California State University San Marcos • NEW COURSE • FORM C CHEM 531

ORIGINATOR'S SECTION:

1. College:

☐ **CHABSS** ☐ **CoBA**
☐ **CoEHHS** ☒ **CSM**

Desired Term and Year of Implementation (e.g., Fall 2008):

Fall 2017

2.Course is to be considered for G.E.? (If yes, also fill out appropriate GE form*) ☐ Yes ☒ No

3. Course will be a variable-topics (generic) course? ☐ Yes ☒ No
("generic" is a placeholder for topics)

4. Course abbreviation and Number:* CHEM 531

5. Title: ***(Titles using jargon, slang, copyrighted names, trade names, or any non-essential punctuation may not be used.)***
Biosynthesis of Natural Products

6. Abbreviated Title for PeopleSoft:
(no more than 25 characters, including spaces)
Bio. Synth. Nat. Prod.

7. Number of Units: 2

8. Catalog Description: ***(Not to exceed 80 words; language should conform to catalog copy. Please consult the catalog for models of style and format; include all necessary information regarding consent for enrollment, pre- and/or corequisites, repeated enrollment, crosslisting, as detailed below. Such information does not count toward the 80-word limit.)***

Introduces the main building blocks and basic synthetic mechanisms employed in the biosynthesis of natural products. Areas of metabolism fed by the acetate, shikimate, mevalonate and deoxyxylulose phosphate pathways will be studied while investigating modern drug candidates that these pathways have produced. *Prerequisite: A minimum grade of C (2.0) in CHEM 202L and CHEM341 or CHEM 352 or classified graduate standing.*

9. Why is this course being proposed?

This course is being proposed as part of the new Masters in Chemistry program. CHEM 531 will serve as an elective course.

10. Mode of Instruction*
For definitions of the Course Classification Numbers:
http://www.csusm.edu/academic_programs/curriculumscheduling/catalogcurricula/DOCUMENTS/Curricular_Forms_Tab/Instructional%20Mode%20Conventions.pdf

Type of Instruction	Number of Credit Units	Instructional Mode (Course Classification Number)
Lecture	2	C-02
Activity		
Lab		

11. Grading Method:*
☒ Normal (N) *(Allows Letter Grade +/-, and Credit/No Credit)*
☐ Normal Plus Report-in-Progress (NP) *(Allows Letter Grade +/-, Credit/No Credit, and Report-in-Progress)*
☐ Credit/No Credit Only (C)
☐ Credit/No Credit or Report-in-Progress Only (CP)

12. If the (NP) or (CP) grading system was selected, please explain the need for this grade option.

13. Course Requires Consent for Enrollment? ☐ Yes ☒ No

☐ Faculty ☐ Credential Analyst ☐ Dean ☐ Program/Department - Director/Chair

14. Course Can be Taken for Credit More than Once? ☐ Yes ☒ No
If yes, how many times? (including first offering)

15. Is Course Crosslisted: ☐ Yes ☒ No

If yes, indicate which course and check "yes" in item #22 below.

16. Prerequisite(s): ☒ Yes ☐ No CHEM 202L and CHEM 341 or 352 or classified graduate standing.

17. Corequisite(s): ☐ Yes ☒ No

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* If Originator is uncertain of this entry, please consult with Program/Department Director/Chair.

18. Documentation attached:
☐ Syllabus ☒ Detailed Course Outline

19. If this course has been offered as a topic, please enter topic abbreviation, number, and suffix:*

20. How often will this course be offered once established?* once every year

PROGRAM DIRECTOR/CHAIR - COLLEGE CURRICULUM COMMITTEE SECTION:
(Mandatory information – all items in this section must be completed.)

21. Does this course fulfill a requirement for any major (i.e., core course or elective for a major, majors in other departments, minors in other departments)? ☒ Yes ☐ No

If yes, please specify:
Elective course in the Masters of Science in Chemistry.

22. Does this course impact other discipline(s)? ***(If there is any uncertainty as to whether a particular discipline is affected, check "yes" and obtain signature.)*** ☐ Yes ☒ No

If yes, obtain signature(s). Any objections should be stated in writing and attached to this form.

Discipline _____ Signature _____ Date _____ Support _____ Oppose

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SIGNATURES : (COLLEGE LEVEL) :

J. Trischman 8/4/2016
1. Originator (please print or type name) Date

8/9/16
2. Program Director/Chair Date

12/14/16
3. College Curriculum Committee Date

12/14/16
4. College Dean (or Designee) Date

(UNIVERSITY LEVEL)

5. UCC Committee Chair Date

6. Vice President for Academic Affairs (or Designee) Date

7. President (or Designee) Date

Office of Academic Programs ~~Banner~~ PS: _____ Catalog _____ Revised 3/28/2007

* If Originator is uncertain of this entry, please consult with Program/Department Director/Chair.

RP ___ Tracker ✓

Course Outline: Chem 531 Biosynthesis of Natural Products

Introduction to the main building blocks and basic synthetic mechanisms employed in the biosynthesis of natural products. Areas of metabolism fed by the acetate, shikimate, mevalonate and deoxyxylulose phosphate pathways will be studied while investigating modern drug candidates that these pathways have produced. Prerequisite: CHEM 202L and CHEM 341 or 352

Learning Outcomes

- Understand the key pathways for the biosynthesis of fatty acids, polyketides, terpenes, and alkaloids
- Recognize and be able to apply key biosynthetic reactions to predict how organisms make secondary metabolites (retrobiosynthetic analysis and biosynthesis)
- Understand and apply biomimetic strategies in organic synthesis for the preparation of various natural products.
- Demonstrate the advantages and use of biotransformations in synthesis including hydrolytic reactions, oxidations and reductions and carbon-carbon bond forming reactions and the concept of green chemistry.
- Apply principles learned to the synthesis and biosynthesis of a medicinal natural product and present to peers.

Text: Reader will be based on materials from current journals as well as selected texts, including

- The Biosynthesis of Secondary Metabolites, R. B. Herbert, *Chapman and Hall*, 1990.
- Medicinal Natural Products: a Biosynthetic Approach, P M Derwick, *Wiley, New York, 1997.*
- Biotransformations in Organic Chemistry, K. Faber, *Springer, 2001.*

Attendance: This course is discussion-based and relies heavily on the use of class notes for quizzes rather than texts. For these reasons, attendance is essential to do well in the class.

Examination: An open notes essay- and problem-based final exam will be given.

Quizzes: Eight quizzes are anticipated for the semester. The 15-minutes quizzes will be based on readings and class notes since the last quiz. Goals in this course include the ability to discuss important aspects of study in natural products biosynthesis and to have a good set of notes to take with you.

Grading: The course will be graded based on the following criteria

Presentation & Discussion		200 points
Quizzes	120	(8 quizzes x 15 points each)
Participation	40	
Final Exam	100	
Total Possible Points	460	

* If Originator is uncertain of this entry, please consult with Program/Department Director/Chair.

Topics:

Week 1	Primary and secondary metabolites, primary building blocks.
Week 2-3	Fatty acid and polyketide biosynthesis, acetate hypothesis, aliphatic and aromatic compounds.
Week 4-5	Terpene and steroid biosynthesis.
Week 5-6	Alkaloid biosynthesis
Week 7-8	Retrobiosynthesis
Week 8-11	Biotransformation and Synthetic Biology Applications • Hydrolytic reactions, mechanism, prochiral/meso substrates, racemic substrates and substrate and active site models. • Oxidations and reductions. • Carbon-carbon bond formation, acyloin reactions, biological aldol condensations, cyanohydrin formation.
Week 12	Biomimetic Chemistry
Week 13-15	Applied study of a natural product – Biosynthesis, synthesis, and significance

Presentation

Part 1: Oral. Students will choose from a list of topics to study in more detail and present to the class. Students will choose one paper that would be a good introduction to the topic for classmates. Paper will be submitted to instructor at least 3 class sessions before scheduled oral presentation. The paper will be distributed to the class one week before the discussion. Students will prepare 3-5 thought-provoking questions for the class to incorporate into the presentation.

Part 2: Written. A 5-6 page paper (1.5 – double spaced, 12 pt. font, ¾" – 1" margins) is due within two weeks of oral presentation. Five points per day will be deducted for late papers. The paper should be written as a review of your topics, complete with abstract.