



The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus

1	Course title	Pharmaceutical Chemistry II - Practical
2	Course number	1201403
3	Credit hours (theory, practical)	1 credit hours , practical course
	Contact hours (theory, practical)	3 practical hours
4	Prerequisites/co-requisites	1201412
5	Program title	BSc pharmacy only
6	Program code	
7	Awarding institution	The university of Jordan
8	Faculty	Pharmacy
9	Department	Pharmaceutical Sciences
10	Level of course	undergraduate
11	Year of study and semester (s)	Second semester of the second year
12	Final Qualification	BSc pharmacy
13	Other department (s) involved in teaching the course	-
14	Language of Instruction	English
15	Date of production/revision	31 January 2016

16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Prof. Dr. Yusuf Al-Hiari, BSc, MSc, PhD.

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http://pharmacy.ju.edu.jo/Lists/FacultyAcademicStaff/Disp_Staff.aspx?ID=41&Dept=Pharmaceutical Sciences

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17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Dr. Ghadeer Suaifan, PhD

Office : new Building, second floor

Phone: 5355000, ext. 23312,

Office: 206

E-mail: gh.suaifan@ju.edu.jo

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Dr. Mohammad A. Khanfar, PhD

Office : Old Building, third floor

Phone: 5355000, ext. 23339,

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Office hours: to be arranged

18. Course Description:

As stated in the approved study plan.

This course aims mainly at introducing the students to practical experience related to assays, tests of medicinal substances and their chemical preparations, to provide means of quality control by applying the various methods and techniques described in the official compendia. The course focuses on multi-step synthesis of medicinal drugs illustrating different principles in synthesis such as steric hindrance and protection groups.

A- Aims:

1. To provide students with the significance of multi-step synthesis as a tool in medicinal drugs.
2. To introduce practical skills in organic synthesis of drugs, as part of SAR studies.
3. To understand and utilize functional groups in organic pharmaceutical compounds, and the importance of these functional groups in the chemical and physical behavior and synthetic reactions of different drugs.
4. To introduce practically the concepts of protecting, leaving and activating groups in drug synthesis.
5. Employ theoretical organic chemistry knowledge for the synthesis of medicinal compounds.
6. To employ background knowledge in purification techniques, separation and distillation such as (i.e., crystallization, decantation, distillation,..) for purifying chemical structures during synthesis.
7. Employ analytical techniques, i.e., infrared spectroscopy, thin layer chromatography and nuclear magnetic resonance (Demo), for characterizing chemical structures during synthetic steps.
8. Introducing the students to practical experience related to assays, tests of medicinal substances and their chemical preparations, to provide means of quality control by applying the various methods and techniques described in the official compendia

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to ...

A. Knowledge and Understanding: Student is expected to

A1- Understand the importance of multi-step synthesis and SAR in pharmaceutical Drugs synthesis and design.

A2- Understanding the basis of analytical techniques, separation and purification techniques and their relation to synthesis and assay of drugs.

B. Intellectual Analytical and Cognitive Skills: Student is expected to

B1. Define and recognize these practical skills in preparing some usefully pharmaceutical drugs using multi-step approach. Furthermore.

B2- Student should apply his basic knowledge in analysis, separation and purification of drugs/compounds.

B3. Ability to apply this knowledge to explain drug activity, behavior, solubility, oxidation, and stability.

C. Subject-Specific Skills: Student is expected to

C1. Acquire good practical skills regarding chemical synthetic procedures and organic reactions.

C2. Understand and Apply the concepts of directing, protecting and bulk functional groups in the synthesis of high yield and assay of drugs.

C3. Practicing special techniques related to organic synthesis such as crystallization, melting point determination, distillation, decantation, and refluxing, NMR, IR, and chromatographic separation, in addition to safe chemical handling and disposal.

D. Transferable Key Skills: Students is expected to

D1. Work within a team to organize and plan a synthetic experiment, to choose assay methods, and to fulfill course library requirements, and to share, discuss and express ideas while working in group discussion sessions.

D2. Gaining some electronic and internet experience while answering some problems through visiting selected web sites related to medicinal chemistry and preparing assignments using internet, and PC software like drawing software.

D3. Develop problem solving experience while attempting finding solutions (method of preparation) for certain pharmaceutically usefully organic compounds.

D4. Master the rules of laboratory safety protocols and procedures needed his period of study

Competencies:**1.1 Obtaining and maintaining medications**

1.1.3 Recognize and follow proper storage conditions of medicines

1.3 Extemporaneous compounding

1.3.1 Characterize different dosage forms of medicines and their proper usage

1.4 Packaging and labeling of medication

1.4.1 Package medicines properly to ensure their stability, safety and patient accessibility

1.4.2 Label dispensed medicines with all necessary information and instructions

1.5 Patient counseling

1.5.1 Advise patients on proper storage, usage and adherence of dispensed medicines

1.5.2 Identify over-the-counter medicines and advise patients on their selection and usage

1.5.3 Advise patients about the proper use of medical devices and other non-medicinal pharmaceutical products

2.2 Fundamentals of drug therapy

2.2.1 Recognize pharmacological classes of drugs

2.2.2 Identify different routes of administration of medicines

2.2.3 Identify indications, side effects and contraindications of medicines

2.2.4 Identify the main mechanisms of action of drugs

2.2.5 Recognize the principles of drug safety and efficacy evaluation

2.5 Monitoring therapeutic outcomes

2.5.2 Identify drug-drug and drug-food interactions of medicines

3 Pharmaceutical Industry**3.1 Formulation design and development**

3.1.1 Identify physicochemical properties of drug substances

3.1.3 Characterize various pharmaceutical dosage forms

3.4 Analysis and stability evaluation

3.4.1 Identify the principles of stability testing and shelf-life determination

3.4.2 Identify analytical method development and validation used in pharmaceutical analysis

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
1- Multi-step Safty and instrumentation	1	All instructors 3; teaching assistants 4	A,2, B1-3, C3, D4	Short questions, discussion	1,2
1- Multi-step Synthesis of Sulfanilamide		All instructors 3; teaching assistants 4			
Part 1: Synthesis of Acetanilide Saturated	2	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 2: Preparation of p-Acetamidobenzenesulfonyl chloride	3	All instructors 3; teaching assistants 4	A1-2, B1, C-1	Exams, Quizes, Oral discussion	1,2
Part 3: Preparation of p-Acetamidobenzenesulfonamide	4	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 4: Preparation of p-Aminobenzenesulfonamide (Sulfanilamide)	5	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 5: Dry Laboratory	6	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, assignments, Oral discussion	1,2
Midterm Exam	7	All instructors 3; teaching assistants 4	A, B, C, D		
2-Multi-step Synthesis of Benzocaine		All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 1: Synthesis of p-Acetotoluidide	8	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 2: Synthesis of p-Acetamidobenzoic acid	9	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 3: Synthesis of p-Amino benzoic acid (PABA)	10	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes	1,2
Part 4: Synthesis of Benzocaine	10	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
3- Multi-step Synthesis of Phenytoin (Dilantin®)		All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 1: Benzoin Condensation	11	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 2: Oxidation of Benzoin to benzil	12	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	1,2
Part 3: Condensation of Benzil with Urea to Form Dilantin	13	All instructors 3; teaching assistants 4	A, B, C, D		1,2
Final Exam	14-15	All instructors 3; teaching assistants 4	A, B, C, D	Exams, Quizes, Oral discussion	

21. Teaching Methods and Assignments:

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

ILO/s	Learning Methods	Evaluation Methods
A, B, C, D	practical sessions, short lectures, discussion	Exam and Quizzes, short questions, evaluation of results colours, yields
B, C, D	Assignment, oral discussion, and short questions and quizzes	Web-based or library based short questions and Quizzes, Oral discussion , Computer aided learning sessions /programs
C, D	Assignments and group discussion	Oral group discussion and Assignments (using internet and PC software)

Learning skills:

1. Critical thinking
2. Digital literacy
3. Problem-solving skills
4. Self-directed learning

22. Evaluation Methods and Course Requirements:

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

- Exams
- Quizzes
- Assignments/short reports: Library based, Internet based projects
- Short questions: critical thinking and self-oriented learning
- Oral discussion and Computer aided learning (softwares)

Course Requirements, assignment:

- Part A: Laboratory designed report to be filled after each experiment, discuss at next lab.
- Part B: library based: Students should submit a detailed assignment related to one synthetic technique based on library and net.

23. Course Policies:

A- Attendance policies:

Attendance: Mandatory.

First warning – with 1 absences

Last warning – with 2 absences

Disqualified and Failing in the subject – with 3 absences (15% permissible absences with justification)

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

Will result in zero achievement without medical excuse.

Certified health report or other significant excuse is approved by lecturer and the student set for MidMakeup exam within same semester.

Certified health report or other significant excuse is approved by dean for final exam and the student set for final-Makeup exam within next semester.

C- Health and safety procedures:

Not applicable

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All these matters follows university regulations and rules:

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:

Evaluation	Point %	Date
Midterm Exam	30	8 th week
Assignments:	10	11 th week
Reports 3	10	6 th , 10 th , 14 th weeks
Quizzes, short question, discussion	10	6 th , 13 th Week, continuous process
Final Exam	40	15-16 th week
Total	100	End of semester

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

- Highly equipped faculty/university classrooms: Overhead projectors, Data show, Smart-boards, writing boards
- Fast internet connection and network
- Computer halls for students only
- Library: Provides updated books, references, encyclopaedias, electronic resources and good collections of data bases and full text papers

24. Required equipment:

Practical part- Chemicals, instruments, equipped and safe laboratory.

For theoretical: Data show; Overhead projectors; writing white boards; internet connection

25. References:

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

- 1- Introduction to Modern Experimental organic Chemistry, By Robert Gilbert
- 2- Unitized Experiments in Organic Chemistry, 4th ed., by Brewster, VanderWerf and McEwen

26. Additional information:

This course is 11 class per week with max 24 student in each lab. It is taught as 3 practical contact hours per class with One doctor and one teaching assistant supervising the lab.

Name of Course Coordinator: Prof. Dr. Yusuf M. Al-Hiari; Signature: ----- Date: 31 Jan 2016

Head of curriculum committee/Department: ----- Signature: -----

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

Head of curriculum committee/Faculty: ----- Signature: -----

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

Copy to:

Head of Department
Assistant Dean for Quality Assurance
Course File