California State University Channel Islands

NEW COURSE PROPOSAL

Courses must be submitted by October 15, 2013, and finalized by the end of that fall semester for the next catalog production.

Use YELLOWED areas to enter data.

DATE (*Change if modified and redate file with current date)*) 10/15/2013; REV 11.26.13

PROGRAM AREA(S) CHEMISTRY

1. Course Information. *[Follow accepted catalog format.]*

Prefix(es) CHEM **and Course No. 480**

Title: BEER, WINE, AND SPIRITS: THE ART AND SCIENCE OF FERMENTATION Units: 4

x Prerequisites CHEM 311, CHEM 314, and student must be at least 21 years of age to enroll

Corequisites

x Consent of Instructor Required for Enrollment

Catalog Description (Do not use any symbols):

This class explores the interface of microbiology, organic chemistry, and biochemistry, using advanced analytical tools. The class focuses on how temperature, water conditions, anaerobe species and strain, sugar solutions, and adjunct ingredients such as hops can be used to manage fermentation outcomes. These concepts are applied practically, with sugar extractions from a variety of vegetable sources such as barley, grapes, and corn. These extracted sugar solutions are fermented using a wide range of anaerobes. Extraction and fermentation products are characterized using GC, HPLC, mass spectrometry, and other methods.

Grading Scheme:

x A-F Grades

Credit/No Credit

Optional (Student Choice)

Repeatability:

Repeatable for a maximum of units

Total Completions Allowed

Multiple Enrollment in Same Semester

Course Level Information:

x Undergraduate

Post-Baccalaureate/Credential

Graduate

Mode of Instruction/Components (*Hours per Unit are defaulted*).

	Units	Hours per Unit	Default Section Size	Graded Component	CS & HEGIS # (Filled in by the Provost's Office)
Lecture	3	1	12	x	
Seminar		1			
Laboratory	1	3	12	x	
Activity		2			
Field Studies					
Indep Study					
Other Blank					

Leave the following hours per week areas blank. The hours per week will be filled out for you.

3 hours lecture per week

3 hours laboratory per week

2. Course Attributes:

General Education Categories: All courses with GE category notations (including deletions) must be submitted to the GE website: http://summit.csuci.edu/geapproval. Upon completion, the GE Committee will forward your documents to the Curriculum Committee for further processing.

A (English Language, Communication, Critical Thinking)

A-1 Oral Communication

A-2 English Writing

A-3 Critical Thinking

B (Mathematics, Sciences & Technology)

- B-1 Physical Sciences
- B-2 Life Sciences – Biology
- B-3 Mathematics – Mathematics and Applications
- B-4 Computers and Information Technology

C (Fine Arts, Literature, Languages & Cultures)

- C-1 Art
- C-2 Literature Courses
- C-3a Language
- C-3b Multicultural

D (Social Perspectives)

E (Human Psychological and Physiological Perspectives)

UDIGE/INTD Interdisciplinary

Meets University Writing Requirement (Graduation Writing Assessment Requirement)

Meets University Language Requirement

American Institutions, Title V Section 40404: Government US Constitution US History
Regarding Exec Order 405, for more information: http://senate.csuci.edu/comm/curriculum/resources.htm

Service Learning Course (Approval from the Center for Community Engagement must be received before you can request this course attribute).

Online Course (Answer YES if the course is ALWAYS delivered online).

x **Lab Fee Request –** Lab fee requests should be directed to the Student Fee Committee.

3. Justification and Requirements for the Course. (Make a brief statement to justify the need for the course)

A. Justification:

This course uses fermentation as a vehicle for delivering important lessons and hands-on training in the tools of analytical chemistry. HPLC, HS-GC/MS, TLC, and host of other techniques are employed in characterizing starting materials and resulting flavor chemistry, and in interpreting the path between the two. Students employ skills developed in Organic Chemistry, Quantitative Analysis and other course work in developing their own literature- and laboratory-research projects. They use their training in an applied and practical context, and see that the methods and process are the same in brewing as in other chemical problems.

B. Degree Requirement:

- Requirement for the Major/Minor
- x Elective for the Major/Minor
- Free Elective

Note: Submit Program Modification if this course changes your program.

4. Student Learning Outcomes. List in numerical order. Please refer to the Curriculum Committee's "Learning Outcomes" guideline for measurable outcomes that reflect elements of Bloom's Taxonomy: *http://senate.csuci.edu/comm/curriculum/resources.htm*. The committee recommends 4 to 8 student learning outcomes, unless governed by an external agency (e.g., Nursing).

Upon completion of the course, the student will be able to (in written and oral form):

- explain the history and developments of fermentation science.
- describe the whole range of beer, wine, and spirit varieties, styles, and trends.
- define the chemical determinants of aroma, taste, and off flavors
- identify the biochemical pathways of starch mobilization and ethanol/acetic/lactic fermentation.
- analyze the chemical and physical parameters governing saccharafication and fermentation of vegetable sugars.
- Employ the analytical tools for complete characterization of fermentation products (e.g., HPLC, HS-GC/MS, NMR, UV/VIS spectroscopy, TLC)
- Design, execute, and evaluate a hypothesis-driven experimental exploration of some aspect fermentation science using all the history, definitions, and methods

Devise and perform hypothesis-driven experimental fermentations of grains, grapes, honey, or other saccharine materials using the ideas, methods, and tools discussed in class.

Characterize fermentation products, and interpret their results in terms of their hypotheses.

Use the scientific literature to drive and support their plans, experiments, and analyses.

5. Course Content in Outline Form. *[Be as brief as possible, but use as much space as necessary]*

I History of fermentation

II Beer
- water quality
- malted grains
- hop chemistry
- yeast strains and fermentation biochemistry
- yeast strains and flavor development
- wild- and other anaerobes
- building a beer-style wiki

III Wine
- grape varieties, wine regions
- terrior and marketing
- wine-specific fermentation: malo-lactic fermentation
- special situations: oak barrels and champagne process

IV Spirits
- sugar sources, and source-specific flavor chemistry
- distillation
- oak and aging

V Lab
- malt extract characteristics: designing a grain bill
- yeast, temperature, lagering, and the diacetyl rest
  - yeast viability assay, TLC of sugars, HPLC of hop acids, GC of ethanol concentration,
- wheat and yeast flocculation: hefewiezen
  - hop isomerization physical chemsitry, headspace analysis of beer volatiles
- grape fermentation
  - monitoring malo-lactic fermentation by TLC

Does this course content overlap with a course offered in your academic program? **Yes** **No** x
If YES, what course(s) and provide a justification of the overlap.

Does this course content overlap a course offered in another academic area? **Yes** **No** x
If YES, what course(s) and provide a justification of the overlap.

Overlapping courses require Chairs' signatures.

6. Cross-listed Courses (*Please note each prefix in item No. 1) Beyond three disciplines consult with the Curriculum Committee.*

A. List Cross-listed Courses (Signature of Academic Chair(s) of the other academic area(s) is required).
List each cross-listed prefix for the course:

B. Program responsible for staffing:

7. References. *[Provide 3 - 5 references]*

1. Lea & Piggot Fermented Beverage Production, 2/e 2003.
2. Bamforth Beer: Tap into the Art and Science of Brewing, 2009.
3. Fix Principles of Brewing Science: A Study of Serious Brewing Issues, 1999.

8. Tenure Track Faculty Qualified to Teach This Course.

Blake Gillespie

9. Requested Effective Date:
First semester offered: Fall 2013

10. New Resources Requested. Yes **No** x
If YES, list the resources needed.

A. Computer Needs (data processing, audio visual, broadcasting, other equipment, etc.)

B. Library Needs (streaming media, video hosting, databases, exhibit space, etc.)

C. Facility/Space/Transportation Needs

D. Lab Fee Requested **Yes** x **No** **(Lab fee requests should be directed to the Student Fee Committee)**

E. Other

11. Will this new course alter any degree, credential, certificate, or minor in your program? Yes **No** x
If, YES attach a program update or program modification form for all programs affected.
Priority deadline for New Minors and Programs: October 1, 2013 of preceding year.
Priority deadline for Course Proposals and Modifications: October 15, 2013, of preceding year.
Last day to submit forms to be considered during the current academic year: April 15th.

Blake Gillespie 11/25/13

Proposer of Course (Type in name. Signatures will be collected after Curriculum approval) Date

Approval Sheet

Program/Course:

If your course has a General Education Component or involves Center affiliation, the Center will also sign off during the approval process.

Multiple Chair fields are available for cross-listed courses.

The CI program review process includes a report from the respective department/program on its progress toward accessibility requirement compliance. By signing below, I acknowledge the importance of incorporating accessibility in course design.

Program Chair		
	Signature	Date
Program Chair		
	Signature	Date
Program Chair		
	Signature	Date
General Education Chair		
	Signature	Date
Center for International Affairs Director		
	Signature	Date
Center for Integrative Studies Director		
	Signature	Date
Center for Multicultural Engagement Director		
	Signature	Date
Center for Civic Engagement Director		
	Signature	Date
Curriculum Chair		
	Signature	Date
AVP		
	Signature	Date