Add Course Request

Submitted on: 2012-10-11 09:30:37

1. **COURSE SUBJECT**	CHEG
2. **COURSE NUMBER** (OR PROPOSED NUMBER)	1200
3. **COURSE TITLE**	Introduction to Food Science and Engineering
4. **INITIATING DEPARTMENT or UNIT**	CMBE
5. **NAME OF SUBMITTER**	Daniel D Burkey
6. **PHONE of SUBMITTER**	Phone: +1 860 486 3604
7. **EMAIL of SUBMITTER**	Email: daniel.burkey@uconn.edu
8. **CONTACT PERSON**	Daniel Burkey
9.**UNIT NUMBER of CONTACT PERSON** (U-BOX)	3222
10. **PHONE of contact person**	Phone: 6-3604
11. **EMAIL of of contact person**	Email: daniel@engr.uconn.edu
12. Departmental Approval Date	02/29/2012
13. School/College Approval Date	10/09/2012
14. Names and Dates of additional Department and School/College approvals	
15. Proposed Implementation Date	Term: Spring, Year: 2013
16.Offered before next printed catalog is distributed?	Yes
17. **General Education Content Area**	Content Area 3 Science and Technology
18. **General Education Skill Code (W/Q).** Any non-W section?	None
19. Terms Offered	Semester: Spring Year: Every_Year
20. Sections	Sections Taught: 1
21. Student Number	Students/Sections: 20
22. Clarification: n/a	
23. **Number of Credits**	3 if VAR Min: Max: credits each term
24. **INSTRUCTIONAL PATTERN** Two lecture periods per week, T-Th, 75 minutes.	

25. Will this course be taught in a language other than English?	No If yes, then name the language:
26. Please list any prerequisites, recommended preparation or suggested preparation:	
27. Is Instructor, Dept. Head or Unit **Consent Required**?	No
28. Permissions and Exclusions: Other, specify: Not open to ENGR/CHEG students	
29. Is this course **repeatable for credit**?	No If yes, total credits allowed: Allow multiple enrollments in same term?
30. **Grading Basis**	Graded
31. If satisfactory/unsatisfactory grading is proposed, please provide **rationale**: n/a	
32. Will the course or any sections of the course be taught as Honors? AsHonors	
33. Additional Details:	
34. Special Attributes: n/a	
35. **REGIONAL CAMPUS AVAILABILITY**: Will only be available at Storrs campus (faculty developing the course are in Chemical Engineering, which is only offered at the Storrs campus.)	
36. PROVIDE THE PROPOSED TITLE AND COMPLETE CATALOG COPY: CHEG 1200 Introduction to Food Science and Engineering Mustain, Ma, Burkey Not open to ENGR or CHEG students. Spring. CHEG 1200 will introduce students to the chemistry and engineering concepts related to both the commercial and personal preparation of various foodstuffs. Major topics included will be meats, dairy, baking, and beverages. In-class demonstration and small laboratory projects will be a component of the class. The class will assume a basic high-school proficiency in chemistry and math.	
37. **RATIONALE** FOR ACTION REQUESTED a.) This course was specifically developed in response to the Provost\\\'s GEOC 2012 competition with the purpose of enhancing general education offerings at the University. b.) As a 1000 level course, the course is designed to be at a basic level about a broad topic that is of interest and daily impact to many.	

c.) As a first offering, we would like to restrict the enrollment to 30 students as we test out the course for the first offfering.

d.) All teaching will be done within the CHEG department with the support of the department head and program director. Impacts on other departments are negligible.

e.) There is some overlap with courses in NUSC - nutritional science, but these courses are part of the major program in NUSC, and have significant pre-requisites. CHEG 1200 is meant as a general interest course and is offered from an engineering perspective.

f.) No other departments have been consulted.

g.) No effect on regional campuses at this time. This course is being developed and offered only at Storrs, as the CHEG program is only offered at Storrs, and the faculty developing the course are attached to the Storrs campus.

h.) $10,000 from the Provost\\\'s GEOC development fund. Other supply costs as committed by the department.

i.) Not cross-listed.

j.) Not an experimental course. Some hand-on demonstrations and take-home projects.

38. **SYLLABUS:**

Online URL: (https://web2.uconn.edu/senateform/request/course_uploads/ddb10003-1349826014-CHEG1200Syllabus.pdf)

39. **Course Information: ALL General Education courses, including W and Q courses, MUST answer this question**

A.)

Learning Objectives:
1. At the end of the course, students will possess a basic understanding of the chemical and physical processes involved in the production or preparation of various foods and beverages.
2. At the end of the course, students will be able to discuss the effect of various processing parameters on the expected quality of a finished food or beverage.
3. At the end of the course, students will have a basic mathematical competency in food science and engineering. Based on the techniques discussed, students should be able to mathematically describe, at a basic level, certain processes to predict the result of an experiment (‘recipe’).
4. At the end of the course, students should have a greater appreciation for the science and engineering processes that impact their nutrition and food production.

B.)
A series of exams/quizzes on the four major content areas of the course.
Assessment of group projects based on assignments from the four major content areas of the course.

C.)
The major topics to be covered are the application of chemistry and chemical engineering principles to the commercial and personal production of various foodstuffs. Four major topic areas will be considered: Meats, Dairy, Baking, and Beverage production.

D.) n/a - new offering.

40. **Goals of General Education: All Courses Proposed for a Gen Ed Content Area MUST answer this question**

We believe that this course fulfills the criteria for a general education course and specifically a CA 3 course in the following ways:

• (Gen Ed Goal 2) Explores a specific area of science and technology in a broadly accessible way: All students are familiar with the preparation of food and beverages, either directly or indirectly, and this course will introduce them to the inherent scientific and engineering processes and challenges.

• (Gen Ed Goal 5) Promotes an understanding of modern scientific inquiry: Students will be exposed to the field of modern food science, which borrows heavily from chemistry and chemical engineering, and is an active area of research for several of the faculty involved.

• (Gen Ed Goal 7) Introduces students to unresolved questions in science or technology: The application of rigorous scientific inquiry to the field of food science is relatively new in the human experience. For most of human history, food preparation has been considered more of an art than a science, so there are still many unanswered questions about the chemistry of food, and how processing can affect the quality of the final product.

• (Gen Ed Goals 2 and 7) Promotes interest, competence, and commitment to continued learning: By applying modern scientific and engineering principles to an area where students have ready access (the kitchen), we hope to spark in them an interest to learn more about the subject by making it accessible and with a low barrier to entry – most of the things they need to experiment on their own, they already have access to.

41. **Content Area and/or Competency Criteria: ALL General Education courses, including W and Q courses, MUST answer this question.:** Specific Criteria

a. **Arts and Humanities:**
b. **Social Sciences:**
c. **Science and Technology:**

We believe that this course fulfills the criteria for a CA 3 course in the following ways:
• Explores a specific area of science and technology in a broadly accessible way: All students are familiar with the preparation of food and beverages, either directly or indirectly, and this course will introduce them to the inherent scientific and engineering processes and challenges.

• Promotes an understanding of modern scientific inquiry: Students will be exposed to the field of modern food science, which borrows heavily from chemistry and chemical engineering, and is an active area of research for several of the faculty involved.
• Introduces students to unresolved questions in science or technology: The application of rigorous scientific inquiry to the field of food science is relatively new in the human experience. For most of human history, food preparation has been considered more of an art than a science, so there are still many unanswered questions about the chemistry of food, and how processing can affect the quality of the final product.
• Promotes interest, competence, and commitment to continued learning: By applying modern scientific and engineering principles to an area where students have ready access (the kitchen), we hope to spark in them an interest to learn more about the subject by making it accessible and with a low barrier to entry – most of the things they need to experiment on their own, they already have access to.

i. **Laboratory:**

d. **Diversity and Multiculturalism:**

43. **International:**

e. **Q course:**

f. **W course:**

42. **RESOURCES:**

Does the department/school/program currently have resources to offer the course as proposed
YES
If NO, please explain why and what resources are required to offer the course.

n/a

43. **SUPPLEMENTARY INFORMATION**:

n/a

ADMIN COMMENT:

Senate approved new W course 11.11.13. SecCCApprv_10/9/13.
GEOCCA3nonLabapp_013113AP. newCA3nonLab_101512AP.

Title of Course: CHEG 1200: Introduction to Food Science and Engineering; (Chemical Engineering). First offering – Spring 2013.

Instructors: William Mustain, Assistant Professor, Anson Ma, Assistant Professor, Daniel Burkey, Assistant Professor-in-Residence

Email Addresses: mustain@engr.uconn.edu, anson.ma@uconn.edu, daniel@engr.uconn.edu

Course Objectives:

This course is an accessible science and engineering elective course based upon the application of chemical and engineering science to the production and processing of various foodstuffs that students have regular interaction with in their daily lives. This course will be suitable for a student who has taken a high schoolchemistry course and is designed to fulfill the CA 3 (Science and Technology) content area.

The major content areas for this course are:

1. Meats

Meats typically undergo complex chemical and physical transformations upon cooking that have a significant impact on their texture and palatability. Meats that contain significant moisture content or are insufficiently dried before cooking can steam rather than brown, as a layer of steam forms between the hot surface and the meat. Browning, indicative of the Maillard reaction, gives cooked meats the distinct exterior texture and flavor that is characteristic. Caramelization, while similar to the Maillard reaction, involves a complimentary series of chemical reactions that can impart their own distinct flavors. Flavor profiles in meats can also often be accentuated via marinating or brining, which are examples of chemical engineering mass transfer principles, as flavor compounds are drawn into the meat and water is expelled via diffusion and osmosis. In this first pillar we will discuss:

• Steaming vs. caramelization (involving sugars) vs. the Maillard reaction (involving amino acids); chemical and physical changes in cooked meat, and the differences between searing and finishing.
• Marinating and brining: chemical reactions, diffusion, and osmotic phenomena
• Thermal conduction vs. thermal convection; how heat transfer principles affect texture and cooking time.

2. Dairy Products

Milk can be processed into a wide variety of dairy products such as cheese, butter, cream, yogurt, and ice cream. Understanding the science behind dairy products is important not only for processing the materials, but also for prolonging the shelf life of the end products (e.g., the use of pasteurization to suppress microbial activity). In this pillar, we will:

• Highlight the fundamental differences in processing methods for different types of dairy products
• Introduce how basic chemical engineering principles (such as thermodynamics, heat and mass transfer, and fluid mechanics) can be applied to design, control, and scale up the production process. For instance, the production of ice cream essentially involves high shear mixing (related to fluid mechanics) and freezing (heat transfer and phase change).
• Focus on how the composition and processing conditions affect the morphology and sensory

properties of the dairy products

All in all, the processing and production of various dairy products will offer an excellent example and unique opportunity to illustrate how simple engineering principles can be applied to convert a natural product into various forms. As part of the haptic learning experiences, we will also coordinate with the UConn dairy bar to tour their on-campus ice cream manufacturing facilities. We believe this course will appeal to students with different backgrounds.

3. Baking

The third pillar will focus on applications of chemistry and chemical engineering to the field of baking. Baking encompasses a wide range of chemical and physical processes that affect the taste, flavor, and texture of the final product. Baking also has wide application to a diversity of foodstuffs, from breads and rolls to cookies and cakes, all using the same core set of ingredients, but combined and processed in different ways. Key concepts that will be covered in this section are:

- Biological Leavening: The introduction of carbon dioxide into a dough or batter via a microorganism, most often yeast. The amount and release rate of the carbon dioxide has a distinct impact on the texture of the finished product, which in the case of breads can range from hard and dense to light and airy.
- Chemical Leavening: The introduction of carbon dioxide via a chemical agent when exposed to water and/or heat. These are often used in quick recipes, like cakes and cookies, where a long reaction time is undesirable.
- The role of the protein gluten in the structure and texture of baked goods
- The role of basic chemical engineering principles, such as thermodynamics, kinetics, and heat transfer to understand how various recipes' baking times are influenced by chemical and physical phenomena

4. Beverages

The final focus pillar for the class outlined in this proposal revolves around the preparation and packaging of consumable liquids. Beverages provide a unique opportunity for the instructor to accomplish two important goals that we try to satisfy in every chemical engineering class. First, after a very focused, real-world (at-home) approach to the first three pillars of the class, this pillar will allow the team to introduce the university population to industrial processes and open discussions into manufacturing-scale problems. Continuous forced carbonation is one such difficulty.

Second, fermented beverages (in this course, beer will be considered initially) are an ideal capstone topic, combining several scientific principles from the previous three units. Beer is also an interesting way to present scientific information to the broader university community through an area where they have tangible experience. The key concepts from brewing that will be tackled include:

- Equilibrium considerations for forced vs. natural carbonation
- Maillard reactions during barley kilning, which balances sweet and bitter flavors. This would also reinforce concepts from the Meat course pillar

• Mashing, which involves starch extraction and enzymatic decomposition. Here, raw materials and processing conditions (i.e. temperature, pH, water chemistry) yield tangible differences in product quality/design
• Fermentation, which will provide a simple introduction into the biology and chemical kinetics surrounding aerobic vs. anaerobic processes, as well as the ATP/ADP (glycolysis) and citric acid energy cycles.

Assessment:

Learning Outcomes:
1. At the end of the course, students will possess a basic understanding of the chemical and physical processes involved in the production or preparation of various foods and beverages.
2. At the end of the course, students will be able to discuss the effect of various processing parameters on the expected quality of a finished food or beverage.
3. At the end of the course, students will have a basic mathematical competency in food science and engineering. Based on the techniques discussed, students should be able to mathematically describe, at a basic level, certain processes to predict the result of an experiment ('recipe').
4. At the end of the course, students should have a greater appreciation for the science and engineering processes that impact their nutrition and food production.

Assessment Methodology:
Regular homework, quizzes, and exams will be used to assess outcomes 1-3. Outcome 4 will be assessed via pre- and post-course surveys, which are qualitative. Given the fact tha access to many of the required tools and ingredients for experimentation is readily available, group projects will be assigned. Students will be asked to qualitatively describe differences in their created products based upon the techniques used. The products will also be shared in class for group comparison and discussion. In all cases, hands-on demonstration of the principles discussed will be performed by the faculty, to draw a physical connection between the coursematerial and the real world.