USF Sarasota-Manatee - New Undergraduate Course Proposal Form

1. **College/School Contact Information**

Tracking Number	Date & Time Submitted	
111	2016-01-11 13:41:45.0	
Discipline	**College/School**	**Budget Account Number**
Chemistry		121300004
Contact Person	**Phone**	**Email**
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2. **Course Information**

Prefix	Number	Full Title
CHS	4411	Chemistry and Microbiology of Beer

Is the course title variable?	N
Is a permit required for registration?	N
Are the credit hours variable?	N

Credit Hours	Section Type	Grading Option
3	Class Lecture (Primarily)	Regular

Abbreviated Title (30 characters maximum)
Chemistry/Microbiology of Beer

5. Prerequisites
   CHM 2045, with a minimum grade of C
6. Corequisites
7. Co-Prerequisites
8. Course Description
   A series of investigations into the chemistry and microbiology underlying the various aspects of beer, its brewing process, and its pairings with food.
9. **Justification**

   (This section is critical since the APC members will make their decision based on the information provided here. The information should be in the following outline form.)

   A. Indicate how this course will strengthen the Undergraduate Program. Is this course necessary for accreditation or certification?

This upper-level science elective will provide students with a contextually interesting, experiential learning-based option that will strengthen the appeal of the Biology Program for current students and those considering the USFSM Biology Program. By promising advanced study, this elective course will help ensure that the program continues to develop as a well-reputed and viable choice for students seeking to major in the biological sciences. This course is not necessary for accreditation.

B. What specific area of knowledge is covered by this course which is not covered by courses currently listed?

1. A broad scientific understanding of the requisite brewing equipment and the processes by which they function in the brewing process. 2. The structure and properties of ions and compounds, at the particulate/molecular level, that underlie beer and its brewing process. 3. The chemistry of water, the main ingredient of beer. 4. The chemistry and microbiology of various ingredient options for brewing. 5. The chemical, biochemical, and biophysical properties and processes of enzymes, particularly those involved in malting and kilning. 6. The chemistry and biochemistry of carbohydrates and sugars and their role in fermentation. 7. The chemical and biophysical composition and processes of the wort. 8. The chemical compound profiles of hops that impart distinctive flavors, aromas, and bittering levels, according to their temporal introduction in the brewing process. 9. The microbiology of yeasts and their role in the fermentation process. 10. Compounds involved in receptor-mediated responses that contribute to the aroma and flavor of common beer styles. 11. The underlying chemistry when using beer in the preparation of food. 12. The chemistry underlying the pairings of beer with various foods. 13. The science of beer aromas, according to the chemistry of volatile organic compounds and the physics of proper glassware. 14. The design and production of signature beers. 15. The showcase of signature beers and food pairings at a final event.

C. What is the need or demand for this course? (Indicate if this course is part of a required sequence in the major.) What other programs would this course service?

The USFSM Biology Program has a long-standing need for upper-level science electives that will enable students to progress along the degree path. Student demand is high, as indicated by the growing numbers of students entering the program (i.e., increased enrollment in the lower level courses) and then requesting access to further courses that provide contextually interesting, advanced subject matter available through upper-level electives so that they can complete their degree with the USFSM Biology Program.

D. Has this course been offered as Selected Topics/Experimental Topics course? If yes, what was the enrollment?

Yes. This course has been taught for two semesters with the following enrollment: Spring 2015 had 13 enrolled and 2 auditing Fall 2015 had 23 enrolled

E. How frequently will the course be offered? What is the anticipated enrollment?

This course will be offered at least once per year; however, a growing student waitlist and craft brewing industry collaborative interest indicate the need for a more frequent offering. Due to the experiential learning nature of this course a cap of 25 students per section may prove necessary.

F. Do you plan to drop a course if this course is added? If so, what will be the effect on the program and on the students? (If dropping/deleting a course please complete the nonsubstantive course change form.)

No course will be discontinued.

G. What qualifications for training and/or experience are necessary to teach this course? (List minimum qualifications for the instructor.)

Undergraduate courses: a masters degree is required with 18 graduate credit hours in the discipline.

10. **Other Course Information**

A. Objectives

1. Upon successful completion of this course, students will have gained a clear understanding of how beer is brewed, how to design a beer, the experimental conditions required to brew, and how various ingredients alter the chemistry of beer. 2. In addition, they will have brewed their own signature beer and considered how beers can be paired with or used in the preparation of various foods. 3. Through these investigations, students will gain contextually specific chemistry and microbiology knowledge and scientific process skills, including critical thinking, quantitative reasoning, inquiry, problem solving, self-assessment, and communication.

B. Learning Outcomes

1. Develop a broad scientific understanding of the requisite brewing equipment and the processes by which they function in the brewing process. 2. Understand the structure and properties of ions and compounds, at the particulate/molecular level, that underlie beer and its brewing process. 3. Develop a meaningful understanding of the chemistry of water, the main ingredient of beer. 4. Explore the chemistry and microbiology of various ingredient options for brewing. 5. Identify and understand the chemical, biochemical, and biophysical properties and processes of enzymes, particularly those involved in malting and kilning. 6.

Identify and describe the chemistry and biochemistry of carbohydrates and sugars and their role in fermentation. 7. Describe aspects of the chemical and biophysical composition and processes of the wort. 8. Describe differences in the chemical compound profiles of hops that impart distinctive flavors, aromas, and bittering levels, according to their temporal introduction in the brewing process. 9. Describe the microbiology of yeasts and their role in the fermentation process. 10. Identify compounds involved in receptor-mediated responses that contribute to the aroma and flavor of common beer styles. 11. Explore the underlying chemistry when using beer in the preparation of food. 12. Explore the chemistry underlying the pairings of beer with various foods. 13. Understand the science of beer aromas, according to the chemistry of volatile organic compounds and the physics of proper glassware. 14. Design and produce signature beers. 15. Showcase signature beers and food pairings at a final event.

C. Major Topics

1. A broad scientific understanding of the requisite brewing equipment and the processes by which they function in the brewing process. 2. The structure and properties of ions and compounds, at the particulate/molecular level, that underlie beer and its brewing process. 3. The chemistry of water, the main ingredient of beer. 4. The chemistry and microbiology of various ingredient options for brewing. 5. The chemical, biochemical, and biophysical properties and processes of enzymes, particularly those involved in malting and kilning. 6. The chemistry and biochemistry of carbohydrates and sugars and their role in fermentation. 7. The chemical and biophysical composition and processes of the wort. 8. The chemical compound profiles of hops that impart distinctive flavors, aromas, and bittering levels, according to their temporal introduction in the brewing process. 9. The microbiology of yeasts and their role in the fermentation process. 10. Compounds involved in receptor-mediated responses that contribute to the aroma and flavor of common beer styles. 11. The underlying chemistry when using beer in the preparation of food. 12. The chemistry underlying the pairings of beer with various foods. 13. The science of beer aromas, according to the chemistry of volatile organic compounds and the physics of proper glassware. 14. The design and production of signature beers. 15. The showcase of signature beers and food pairings at a final event.

D. Examples of Course Textbooks and Course Readings

Barth, R. (2013), The Chemistry of Beer: The Science in the Suds. Hoboken, NJ: John Wiley & Sons, Inc. References to peer-reviewed scientific journal articles and other course materials are posted to Canvas.

11. **Syllabus**

Please submit an electronic copy of your syllabus to Rhonda Moraca, moraca@sar.usf.edu.