

Title: Biosynthetic Logic of Medicinal Natural Products (3 Credits) (PHA/CHM 6435, Section: 2C99 (PHA), BP35 (CHM))

Instructors:

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Class Time: Aug 23 to Oct 11: Monday/Wednesday/Friday: 10:40 am-11:30 am (Chem)

Oct 13 to Dec 11: Monday: 10:40 am-12:30 am / Friday: 10:40 am-11:30 am (Pharm)

Description: The course will outline of the major families of medicinal natural products, how they are biosynthesized, structural and biochemical understanding of their biosynthetic logic, gene cluster identification, genome mining, and production of bioactive “unnatural products” for drug discovery and development. Students will gain a general understanding of how Nature creates these bioactive chemicals.

Suggested reference text: Paul M. Dewick, Medicinal Natural Products: A Biosynthetic Approach, 3rd Edition; ISBN: 978-0-470-74168-9, Wiley Press (Not required)

Learning objectives:

After completing this course, successful students will be able to:

1. Describe the major types of bioactive natural products.
2. Discuss the biosynthesis of major types of bioactive natural products.
3. Explain structural characterization of natural products biosynthesis.
4. Identify natural products gene clusters.
5. List, describe, and compare the common approaches to create “unnatural products” for drug discovery.

Course Format:

Course materials will be delivered using traditional lectures, assigned reading, presentation and classroom discussions.

Exams and grading:

The students will be evaluated in class attendance (20 points), a written report about one self-selected paper (50 points), classroom discussions (30 points), and three exams each worth 100 points. Students will be allowed to inspect their exams to verify their scores but exam will be kept by the faculty for 3 years. A key of correct answers for each exam during the semester will be kept on reserve so that students can determine whether they have properly applied the processes of induction and deduction to arrive at their answers.

Grading will be on a point basis with 93-100 (A), 90-92.9 (A-), 87-89.9 (B+), 83-86.9 (B), 80-82.9 (B-), 77-79.9 (C+), 73-76.9 (C), 70-72.9 (C-), 67-69.9 (D+), 63-66.9 (D), 60-62.9 (D-), <60 (E). There will be no make-up exams.

For information on UF's Grading Policy: <http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>;
<http://www.isis.ufl.edu/minusgrades.html>

Miscellaneous:

The student will be tested on the lecture material and in-class handouts which, for the most part, are not covered in precisely the same way in any available textbook.

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. Contact the Disability Resources Center (<http://www.dso.ufl.edu/drc/>) for information about available resources for students with disabilities.

Students are expected to complete assignments and take quizzes with integrity. Academic dishonesty will not be tolerated. If a student commits academic dishonesty, the academic penalty will be a failing grade in the course. The UF policies and procedures on academic dishonesty will be followed. For University of Florida's honor code, see <http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php>.

PHA6435 Fall 2023

	Time	Classroom	Topics
1	Wednesday, Aug 23, 2023	LEI 0242	Course introduction and Survey of natural products
2	Friday, Aug 25, 2023	LEI 0242	Introduction to gene clusters and producers
3	Monday, Aug 28, 2023	LEI 0242	Polyketides, assembly line methodology and gene clusters
4	Wednesday, Aug 30, 2023	LEI 0242	Polyketides, structure and enzyme mechanism
5	Friday, Sept 1, 2023	LEI 0242	Polyketides, post-translational modification and activity
6	Wednesday, Sept 6, 2023	LEI 0242	Nonribosomal peptides, assembly line methodology and gene clusters
7	Friday, Sept 8, 2023	LEI 0242	Nonribosomal peptides, structure and mechanism
8	Monday, Sept 11, 2023	LEI 0242	Nonribosomal peptides, modification and PKS hybrid systems
9	Wednesday, Sept 13, 2023	LEI 0242	Ribosomal peptides, chemistry and gene clusters
10	Friday, Sept 15, 2023	LEI 0242	Ribosomal peptides, chemistry and gene clusters
11	Monday, Sept 18, 2023	LEI 0242	Ribosomal peptides, enzyme structure and pathways
12	Wednesday, Sept 20, 2023	LEI 0242	Terpenoid biosynthetic pathways and natural products
13	Friday, Sept 22, 2023	LEI 0242	Structure and mechanism of terpenoid enzymes
14	Monday, Sept 25, 2023	LEI 0242	EXAM #1
15	Wednesday, Sept 27, 2023	LEI 0242	Alkaloid biosynthetic pathways and natural products
16	Friday, Sept 29, 2023	LEI 0242	Complex alkaloid gene clusters and enzyme mechanism
17	Monday, Oct 2, 2023	LEI 0242	Complex alkaloid gene clusters and enzyme mechanism
18	Wednesday, Oct 4, 2023	LEI 0242	Non-classical pathways and enzymology
19	Monday, Oct 9, 2023	LEI 0242	Non-classical pathways and enzymology
20	Wednesday, Oct 11, 2023	LEI 0242	Non-classical pathways and enzymology
21	Friday, Oct 13, 2023	HSC C1-11	Overview of natural products isolation and purification/Identification of BGC
22	Monday, Oct 16, 2023	HSC C1-11	Identification of BGC: new approaches + computational I
23	Friday, Oct 20, 2023	HSC C1-11	Computational approaches in natural products research I
24	Monday, Oct 23, 2023	HSC C1-11	Computational approaches in natural products research I+II
25	Friday, Oct 27, 2023	HSC C1-11	EXAM #2
26	Monday, Oct 30, 2023	HSC C1-11	Protein engineering in natural products research I: tailoring enzymes
27	Monday, Nov 6, 2023	HSC C1-11	Protein engineering in natural products research II: core biosynthetic enzymes
28	Monday, Nov 13, 2023	HSC C1-11	Chemistry-oriented approaches for the production of unnatural products
29	Friday, Nov 17, 2023	HSC C1-11	Special Topic: Synthetic biology in the gut microbiome research
30	Monday, Nov 20, 2023	HSC C1-11	Activation of cryptic gene clusters
31	Monday, Nov 27, 2023	HSC C1-11	SynBiol in natural products research I: Heterologous expression
32	Friday, Dec 1, 2023	HSC C1-11	SynBiol in natural products research II: Combinatorial biosynthesis
33	Monday, Dec 4, 2023	HSC C1-11	SynBiol in natural products research III: Host development and pathway assembly
34	Monday, Dec 11, 2023	HSC C1-11	EXAM #3