Course Change Request

New Course Proposal

Date Submitted: 03/07/22 10:02 am

Viewing: CHEM 460 : Chemistry in the Kitchen

Last edit: 03/30/22 10:26 am

Changes proposed by: rjones22

Are you completing this form on someone else's behalf?

In Workflow

1. **CHEM Chair**
2. SC Curriculum Committee
3. SC Associate Dean
4. Assoc Provost-Undergraduate
5. Registrar-Courses
6. Banner

Approval Path

1. 03/07/22 10:12 am Gerald Weatherspoon (grobert1): Approved for CHEM Chair
2. 03/21/22 1:12 pm Jennifer Bazaz Gettys (jbazaz): Rollback to CHEM Chair for SC Curriculum Committee

No

Effective Term: Fall 2022

Subject Code: CHEM - Chemistry

Course Number: 460

Bundled Courses:

Is this course replacing another course? No

Equivalent Courses:

Catalog Title: Chemistry in the Kitchen

Banner Title: Chemistry in the Kitchen

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture w/Lab

Hours of Lecture or Seminar per week: 2

Hours of Lab or Studio per week: 3

Repeatable: May be only taken once for credit, limited to 3 attempts (N3)

Max Allowable Credits: 9

Default Grade Mode: Undergraduate Regular

Recommended Prerequisite(s):

CHEM 211/213 and CHEM 212/214 (or CHEM 271/272), CHEM 313/315 (or CHEM 310), and CHEM 463, or permission of instructor.

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

minimum 60 earned credit hours

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description:

One semester synthesis course exploring the chemistry observed and experienced in household kitchens. As chemistry is the study of matter and its changes, this course explores the chemistry of the food we eat and cook on a molecular level. Students will participate in a creative and scholarly project, practice scientific communication skills, and learn to apply a chemical perspective to real world situations.

Justification:

The Department of Chemistry and Biochemistry does not have a synthesis course option for our majors. Creation of this course will enable students to apply knowledge they have learned in prior courses to real-world problems in a kitchen laboratory environment. Mason Core synthesis and course specific learning outcomes will be realized via class discussions, laboratory activities, weekly blog posts, weekly quizzes, and final reports and presentations.

Does this course cover material which crosses into another department? Yes

Impacted Departments:

Department
NUTR - Nutrition & Food Studies

Learning Outcomes:

Course-Specific Outcomes

After completing this course, students will be able to

• Identify and describe the chemical characteristics of many of the molecules in our food

• Use the language and vocabulary of chemistry to describe food and cooking

• Describe and explain how food molecules interact with each other and how they change when subjected to different physical and chemical processes

• Employ scientific reasoning and experimentation skills in the context of a kitchen lab

• Design and execute a kitchen-based research project

• Effectively communicate results from an independent research project via oral and written methods

Mason Core Outcomes

Upon completing this synthesis course, students will be able to:

• Communicate effectively in both oral and written forms, applying appropriate rhetorical standards (e.g., audience adaptation, language, argument, organization, evidence, etc.)

• Use perspectives from two or more disciplines, connect issues in a given field to wider intellectual, community or societal concerns

• Apply critical thinking skills to evaluate the quality, credibility and limitations of an argument or a solution using appropriate evidence or resources and

Attach Syllabus

CHEM 460 Chemistry in the Kitchen.pdf

Additional Attachments

CHEM 460 SYNTH-Curriculum-Map .pdf

Staffing:

This class could be taught by various current members of the Department of Chemistry and Biochemistry, including but not limited to Dr. Rebecca M. Jones, Dr. Lee Solomon, and Dr. Megan Erb.

Relationship to Existing Programs:

This course will add a Chemistry specific synthesis course to the undergraduate degree paths in the Department of Chemistry and Biochemistry. At present, no synthesis course exists in this department and this addition will strengthen our undergraduate degree programs.

Relationship to Existing Courses:

This course has been developed after consultation with the chair of and faculty from NUTR. The course bears some modest similarity with NUTR 312 (Experimental Foods) and the corresponding lab (NUTR 313), however there are significant differences. CHEM 460 will be a course designed for junior and senior level chemistry majors and it will be open to students with other majors (such as biology, community health, and bioengineering) who have successfully completed the prerequisites. The NUTR courses do not have prerequisites and were not designed for students in STEM majors. Additionally, CHEM 460 will use guided-inquiry discussions and laboratories and independent research projects to reach student learning outcomes. The NUTR courses were designed as more traditional lecture and lab. Finally, CHEM 460 will be primarily a chemistry course with significant chemical topics and ideas discussed each class as they apply to a kitchen laboratory. From my conversations with the department and faculty, NUTR 312/313 are nutrition courses with a very small amount of chemistry. While approved, NUTR 312/313 has not been taught to date.

Additional Comments:

CHEM 460 will be open to other majors beyond chemistry (such as biology, community health, and bioengineering) and, notably, NUTR minors who have the prerequisites or suitable equivalent experience.

CHEM 460 is designed to be taught in the Nutrition Kitchen in Peterson Hall. Discussions of logistics for using this space are ongoing between the relevant departments and colleges.

Reviewer Comments

Gregory Craft (gcraft) (03/07/22 10:16 am): Changed the N3 credit hours to fit with university policy.

Jennifer Bazaz Gettys (jbazaz) (03/21/22 1:12 pm): Rollback: Per request- thanks!

Key: 17551

Chem 460: Chemistry in the Kitchen

Course Section: CHEM 460-001
Class time: 2 hours lecture, 3 hours laboratory
Credit hours: 3
Lecture Room: TBD
Lab Room: Peterson Hall 1500

Prerequisites
Chem 211/213 and 212/214 (or Chem 271/272), Chem 313/315 (or Chem 310), and 60 earned credit hours or permission of instructor

Course Description
One semester Mason Core synthesis course exploring the chemistry observed and experienced in household kitchens. As chemistry is the study of matter and its changes, this course explores the chemistry of the food we eat and cook on a molecular level. Students will participate in a creative and scholarly project, practice scientific communication skills, and learn to apply a chemical perspective to real world situations.

Instructor
Dr. Rebecca M. Jones
Professor, Department of Chemistry and Biochemistry and STEM Accelerator, College of Science
Email: rjones22@gmu.edu
Zoom Office Hours: Tuesdays or Thursdays 1:00-3:00pm by appointment via Calendly
https://calendly.com/drrebeccamjonesofficehours

Textbook
Colabroy, Keri L., Joseph J. Provost, Brenda S. Kelly, and Mark A. Wallert. 2016. *The Science of Cooking*. Wiley-Blackwell. Full text available via Mason Libraries: https://ebookcentral-proquest-com.mutex.gmu.edu/lib/GMU/detail.action?docID=4530809&pq-origsite=primo

Learning Outcomes
After completing this course, students will be able to

- Identify and describe the chemical characteristics of many of the molecules in our food
- Use the language and vocabulary of chemistry to describe food and cooking
- Describe and explain how food molecules interact with each other and how they change when subjected to different physical and chemical processes
- Employ scientific reasoning and experimentation skills in the context of a kitchen lab
- Design and execute a kitchen-based research project
- Effectively communicate results from an independent research project via oral and written methods

Mason Core: Synthesis Course
The purpose of a synthesis course is to provide students with the opportunity to synthesize the knowledge, skills and values gained from the Mason Core curriculum. This synthesis course strives to expand students' ability to master new content, think critically, and develop life-long learning skills across the disciplines.
Upon completing this synthesis course, students will be able to:

1. Communicate effectively in both oral and written forms, applying appropriate rhetorical standards (e.g., audience adaptation, language, argument, organization, evidence, etc.)

2. Use perspectives from two or more disciplines, connect issues in a given field to wider intellectual, community or societal concerns
3. Apply critical thinking skills to evaluate the quality, credibility and limitations of an argument or a solution using appropriate evidence or resources

Course Structure

For the purpose of this class, weeks are considered to begin on Mondays and end on Sundays. Each week of our semester has its own folder in Blackboard in the "Learn Here: Weekly Lessons" area. These folders contain course materials such as reading material, videos and web links that will help you learn the topic for the week. Our class meetings will include discussion and active problem solving. Laboratory exercises will include cooking, active discussion and recipe experimentation. Students will be expected to prepare for each class meeting and laboratory sessions by reading the assigned textbook sections and watching the assigned videos. Students are responsible for any and all course changes during the semester; significant changes will be announced in class and on Blackboard.

General Course Schedule

(Detailed weekly learning outcomes and reading assignments are on Blackboard)

	Topic	**Recipe**
Week 1	Milk – water and aqueous solutions, colloids	Whipped Cream
Week 2	Sugars – dissolution, crystallization, aeration	Marshmallows and rock candy
Week 3	Lipids, oils, emulsions, and butter	Brown butter rice crispy treats
Week 4	Protein structure and changes, eggs	Scrambled eggs
Week 5	Interactions of protein, dairy, and carbohydrates, acid-base chemistry, the role of steam	Popovers, Buttermilk Pancakes
Week 6	Foams, phase changes, crystallization	Pavlova, Chocolate mousse
Week 7	The world of cheese, involving bacteria	Homemade ricotta
Week 8	Chemical Leavening, protein and carbohydrate interactions	Banana muffins
Week 9	Biological Leavening, protein and carbohydrate interactions, gluten	Yeast bread
Week 10	Starch, variations on a theme	Risotto and sticky rice
Week 11	Extraction, caramelization, solutions, Maillard Reaction	Chicken stock and chicken noodle soup
Week 12	Flavor molecules, peppers, capsaicin	Homemade salsa, hot sauce
Week 13	Independent Experiments and Recipe Development	TBD
Week 14	Independent Experiments and Recipe Development	TBD
Week 15	Independent Experiments and Recipe Development	TBD
Finals	Project Presentations	

Evaluation
The lecture and laboratory portions of this class are fully integrated and students will receive one grade for the course. Student performance evaluation will consist of weekly quizzes, participation in class, weekly laboratory blog posts, and a final report and presentation. Participation grades will be assigned based upon participation in weekly class sessions and laboratories. A minimum grade scale is shown below; + or – grades are awarded within the noted range at the discretion of the instructor.

Method	***Number***	***Value***	**Total**
Participation	30	10	270
Quizzes	10	20	200
Blog posts	11	30	330
Final presentation	1	100	100
Final project report	1	100	100
		Total Points Possible	**1000**

Total Points Earned	**Letter Grade** (+/- ranges to be determined)
900-1000	A- / A / A+
775-899	B- / B / B+
625-774	C / C+
500-624	D
1-499	F

Technology Requirements
Hardware
You will need access to a Windows or Apple computer with at least 2 GB of RAM and access to a fast and reliable broadband internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience. For the amount of Hard Disk Space required taking a distance education course, consider and allow for:

1. the storage amount needed to install any additional software and
2. space to store work that you will do for the course.

Software
Access to MyMason and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class. Check the IT Support Center website. Navigate to the Student Support page for help and information about Blackboard. In the menu bar to the left you will find all the tools you need to become familiar with for this course. Take time to learn each. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning.

You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the myMason Portal. See supported browsers and operating systems. Log in to myMason to access your registered courses. Your computer should be capable of running current versions of Acrobat Reader, Flash, Java, and Windows Media Player, QuickTime and/or Real Media Player.. Also, make sure your computer is protected from viruses by downloading the latest version of Symantec Endpoint Protection/Anti-Virus software for free here.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

Online Resources

- Food and Cooking Chemistry, ACS curated resources, https://www.acs.org/content/acs/en/education/students/highschool/chemistryclubs/activities/food-and-chemistry.html
- Chemistry of Flavor, Royal Society of Chemistry, https://edu.rsc.org/resources/the-chemistry-of-flavour/816.article
- Kitchen Chemistry Summer Camp activities, ScienCenter, Ithaca, NY, http://www.sciencenter.org/chemistry/d/framework_kitchen_chemistry.pdf

Reference Courses

- Kitchen Chemistry, Open Access Course Materials, MIT, https://ocw.mit.edu/courses/experimental-study-group/es-287-kitchen-chemistry-spring-2009/index.htm
- Syllabus from Science and Cooking, PHYS E-27, Harvard University, https://canvas.harvard.edu/courses/8443/assignments/syllabus

Supplemental Digital Textbooks

- Belitz, H.-D., Grosch, W., & Schieberle, P. (2009). *Food Chemistry*. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-69934-7
- Coupland, J. N. (2014). *An Introduction to the Physical Chemistry of Food*. Springer New York. https://doi.org/10.1007/978-1-4939-0761-8
- Kan, J., & Chen, K. (2021). *Essentials of food chemistry*. Springer. https://doi.org/10.1007/978-981-16-0610-6
- Kontogiorgos, V. (2021). *Introduction to Food Chemistry*. Springer International Publishing. https://doi.org/10.1007/978-3-030-85642-7
- Ruan, D., Wang, H., & Cheng, F. (2018). *The Maillard Reaction in Food Chemistry: Current Technology and Applications*. Springer International Publishing. https://doi.org/10.1007/978-3-030-04777-1
- Wang, D. (2012). *Food Chemistry*. Nova Science Publishers.
- Wong, D. W. S. (2018). *Mechanism and Theory in Food Chemistry, Second Edition*. Springer International Publishing. https://doi.org/10.1007/978-3-319-50766-8

Diversity

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

Academic Integrity
Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct.

Students are expected to conduct themselves appropriately at all times. Disruptive students who refuse to cooperate will be asked to leave the class session and may be removed from the course. Disruptive behavior may be defined, but is not limited to, any activities that disturb the learning environment including disrespectful outbursts, offensive language, and the use of any electronic or other device that interrupts the concentration of others. Cell phones, pagers, etc. must be turned off or silenced for the duration of class.

Academic and classroom misconduct will not be tolerated. Academic dishonesty may be defined as any act of dishonesty in academic work. This includes, but is not limited to, plagiarism, the changing or falsifying of any academic documents or materials, cheating, and giving or receiving of unauthorized aid in tests, examinations, or other assigned work. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately responsible to the instructor of the class. The penalty for cheating will be a grade of "F" on the work in question; at the instructor's discretion, the incident may be referred to academic affairs for disciplinary action.

Disability Accommodations
If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474, http://ods.gmu.edu. All academic accommodations must be arranged through the ODS. In order to receive accommodations, students must submit the appropriate forms at least one week before an exam.

Privacy and Student Support
Students must use their university email account to receive important University information, including messages related to this project. See http://masonlive.gmu.edu for more information. As a faculty member and designated "Responsible Employee", I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434) or Counseling and Psychological Services (703-993-2380). You may also seek assistance from Mason's Title IX Coordinator (703-993-8730; titleix@gmu.edu).