Form: Course Syllabus		
	Form Number	EXC-01-02-02A
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1.	**Course Title**	Natural Products Chemistry
2.	**Course Number**	1201707
3.	**Credit Hours (Theory, Practical)**	3, Theory
	Contact Hours (Theory, Practical)	3, Theory
4.	**Prerequisites/ Corequisites**	None
5.	**Program Title**	Master of Science in Pharmaceutical Sciences
6.	**Program Code**	40
7.	**School/ Center**	Pharmacy
8.	**Department**	Pharmaceutical Sciences
9.	**Course Level**	9th
10.	**Year of Study and Semester (s)**	1st Year, 2nd Semester.
11.	**Other Department(s) Involved in Teaching the Course**	NA
12.	**Main Learning Language**	English
13.	**Learning Types**	☒Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	☒ Moodle ☒Microsoft Teams
15.	**Issuing Date**	November 2024
16.	**Revision Date**	November 2024

17. Course Coordinator:

Prof. Dr. Talal A. Aburjai
Office Number 23309,
email address: aburjai@ju.edu.jo

18. Other Instructors:

Name:

Office number:

Phone number:

19. Course Description:

This course covers the principles of natural product chemistry, research methods, and their applications in pharmaceutical technologies. It focuses on bioactive natural products derived from plant sources or other natural origins. The curriculum includes modern chromatographic techniques for separation and purification, as well as methods for determining and interpreting chemical structures using instrumental analysis. Additionally, the course features a practical component where students gain hands-on experience in various extraction and separation processes to isolate pure compounds, identify them, and study their diverse pharmacological effects.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Demonstrate advanced knowledge and deep understanding of essential facts, concepts, principles and theories of drug discovery and development including synthetic strategies, retro-synthetic analysis of organic and natural product and techniques applied in drug design and drug discovery different analytical methodologies used in the identification and quantification of drugs or natural and synthetic origin.
2. Demonstrate advanced knowledge and deep understanding of essential facts, concepts, principles and theories of pharmaceutics and dosage forms development, physical chemistry, drug formulation, drug targeting, stability and bioavailability in medical or cosmetic preparations.
3. Apply advanced mathematical and statistical methods required for the treatment of complex scientific problems and research results.
4. Plan and carry out experiments independently, including the conduct of advanced laboratory procedures and use of instrumentation in synthetic and analytical work or biochemical and microbial assessment.
5. Prepare definite research plans and evaluate results analytically and critically independently and demonstrate self-direction and originality in the application of knowledge.
6. Demonstrate self-directing and ability to learn independently and evaluate critically current research and methodologies and problem solving.
7. Deal with complex issues both systemically and creatively, make sound judgments in the absence of complete data, and communicate their conclusions and scientific findings clearly to specialist and non-specialist audiences in forms of oral presentations or scientific writing.
8. Demonstrate and exercise the initiative and personal responsibility; decision-making in complex and unpredictable situations, and ability to work in a group and in the interdisciplinary and international environment.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Understand and explain the principles of phytochemistry and pharmacognosy, including the scope and practice of natural product chemistry (NPC) and the role of medicinal plants in medicine.
2. Analyze and differentiate between primary and secondary metabolites, their biosynthetic origins, and their pharmacological importance, with a focus on carbohydrates, proteins, lipids, and secondary metabolites in pharmacy and therapy.
3. Demonstrate proficiency in modern methods for the preparation and extraction of natural products, including solvent extraction, distillation, and supercritical extraction.
4. Apply chromatographic techniques for the separation, purification, and analysis of natural compounds using analytical (e.g., TLC, HPLC, LC-MS) and preparative chromatography (e.g., column chromatography, flash chromatography).
5. Interpret chemical structures of isolated compounds using physical and spectroscopic methods such as UV, IR, MS, ^{1}H-NMR, and ^{13}C-NMR.
6. Evaluate the pharmacological activities of natural products, including anti-inflammatory, analgesic, antidiabetic, antifertility, antimicrobial, and hypolipidemic effects, using relevant bioassays.
7. Investigate and characterize the biological activities and chemical constituents of Jordanian plants, including the isolation and structure determination of active components and their antibacterial, antifungal, and antiplatelet activities.
8. Exhibit responsibility, accountability, and dedication by showing respect to professors and classmates and adhering to applicable university policies.
9. Demonstrate the ability to collaborate effectively in teams, analyze complex problems critically, and apply creative approaches to develop solutions.

Course ILOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**Evaluating**	**Creating**
1	✓	✓				
2				✓		
3			✓			
4			✓			
5				✓		
6					✓	

7						✓
8			✓			
9			✓			

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Descriptors		PLOs / ILOs	PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)
Knowledge	K1	Understand and explain the principles of phytochemistry and pharmacognosy, including the scope and practice of NPC and the role of medicinal plants in medicine.	✓							
	K2	Analyze and differentiate between primary and secondary metabolites, their biosynthetic origins, and their pharmacological importance.	✓		✓					
Skills	S1	Demonstrate proficiency in modern methods for the preparation and extraction of natural products, including solvent extraction, distillation, and supercritical extraction.				✓				
	S2	Apply chromatographic techniques for the separation, purification, and analysis of natural compounds using analytical and preparative chromatography.				✓				

	S3	Interpret chemical structures of isolated compounds using physical and spectroscopic methods such as UV, IR, MS, ^{1}H-NMR, and ^{13}C-NMR.	✓			✓				
	S4	Evaluate the pharmacological activities of natural products using relevant bioassays.	✓				✓			
	S5	Investigate and characterize the biological activities and chemical constituents of Jordanian plants.					✓	✓		
Competencies	C1	Exhibit responsibility, accountability, and dedication by showing respect to professors and classmates and adhering to applicable university policies.								✓
	C2	Demonstrate the ability to collaborate effectively in teams, analyze complex problems critically, and apply creative approaches to develop solutions.						✓		✓

23. Topic Outline and Schedule:

Week	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	Introduction to Phytochemistry and Pharmacognosy, covering medicinal plants, natural product chemistry (NPC), and plant nomenclature and taxonomy.	K1, S2	Face to Face	Moodle and MS Teams	Synch.	Exam	1 and 2

Week	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
2	Traditional plant medicines, biological and geographical sources of natural drugs, marine drugs, and their pharmacological activities.	K1, S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	1 and 2
3	Natural products and their definition, including the biosynthetic origin of primary and secondary metabolites.	K1, K2, S4	Face to Face	Moodle and MS Teams	Synch.	Exam	1 and 2
4	Importance of carbohydrates, proteins, and lipids in pharmacy and therapy, and the role of secondary metabolites.	K1, K2	Face to Face	Moodle and MS Teams	Synch.	Exam	1 and 2
5	Methods of preparation of natural products, including plant extraction (solvent extraction, distillation, supercritical extraction) and purification of pure compounds from co-occurring substances.	S1, S2	Face to Face	Moodle and MS Teams	Synch.	Exam	1, 3, and 4
6	Chromatography: Analytical (PC, TLC, GC, GC-MS, HPLC, UPLC, LC-MS) and Preparative (PTLC, CC, Flash, MPLC, HPLC) techniques.	K1, S1, S2, S3, S4	Face to Face	Moodle and MS Teams	Synch.	Exam	1, 3, and 4
7	Structure elucidation of pure isolated compounds using physical and spectroscopic methods, including UV, IR, MS, ^{1}H-NMR, and ^{13}C-NMR.	K2, S2, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	1, 3, and 4
8	Assay for plant Bioactivity Selection, Preparation and Pharmacological Evaluation of Plant Material; Anti-inflammatory and analgesic activity	K1, K2, S1, S2, S3, S5, C1, C2	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6
9	Assay for plant Bioactivity Selection, Preparation and Pharmacological Evaluation of Plant Material; Diabetes mellitus	K1, S1, S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6

Week	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
10	Assay for plant Bioactivity Selection, Preparation and Pharmacological Evaluation of Plant Material; Fertility and Antifertility	K1, K2, S1, S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6
11	Assay for plant Bioactivity Selection, Preparation and Pharmacological Evaluation of Plant Material; Burns and Wounds	S1, S2, S3, S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6
12	Assay for plant Bioactivity Selection, Preparation and Pharmacological Evaluation of Plant Material; Burns and Wounds: Crown gall tumors on potato disc and Brine shrimp lethality test	S1, S2, S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6
13	Assay of hypolipidemic agents from natural sources	K1, K2, S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6
14	Assay for platelet aggregation activity	S4, S5	Face to Face	Moodle and MS Teams	Synch.	Exam	5 and 6
15	Presenting, analyzing, and discussing practical findings of the experimental part in seminars	K1, K2, S1, S2, S3, S4, S5, C1, C2	Face to Face	Moodle and MS Teams	Synch.	Exam	7
16	Final Exam						

24. Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm Exam	30 M	Week 1-7	K1,K3, S1, S2, C1	Week 8	On Campus
Semester Work (Presentation and Discussion)	30 M	Seminars to discuss practical findings	K1, K3, S1,S2S3,S4,S5 ,C1, C2	Week 15	On Campus
Final Exam	40 M	All topics	K1, K2, K3, S1, S2, S3, C1, C2	Week 16	On Campus

25. 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 Moodle and MS Teams.

26. Course Policies:

A. Attendance policies:
- According to the University Regulations
- Attendance: Mandatory.

B. Absences from exams and submitting 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:
- Participation in cheating will lead to applying all following penalties together
  - Failing the subject he/she cheated at
  - Failing the other subjects taken in the same course
  - Not allowed to register for the next semester. The summer semester is not considered as a semester.

E. Grievances Policy:

- According to the general policies applied at the University of Jordan for grievance, when there is a complaint or conflict between a student and an academic/staff member or another student, the following procedures must be followed:
  - The student writes a formal complaint describing the situation of conflict to the Dean of the School or the President of the University.
  - Dean or President will first try to resolve the controversy by meeting/listening to both parties.
  - If agreement was not possible, Dean or president forms an investigation committee which will follow, within a specified timeline, the general policies for relevant circumstances.
- The following points are considered:
  - The committee will meet/talk to both parties and witnesses (if applicable) within two weeks of conflict.
  - All meetings and discussions are documented according to the university policies.
- Results/ recommendations will be sent to the Dean or President who is responsible for their implementation

F. Grading policy:

- Presentation and Discussion: 30 Points
- Midterm Exam: 30 Points.
- Final Exam: 40 Points.

G. Available university services that support achievement in the course:
An account on MS teams, library, internet connection, E-Learning.

27. References:

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

1. Trease and Evans Pharmacognosy, 15th edition, 2002
2. Pharmacognosy, Phytochemistry and medicinal plants, 2nd edition, 2000
3. Instrumental Analysis, Skoog 2000
4. Preparative \chromatography Technique, K. Hostetmann, 1994
5. Methods in plant Biochemistry, Vol. 6, Assay for Bioactivity, K. Hostettmann
6. Selection, Preparation and Pharmacological Evaluation of Plant material, Vol. 1. Williamson et al., 1996.
7. Some recent articles to be mentioned on the specific topics

28. Additional information:

Name of the Instructor or the Course Coordinator: ……	Signature: ……...……	Date: 17/11/2024 ……..……
Name of the Head of Quality Assurance Committee/ Department ……	Signature: ……...……	Date: ……..……
Name of the Head of Department ……	Signature: ……...……	Date: ……..……
Name of the Head of Quality Assurance Committee/ School or Center ……	Signature: ……...……	Date: ……..……
Name of the Dean or the Director ……	Signature: ……...……	Date: ……..……