California State University San Marcos • NEW COURSE • FORM C CHEM 521

ORIGINATOR'S SECTION:

1. College:

☐ CHABSS ☐ CoBA
☐ CoEHHS ☒ CSM

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

Fall 2018

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 521

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

6. Abbreviated Title for PeopleSoft:
(no more than 25 characters, including spaces)
Organometallics

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 chemistry of carbon to transition-metal bonds beginning with rules governing structure and stability; effects of metal and ancillary ligand environment; general mechanistic steps; NMR and IR spectroscopy; fluxional processes. Followed by applications in homogeneous catalysis and stoichiometric organic synthesis. *Prerequisite: A minimum grade of C (2.0) in CHEM 202L and CHEM 404 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 521 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)

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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 404 or classified graduate standing.

17. Corequisite(s): ☐ Yes ☒ No

* 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?* In a 2.5 to 3-year rotation of elective courses.

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 _____ _____ _____Support _____Oppose
Signature Date

Discipline _____ _____ _____Support _____Oppose
Signature Date

SIGNATURES : (COLLEGE LEVEL) :

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

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

Robert Guest 12/14/16
3. College Curriculum Committee Date

Mark D. 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 PS Banner Catalog Revised 3/28/2007

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

RP Trackit ✓

Course Outline: Chem 521 Organometallics

Course Description: Introduces the theory behind planning of syntheses of complex molecules from simpler ones, with emphasis on carbon-carbon bond formation using organometallic reactions and their use in synthetic process. Explores the reasoning and art involved in organic synthesis. Prerequisites: Chem 202L and 404.

Learning Outcomes

- Examine the basic principles that govern the electronics, structure and bonding in inorganic and organometallic complexes
- Explore the fundamental and experimental aspects of elementary organometallic transformations
- Apply elementary organometallic reactions in the context of catalysis and new reactivity
- Demonstrate and predict the reactivity pattern of organometallic complexes
- Have a background to apply organometallics to other fields: organic synthesis, polymerization, bioinorganic chemistry, etc.

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

- Modern Organic Synthesis, G. Zweifel and M. Nantz, *Freeman*, 2007.
- Organic Synthesis, M. B. Smith, *Academic Press*, 2011.
- The Art of Writing Reasonable Organic Reaction Mechanisms, R. B. Grossman, *Springer*, 2003.

Other useful references:

- The Logic of Chemical Synthesis, E. J. Corey, X.-M. Cheng, *VCH*, 1995.
- The Organometallic Chemistry of the Transition Metals, R. H. Crabtree, *Wiley*, 2009.
- Transition Metals in the Synthesis of Complex Organic Molecules, L. S. Hegedus and B. C. G. Soderberg, *University Science Books*, 2009.

Attendance: Attendance is mandatory and essential to do well in the class.

Homework: Seven comprehensive problem sets will be given throughout the semester. The problem sets will emphasize the topics covered during the lecture.

Examination: Two mid-term examinations and one final exam will be given.

Quizzes: Four quizzes are anticipated for the semester. The 10-minute 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 retrosynthesis and synthetic methods.

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

Problem Sets:	140	(7 problem sets @ 20 points each)
Quizzes:	100	(4 quizzes @ 25 points each)
Paper	50	
Participation:	30	
Midterm Examinations:	200	(2 exams @ 100 points each)
Final Examination:	200	
Total Possible Points	720	

Topics

Week 1	Introduction in bonding and molecular orbitals
Week 2	Metal-ligand interactions; Basic principles of ligand-field theory; MO theory
Week 3	Metal-centered organometallic reactions
Week 4	Alkene pi complexes, Oxidative additions, reductive eliminations
Week 5-6	Palladium catalyzed cross coupling reactions
Week 7	Heck Reactions
Week 8-9	CO insertion chemistry
Week 10	Alkene and Alkyne insertion chemistry
Week 11	Carbene & carbenoid complexes
Week 12	Cobalt chemistry
Week 13	Metathesis
Week 14-15	Synthetic Analysis and Strategies, Synthetic Efficiency, Total Synthesis

Written term paper. A 10 page paper (1.5 – double spaced, 12 pt. font, ¾" – 1" margins) is due at the end of the semester. The paper should be written as a review of the synthetic steps and methods in a classical example in total synthesis. Emphasis will be on illustrating and describing chemical transformations. The report will be fully references and references should be in the same format as the *Journal of the American Chemical Society*.