
	9.2	Raman Spectroscopy (Application)	Synchronous lecturing (On campus, MS teams)	Exam	2
10	10.1	NMR Spectroscopy-1 (Principles, Introduction to theory of NMR, origin of NMR signal)	Synchronous lecturing (On campus, MS teams)	Exam	1
	10.2	NMR Spectroscopy-1 (Chemical shift)	Synchronous lecturing (On campus, MS teams)	Exam, Case Study	1 and 2
11	11.1	NMR Spectroscopy-Part 2 Interpretation of NMR spectra	Synchronous lecturing (On campus, MS teams)	Exam, Assignment	1 and 2
	11.2	NMR Spectroscopy-Part 2 Interpretation of NMR spectra	Synchronous lecturing (On campus, MS teams)	Exam, Assignment	1 and 2
12	12.1	Carbon NMR and Instrumentation	Synchronous lecturing (On campus, MS teams)	Exam, Case Study	1 and 2

	12.2	NMR interpretation (examples)	Synchronous lecturing (On campus, MS teams)	Exam, Case Study	1 and 2
13	13.1	Introduction to chromatography	Synchronous lecturing (On campus, MS teams)	Exam	1
	13.2	TLC	Synchronous lecturing (On campus, MS teams)	Exam	1
14	14.1	GC	Synchronous lecturing (On campus, MS teams)	Exam	1
	14.2	HPLC (principle and theory)	Synchronous lecturing (On campus, MS teams)	Exam	1
15	15.1	HPLC (instrumentation and optimization)	Synchronous lecturing (On campus, MS teams)	Exam	1
	15.2	Chromatography revision	Synchronous lecturing (On campus, MS teams)	Exam	1

- Teaching methods include: Synchronous lecturing/meeting
- Evaluation methods include: Homework, Quiz, Exam,

23 Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
Quiz	10 M	Weeks 1, 2 and 3	Week 4-5	Online (LM system)
Assignment	10 M	NMR and IR spectroscopy	Week 11	Online (LM system)
Midterm Exam	30 M	Weeks 1-7	Week 8	On Campus or LM system
Final Exam	50 M	All given Material	Week 16	On Campus or LM system

24 Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):

Students should have a computer, internet connection and an account on MS teams

25 Course Policies:

A- Attendance policies:

According to the University Regulations

Attendance: Mandatory.
First warning – with 4 absences
Last warning – with 5 absences
Failing in the subject – with 6 absences

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

Will result in zero achievement unless health report or other significant excuse is documented.

C- Health and safety procedures: NA

D- Honesty policy regarding cheating, plagiarism, misbehavior:

The participation, the commitment of cheating will lead to applying all following penalties together

1) Failing the subject he/she cheated at
2) Failing the other subjects taken in the same course
3) Not allowed to register for the next semester. The summer semester is not considered as a semester

E- Grading policy:

Semester Works	20 Marks (Quiz (10), Assignments (10))
Midterm Exam	30 Marks
Final Exam	50 Marks
Total	100 Marks

F- Available university services that support achievement in the course:

An account on MS teams, library, internet connection, E-Learning, smart board

26 References:

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

***Textbook:**

1) Pharmaceutical Analysis; A Textbook for Pharmacy Students and Pharmaceutical Chemists by David Watson 2016.

2) Douglas A. Skoog, F James Holler and Stanley Crouch (2007) Principles of Instrumental Analysis. 6th Edition or later.

B- Recommended books, materials, and media:

3- Roger E. Schirmer (Editor) Modern methods of Pharmaceutical Analysis, 1982

4- Kenth A. Connors , A text book of Pharmaceutical Analysis, 1982

27 Additional information:

Name of Course Coordinator: Lina Dahabiyeh Signature: Date: 10/10/2021

Head of Curriculum Committee/Department: ---------- Signature: ----------

Head of Department: ---------- Signature: ----------

Head of Curriculum Committee/Faculty: ---------- Signature: ----------

Dean: ---------- Signature: ----------