

Jordan University of Science and Technology
Faculty/College of Pharmacy
Department of Department of Medicinal Chemistry and Pharmacognosy
Second Semester 2015/2016

Course Specifications

Title & Instructor	
Course Title	Natural Products Chemistry
Course Number	PHAR 332
Prerequisites	Organic Chemistry, Medicinal Chemistry, Biochemistry, and Pharmacology
Course Website	NA
Instructor	Dr Tamam M. El-Elimat
Office Location	P2/L-2
Office Phone	26772
Office Hours	Sunday 8:00-09:00; Monday: 09:30-10:30; Tuesday: 10:00-11:00; Wednesday: 11:00-12:00
E-mail	telimat@just.edu.jo

Course Aims and Objectives	
The main aim of this course is to provide students with a basic understanding and knowledge of the chemistry of natural products of medicinal importance.	
Objectives	Weights
1) Know the basic terms in natural product chemistry	3%
2) Recognize the different natural products resources	3%
3) Know the basic rules of plant taxonomy, including plant description and morphology	3%
4) Know the contribution of natural products to the drug discovery process	3%
5) Know the different approaches that are used to discover new drug leads from nature	3%
6) Understand the different methods that are used in natural products chemistry, including extraction, isolation, and structural elucidation	3%
7) Understand the key biosynthetic pathways for the biosynthesis of polyketides, natural phenolics, terpenes, alkaloids, peptides and proteins	5%
8) Recognize the most important building blocks employed in the biosynthesis of secondary metabolites	10%
9) Analyze complicated natural product structures and transform them into simpler fragments	10%
10) Recognize and be able to apply key biosynthetic reactions in order to predict how organisms make secondary metabolites	7%
11) Study the main classes of natural products	30%
12) Review representative drug producing species	10%
13) Review natural products use in contemporary medicine	10%

Course Description

The main objective of this course is to show students how nature contributes to contemporary medicine. This course provides students with a basic understanding and knowledge of the chemistry of natural products of medicinal importance, semi-synthetic derivatives, and synthetic analogues based on natural product templates. Biosynthetic approach will be used to classify natural products into distinct groups and to display the relationships between diverse structures encountered in nature. Detailed information is given for biologically important natural products and drugs of natural origin, including sources, principal components, structural component analysis, drug use, mechanism of action, and current status use. A preliminary chapter is used to outline natural products resources, taxonomy, plant description and morphology, the role of natural products in drug discovery and development, and approaches to discover new drug leads from nature. Genetic based natural products and drug discovery will also be reviewed.

Text Book & References

Title	Medicinal Natural Products: A Biosynthetic Approach
Author(s)	Paul M. Dewick
Publisher	John Wiley & Sons
Year	2009
Edition	Third
Book Website	http://onlinelibrary.wiley.com/book/10.1002/9780470742761
References	<ul style="list-style-type: none"> - Fundamentals of Pharmacognosy and Phytotherapy. M. Heinrich, J. Barnes, S. Gibbons, and E. M. Williamson. 2012, 2nd edition, Elsevier. - Trease and Evans Pharmacognosy. William C. Evans. 2009, 16th edition, Elsevier.

Intended Student Learning Outcomes (ISLOs)

Upon successful completion of this course, students should be able to:

ISLOs	Related Objective(s)	Reference(s)
Build good understanding of compounds of natural origin and their contribution to drug discovery	1-6, 11, 12	Part 1/handouts
Impart an understanding of natural product structures and the way they are put together by living organisms	7, 10	Chapters 2
Breakdown complicated natural product structures into simpler fragments and building blocks	8, 9	Chapters 3, 4, 5, 6, and 7

Teaching & Learning Methods

- Lecturing: teacher-centered, oral presentations. Students are expected to take notes and absorb information and to interrupt should they have any questions.
- Question and answer strategy: oral and written questions to be answered orally by students.

Assessment

Assessment Type	Expected Due Date	Weight
First Exam	24/3/2016	30%
Second Exam	25/4/2016	30%
Final Exam	31/5/2016	40

Useful Resources

- Class notes and handouts
- Catalogue of Life: <http://www.catalogueoflife.org/col/>
- National Center for Complementary and Integrative Health, National Institutes of Health (NIH). Available online at <https://nccih.nih.gov>
- American Botanical Council: <http://abc.herbalgram.org>

Course Content

Week	Topics	Chapter in Text/handouts
1	Introduction: Pharmacognosy vs. natural products chemistry The role of natural products in drug discovery and development.	Part 1/handouts
2	Approaches to discover new drug leads from nature Methods in natural product chemistry	Part 1/handouts
3	Primary and secondary metabolism The building blocks Enzymes and catalysis	Chapter 2 (Part 1/handouts)
4	The construction mechanisms	Chapter 2 (Part 1/handouts)
5	The acetate pathway: fatty acids and polyketides Saturated fatty acids, unsaturated fatty acids, uncommon fatty acids, prostaglandins, thromboxanes, leukotrienes	Chapter 3 (Part 2/handouts)
6	The acetate pathway: fatty acids and polyketides Macrolides and aromatics	Chapter 3 (Part 2/handouts)
8	The shikimate pathway: Aromatic amino acids, simple benzoic acids, and phenylpropanoids	Chapter 4 (Part 3/handouts)
9	The shikimate pathway: Aromatic polyketides and terpenoid quinones	Chapter 4 (Part 3/handouts)
10	The mevalonate pathway: terpenoids and steroids Monoterpenes and sesquiterpenes	Chapter 5 (Part 4/handouts)
11	The mevalonate pathway: terpenoids and steroids Diterpenes, triterpenes and steroidal saponins	Chapter 5 (Part 4/handouts)
12	The mevalonate pathway: terpenoids and steroids Cardiac glycosides, phytosterols, and tetraterpenes	Chapter 5 (Part 4/handouts)
13	Peptides, proteins, and other amino acid derivatives: Peptides and proteins, peptide hormones, and modified peptides: penicillins and cephalosporins	Chapter 7 (Part 5/handouts)
14	Alkaloids: Ornithine and lysine derived, nicotinic acid derived, phenylalanine and tyrosine derived	Chapter 6 (Part 5/handouts)
15	Alkaloids: Tryptophan derived, histidine derived, purine derived, and terpenoid derived	Chapter 6 (Part 5/handouts)

Additional Notes	
Exams	All exams are closed book and notes. The final exam is comprehensive (covers all the material). Incomplete exams need approval from the dean
Cheating	<p>Prohibited; The commitment of the acts of cheating and deceit such as copying during examinations, altering examinations for re-grade, plagiarism of homework assignments, and in any way representing the work of others as your own is dishonest and will not be tolerated. Standard JUST policy will be applied</p> <p>المادة 7: إذا ضبط الطالب أثناء الامتحان أو الاختبار متلبساً بالغش فتوقع عليه العقوبات التالية مجتمعة أ- اعتباره راسباً في ذلك الامتحان أو الاختبار. ب- الغاء تسجيله في بقية المساقات المسجل لها في ذلك الفصل. ج- فصله من الجامعة لمدة فصل دراسي واحد، و هو الفصل التالي للفصل الذي ضبط فيه.</p>
Attendance	<p>Excellent attendance is expected.</p> <p>JUST policy requires the faculty member to assign ZERO grade (35) if a student misses 10% of the classes that are not excused.</p> <p>If you miss class, it is your responsibility to find out about any announcements or assignments you may have missed.</p>
Participation	Excellent participation is expected
Withdraw	Last day of courses withdrawal (without reimbursement of tuition fees) is May, 20 th , 2016.