

Title: Biosynthetic Logic of Medicinal Natural Products (3 Credits)

Instructors:

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Class Time: Mondays 8:30am-10:10am
Fridays 8:30am-9:20am

Classroom: TBA

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.

Exams and grading:

The students will be evaluated in three exams each worth 100 points of the final 300 points for the course. 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, see: <http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>; <http://www.isis.ufl.edu/minusgrades.html>

Miscellaneous:

Class attendance is not mandatory. However, 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>.

Tentative lecture schedule:

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|----|---------------------------|------|---|
| 1 | Friday, January 08, 2016 | | Course introduction and Survey of natural products |
| 2 | Monday, January 11, 2016 | | Polyketides, assembly line methodology and gene clusters |
| 3 | Friday, January 15, 2016 | | Polyketides, structure and enzyme mechanism |
| 4 | Friday, January 22, 2016 | | Polyketides, post-translational modification and activity |
| 5 | Monday, January 25, 2016 | | Nonribosomal peptides, assembly line methodology and gene clusters |
| 6 | Friday, January 29, 2016 | | Nonribosomal peptides, structure and mechanism |
| 7 | Monday, February 01, 2016 | | Nonribosomal peptides, modification and hybrid systems |
| 8 | Friday, February 05, 2016 | | Complex PKS/NRPS gene clusters |
| | Monday, February 08, 2016 | EXAM | #1 |
| 9 | Friday, February 12, 2016 | | Terpenoid biosynthetic pathways and natural products |
| 10 | Monday, February 15, 2016 | | Structure and mechanism of terpenoid enzymes |
| 11 | Friday, February 19, 2016 | | Alkaloid biosynthetic pathways and natural products |
| 12 | Monday, February 22, 2016 | | Complex alkaloid gene clusters and enzyme mechanism |
| 13 | Friday, February 26, 2016 | | Overview of natural products isolation and purification |
| 14 | Monday, March 07, 2016 | | Identification of natural product gene cluster: canonical and new approaches |
| 15 | Friday, March 11, 2016 | | Computational approaches in natural products research I |
| 16 | Monday, March 14, 2016 | | Computational approaches in natural products research II |
| | Friday, March 18, 2016 | EXAM | #2 |
| 17 | Monday, March 21, 2016 | | Protein engineering in natural products research I: tailoring enzymes |
| 18 | Friday, March 25, 2016 | | Protein engineering in natural products research II: core biosynthetic enzymes |
| 19 | Monday, March 28, 2016 | | Chemistry-oriented approaches for the production of unnatural products |
| 20 | Friday, April 01, 2016 | | Activation of cryptic gene clusters |
| 21 | Monday, April 04, 2016 | | Synthetic biology in natural products research I: Heterologous expression |
| 22 | Friday, April 08, 2016 | | Synthetic biology in natural products research II: Combinatorial biosynthesis |
| 23 | Monday, April 11, 2016 | | Synthetic biology in natural products research III: Host development and pathway assembly |
| 24 | Friday, April 15, 2016 | | Synthetic biology in natural products research III: Optimization of productivity |
| | Monday, April 18, 2016 | EXAM | #3 |