The Chemistry and Biochemistry of Brewing I

Instructors: **Stephen Frazier (sfrazier@umbc.edu)**
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Meeting Times: This course will meet Tuesday and Thursday from 8:00-9:45.

Text: Charles W. Bamforth "Scientific Principles of Malting and Brewing", American Society of Brewing Chemists: St. Paul, Minnesota, 2006.
Review Articles will be posted on Blackboard during the semester to augment or expand upon topics from the course text.

Pre-requisites: MATH151, PHYS121, CHEM300, CHEM352 (for all, a C or better is required)

Course Overview: This interdisciplinary course provides an in-depth exploration of the chemical and biochemical processes fundamental to the different stages of brewing. Topics will include water chemistry, chemistry and biochemistry of barley malting, organic chemistry of hops, and microbiology and biochemistry of yeast. Integral to the course is an exploration of how each aspect of the brewing process is affected by underlying chemical and biochemical processes, and how these processes contribute to specific qualities of the beer produced.

Week 1	Introduction to beer and raw ingredients
Week 2	Overview of brewing processes, properties of beer
Week 3	Barley (Physical and chemical structures, agriculture)
	Malting process (Biochemistry)
Week 4	Malting process (Organic/Maillard chemistry)
Week 5	Water chemistry (pH, hardness, effects)
Week 6	*Practitioners in the Field: Malting*
	Matt Musial, Proximity Malt
	Mashing (Physical, chemical processes)
Week 7	Wort separation and boiling (Processes)
	Wort separation and boiling (Chemistry)
Week 8	Hops (Agriculture and processing)
	Hops (Small molecule chemistry)
Week 9	Hops (Hop products and process considerations)
	Practitioners in the Field: Hop Chemist
	Dr. John Paul Maye, Hopsteiner
Week 10	Flavor Chemistry
	The Chemistry and Biochemistry Behind Different Beer Styles
Week 11	*Practitioners in the field: Practical Chemistry in the Brewery*
	Zandy Zeiser, Dipl. Brew., Union Craft Brewing
	Student Presentations
Week 12	Student Presentations

Week 13 Student Presentations
Week 14 Student Presentations

Grading: Grades will be based on four evaluations (two quizzes and two exams) and a term paper and presentation. These will contribute to you final grade as follows:

Quizzes: 25 points each = 50 points
Exams: 100 points each = 200 points
Term Paper: 75 points
Presentation: 75 points
Total: 400 points
Final Average = (points earned/400) x 100
Final Grade: >85% = A, >75 = B, >65 = C.

Quizzes and exams will be primarily short-answer format, and my require providing chemical structures and/or reaction mechanisms.

The term paper and presentation will be based on a topic of your choice that is related to the course material and that is approved by both course instructors. Your paper should be 15-20 pages in length, double spaced exclusive of figures; it should be based on at least three sources, including one paper from the primary chemical or biochemical literature, which are properly cited at the end of your paper. No plagiarism please. Presentations should be 20 minutes in length, with five minutes for questions.

Academic Integrity: By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating and helping others to cheat constitute academic dishonesty and are wrong. Such academic misconduct could result in disciplinary action including, but not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory.

Please see the below Google Doc for UMBC Policies and Resources during COVID-19, including important information about equity and inclusion at UMBC.

https://docs.google.com/document/d/1xWWGAR8qEzKYr7qaVHoEhvO6lyXIyn6M3M7EFZPJQgA/edit?pli=1