Chemistry 212 Natural Products Chemistry
Spring 2014

Contact Information
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Office Hours: Tues Noon to 1:30pm; Thurs 9:00 - 10:30am
Class Days/Time: Lecture TR 6:00pm - 7:15pm
Classroom: DH 415
Prerequisites: Chem 112A, 112B and 113A (or equivalent); Note Chem 114 is not essential for this course.

Greensheet and MYSJSU Messaging
I use the email address listed on your mySJSU account regularly to send information on Chem 212. You are responsible for checking for messages on this email on a regular basis to learn of any updates. The Greensheet and course schedule may be found on the Chemistry Department webpage. I will likely use Canvas or another site for document retrieval - I will inform you when this is active.

Course Description
Chemistry 212 will provide a comprehensive overview on the field of natural products chemistry. By nature, this is a very broad-based field, and will involve elements of organic chemistry, analytical chemistry, biochemistry and molecular biology. Emphasis will be placed on the structure analysis of secondary metabolites, and pathways and chemical methods for studying their biosynthesis. Other topics will include chemical ecology, toxins and drugs, marine natural products, clinically useful natural
products, and molecular biology tools to produce "unnatural" natural products.

Chem 212 requires a good level of understanding of organic chemistry based on a typical undergraduate one-year course (e.g. equivalent to Chem 112A and 112B @ SJSU). Application of organic reaction mechanisms will form an important core of Chem 212. A good understanding of stereochemistry and nomenclature is also expected. While this course will not involve any direct laboratory work, we will discuss experimental methods involving analytical methods, including chromatography, NMR and mass spectroscopy. The level of background needed of these methods is what is covered in Chem 113A @ SJSU.

**Course Goals and Learning Objectives**

**Course Learning Outcomes (CLOs)**

- Be able to define terms including natural products, secondary metabolites, biosynthesis, pharmacognosy
- Be able to classify natural products according to the major biosynthetic groups (polyketide, shikimate, terpene, alkaloid, mixed biogenesis)
- Understand how analytical methods (including isotopic labeling, mass spectrometry, NMR spectroscopy) are used to determine structure and biosynthetic pathways of natural products in conjunction with "feeding experiments" of live organisms or tissues.
- Grasp how biosynthetic pathways are deduced for each class of natural products starting with appropriate precursors leading to natural products (including mechanisms involved in enzymatic or non-enzymatic steps)
- Learn of the biological and ecological roles of natural products
- Learn of the significance of natural products in human terms, including as drugs, toxins, and pharmacological tools.
- Learn of the molecular biology approaches to study natural product formation and to produce novel classes of compounds.
- Locate scientific information from literature
- Be able to prepare written and oral reports on selected topics on natural products.

**Program Learning Outcomes (PLOs)**

Chemistry 212 satisfies the following Graduate Program Learning Outcomes for the Chemistry Department:

- Program Learning Objectives #1 - To demonstrate an advanced understanding of selected topics in chemistry.
• Program Learning Objectives #2 - To demonstrate information literacy skills for acquiring knowledge of chemistry, both as a student and as a life-long learner.

Program Learning Objectives #3 - To demonstrate an understanding of experimentation, observation and data analysis, and their application to defined questions in chemistry.

Program Learning Objectives #4 - To demonstrate a familiarity with available instrumentation for conducting specific scientific research.

• Program Learning Objectives #5 - To communicate effectively, verbally and written, for the purposes of conveying chemical information to both professional scientists and to the public.

Required Texts/Readings

Textbook
This book is out of print, but copies are available from Amazon and other online sources (not the SJSU Bookstore). A copy will also be placed in the King Library Course Reserves.

Described it's age, this short book provides a good basic introduction to the core topics of Chem 212.

Other Readings
Most of the reading for this course will come from scientific literature. A reading list of articles from journals will be provided.

Library Liaison
The Chemistry Library Liaison is Yiping Wang (yiping.wang@sjsu.edu).

Course Requirements and Assignments

Catalog Description Topics from the structure proof, synthesis and biosynthesis of secondary metabolites.

The scheduled time for this course is TR 6:00pm to 7:15pm in DH 415. In addition, one or two lectures from the Chemistry Department seminars (T 4:30 to 5:30pm) will be related to this course and are strongly recommended.

Tentative Course Calendar:
A tentative schedule for the semester appears at the end of this document. Note in particular the dates for the Midterm and Final Exams.
SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

NOTE that University policy F69-24, “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

Attendance Policy

As a graduate course, we will cover a significant amount of material during each class meeting. You should plan to attend all class meetings. Assignments may be given at any time, and you must be present to obtain these. Please arrive promptly at 6:00pm.

Grading Policy

GRADING (see below for numerical breakdown and percentages)

Grading for Chem 212 will be assigned according to the following components:

The grades for this course will assigned as "plus/minus" and will be based on the following categories:

- Quizzes and/or problem sets: 30 points, 15%
- Written report & oral report: 50 points, 25%
- Midterm: 40 points, 20%
- Final exam @ pts: 80 points, 40%
- Total possible for 113A: 200 points total

The overall course grade will generally follow the following correlations:
"A range" 90-100 %; "B" range 80-90 %, "C" range 70-80 %; "D" range 60-70 %, "F" less than 59 %.

For security, final course grades are not posted, sent by email, or given over the phone. If you would like a breakdown of your 113A scores, leave a stamped and addressed envelope with me at the final exam.

Other Class Policies:

Audio Recording: audio (only) recording is allowed. Note I do not allow video recording. See also University Policies below.
Cell Phones: Out of courtesy, turn these off during lectures.
Computers: You may use your laptop only during class lectures, as long as you can do so in a way that is not distracting to other students.

Academic Integrity:

No form of cheating, copying, or other unfair advantage will be tolerated, and will be dealt with severely. All reports must be submitted to turnitin.com, which will provide a report on originality for each paper. Turnitin.com gives a quantitative index if a paper is substantially copied from a previously submitted report. A first infraction will result in “0 points” for that experiment or exam. A second will result in an automatic grade of "F" for the course. The underlying principle will be fairness to all students in the course. In particular, copying or plagiarism (the excessive use of someone else's words, even if acknowledged, see the section from the Academic Senate below) is considered a serious offense, especially with regard to the formal lab reports. Note that simply "re-ordering" words from another source does not constitute an original paper, and will be "flagged" by turnitin.com. You must use your own words and analysis in all reports for this course.

From the Office of Student Conduct and Ethical Development: “Your own commitment to learning, as evidenced by your enrollment at San Jose State University, and the University’s Academic integrity Policy requires you to be honest in your academic course work. Faculty are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found here:
http://www.sjsu.edu/studentconduct/Students/Student_Academic_Integrity_Process/

From the SJSU Academic Senate Resolution S04-12U

1.2 PLAGIARISM:

At SJSU plagiarism is the act of representing the work of another as one's own (without giving appropriate credit) regardless of how that work was obtained, and submitting it to fulfill academic requirements. Plagiarism at SJSU includes but is not limited to:
1.2.1 The act of incorporating the ideas, words, sentences, paragraphs, or parts thereof, or the specific substance of another's work, without giving appropriate credit, and representing the product as one's own work; and
1.2.2 Representing another's artistic/scholarly works such as musical compositions, computer programs, photographs, paintings, drawings, sculptures or similar works as one's own.

BE SURE YOU UNDERSTAND WHAT PLAGIARISM MEANS. IF NOT, ASK!!

University Policies (following are policies from the University)

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester’s Catalog Policies section at
http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic_calendars/. The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latedrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/.

Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor’s permission to record the course.

• “Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor’s permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”

• “Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Integrity Policy S07-2 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/drc/ to establish a record of their disability.
**Emergencies and Building Evacuations**

If you hear a continuously sounding alarm, or are told to evacuate the building by an Emergency Coordinator, walk quickly to the nearest exit (out the door and turn left to exit the Science Building). Take your personal belongings as you may not be allowed to return. Follow the instructions of the Emergency Coordinators. Be quiet so you can hear instructions. Once outside, move away from the building. Do not return to the building unless the Police or the Emergency Coordinator announces that this is permissible.

Following are resources that are available to all students. They may apply to this course as well as other courses you are taking.

**Student Technology Resources**

Computer labs for student use are available in the Academic Success Center at http://www.sjsu.edu/at/asc/ located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library.

A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

**SJSU Peer Connections**

Peer Connections, a campus-wide resource for mentoring and tutoring, strives to inspire students to develop their potential as independent learners while they learn to successfully navigate through their university experience. You are encouraged to take advantage of their services which include course-content based tutoring, enhanced study and time management skills, more effective critical thinking strategies, decision making and problem-solving abilities, and campus resource referrals.

In addition to offering small group, individual, and drop-in tutoring for a number of undergraduate courses, consultation with mentors is available on a drop-in or by appointment basis. Workshops are offered on a wide variety of topics including preparing for the Writing Skills Test (WST), improving your learning and memory, alleviating procrastination, surviving your first semester at SJSU, and other related topics.

A computer lab and study space are also available for student use in Room 600 of Student Services Center (SSC).

Peer Connections is located in three locations: SSC, Room 600 (10th Street Garage on the corner of 10th and San Fernando Street), at the 1st floor entrance of Clark Hall, and in the Living Learning Center (LLC) in Campus Village Housing Building B. Visit Peer Connections website at http://peerconnections.sjsu.edu for more information.
SJSU Writing Center

The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the Writing Center website at http://www.sjsu.edu/writingcenter. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook. (Note: You need to have a QR Reader to scan this code.)

SJSU Counseling Services

The SJSU Counseling Services is located on the corner of 7th Street and San Fernando Street, in Room 201, Administration Building. Professional psychologists, social workers, and counselors are available to provide consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit Counseling Services website at http://www.sjsu.edu/counseling.
January 23  Introduction, general classification & definitions
Jan 28-30  Overview of methods used in biosynthesis & structure elucidation
Feb 4 - 11  Polyketide pathway
Feb 13 - 18  Shikimic pathway
Feb 20 - 27  Terpenoid pathway
Mar 4 - 11  Amino acid pathway (alkaloids)
Mar 13  Mixed biogenesis; other pathways

March 18  MIDTERM EXAM
March 20 Apr 1  Marine Natural Products
April 3  Toxins / Drugs
April 8  Food / Fragrance / Cosmetics
April 10  Chemical Ecology
April 15 - 22  Selected bioactive natural products
April 24  Natural products as tools in biology and medicine
Apr 29 - May 1  New frontiers in natural products (Prof. Katharine Watts)
May 6 and 8  Oral Papers
May 13  TBA

May 23  FINAL EXAM  (7:45 - 10:00pm)

Key Dates:
Midterm  March 18 (in class)
Paper Due Date:  May 8
Final Exam  May 15, 5:15pm to 7:30pm

Tues, March 11  Chemistry Dept seminar (4:30 to 5:30pm)
Dr. Michael Tempesta will present a seminar on Crofelemer, the first FDA approved botanical drug. After the seminar, he will attend our class and discuss the role of natural products in industry.

Professor Taro Amagata of San Francisco State will also give a seminar in the Spring and attend our class. Date TBA.