

Engineering a Craft Brewery – Europe
ENGR 1920
Spring 2018 (2194)
DRAFT Syllabus
Website on CourseWeb (<http://courseweb.pitt.edu>)

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Required Software:

- BeerSmith 3 (Home Brewing Software), <http://beersmith.com>

Reference Texts:

- *For the Love of Hops: The Practical Guide to Aroma, Bitterness, and the Culture of Hops* (Brewing Elements), by Stan Hieronymus, Brewers Publications
- *Malt: A Practical Guide from Field to Brewhouse* (Brewing Elements), by John Mallett, Brewers Publications
- *Water: A Comprehensive Guide for Brewers* (Brewing Elements), by John Palmer and Colin Kaminski, Brewers Publications
- *Yeast: The Practical Guide to Beer Fermentation* (Brewing Elements), by Chris White and Jamil Zainasheff, Brewers Publications
- *Brewing*, (2nd Ed.), by Michael J. Lewis and Tom W. Young, Springer, 2002
- *The Complete Joy of Homebrewing* (4th Ed.), by Charlie Papazian, William Morrow Paperbacks, 2014
- *Homebrewer's Companion* (2nd Ed.), by Charlie Papazian, William Morrow Paperbacks, 2014
- AHA Homebrewapedia, <http://wiki.homebrewersassociation.org>

Course Objectives

At the end of this course, students should be able to

- use engineering principles to describe, analyze, characterize, and design the brewing process.
- relate brewing process variables to style characteristics.
- evaluate brewing options and equipment for commercially relevant operations.
- justify brewing choices based upon brewing science, engineering, and economic considerations.

ABET Learning Outcomes

3a, Math, Science, and Engineering

- Perform unit conversions in brewing-relevant unit systems
- Construct and solve steady-state mass, energy, and momentum balance relationships for brewery processes
- Construct dynamic mathematical models of physical systems from process descriptions

3c, Design

- Design pumps and piping to achieve desired fluid flow objectives
- Design vessels to achieve specific reaction-engineering objectives (mash, fermentation)
- Design heat exchangers, and heat exchange networks, to achieve desired safety and efficiency objectives

3e, Problem Solving

- Solve sets of algebraic equations for steady state operation and performance metrics
- Construct dynamic simulations of brewery process unit operations based on energy, mass, and momentum balances
- Design and tune control systems to achieve brewery-relevant targets and outcomes

3k, Software and Computer Aided Design (CAD), Techniques, and Tools

- Generate system output responses using computational tools
- Simulate open-loop and closed-loop process operation
- Use graphic design and CAD tools to analyze brewery layouts

Course Grades

The grade earned in this course will be determined by individual performance on the homeworks, sample analyses, and exam, as well as group or individual performance (as indicated on the project) on the mini-projects. The following ***absolute*** grade scale will apply:

If your average exceeds	Your grade will be <i>at least</i>
85%	A-
75%	B-
65%	C-

These percentages may shift down (but not up), at the instructor's discretion. It is not advisable to rely upon a grade shift, however.

The following components will contribute to the grade you earn in this class, according to the weights listed:

Sample Analyses	20%
Travel Blog	60%
Class Participation	20%
Total	100%

Grading Policy

Sensory Session: The course will provide students the opportunity to compare and contrast beers of different styles. Students will be expected to construct a BJCP-style review of two beers sampled from each sensory session. For students who do not wish to sample beer, short papers about the history of the style sampled, and one of the breweries in the sample list (must be different for each sample set), can be substituted for the sample analyses.

Travel Blog: Each student traveling to Belgium will keep a travel blog of breweries and venues visited, beers sampled, and their travel experiences. A minimum of 1 beer per day needs to be evaluated as per the Sensory Sessions BJCP style sheet (though the sheet need not be used). Blogs are to be posted to the 1933 Courseweb site.

The Course Web Site

CourseWeb will be used as the primary content delivery vehicle. Announcements will be posted on the web site, as well as items such as homework, in-class notes, and mini-project assignments. Grades will be available on-line as absolute scores. It is a good idea to check your grades periodically, in order to catch any data entry errors that may occur. Weighted grades must be calculated by the student, as the CourseWeb system will not (conveniently) report "weighted" grades using the breakdown provided above.

Discussion Board (on the course web site): This is an easy central location to post questions about the various topics (*e.g.*, Homework, Project, etc.) and to receive answers. The Professor will routinely check this forum outside of office hours in order to address questions; students are encouraged to respond as well (this will contribute to the class participation grade). **NOTE: solutions to problems (or similar) are not to be posted onto the Discussion board** – these will constitute a violation of the University's Academic Integrity policy (see below). Furthermore, posts are to respect all individuals; trolling and flames will not be tolerated and will impact the class participation score unless more serious consequences are justified by University policy.

Online Resources: There are many online resources that can be used to supplement your learning in this class, and may continue to serve as resources in the future. A discussion board entry will be kept as these resources are identified, and students are encouraged to post links to interesting course-relevant online sites.

Academic Integrity

All homework and exams will be completed individually. Consultation is permitted on homework *only*. Collaboration is expected on the project and quizzes, within your project or quiz group *only*. Collaboration with others on non-project assignments will result in penalties consistent with the University Academic Integrity Guidelines, which may include an F grade for all parties involved. The University Academic Integrity Guidelines can be found here:
<http://www.provost.pitt.edu/info/acguidelinespdf.pdf>

Technology

Tablets: Those who prefer to take notes on their tablet or (touch-screen) computer, rather than paper, are encouraged to do so. However, these devices are not to be used for email, web-surfing, instant messaging, or other related practices during class time, as this is distracting and disruptive for your in-class neighbors.

Cellular Phone Use: The use of cellular telephones (and other cellular or wireless devices) for activities other than note-taking and executing in-class examples, or at the direct instruction of the Professor, is prohibited during class, except in an emergency. Advance notification of such a situation (*e.g.*, pregnancy nearing term, hospitalization of a family member, etc.), when possible, is requested. Any cellular/wireless device observed during class or recitation not conforming to the above use (*e.g.*, text messaging) is subject to confiscation. Students may visit the Professor's office after class to request the return of their cellular/wireless device.

Recording of Classes: To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the students own private use. Other use of such a recording is a violation of University policy and will be pursued through the appropriate University channels.

Disabilities

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS) [140 William Pitt Union, 412-648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users] as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Counseling

The University Counseling Center's staff is dedicated to assisting students in their pursuit of personal and academic growth, to helping students gain a better understanding and appreciation of themselves, and to supporting students as they make important decisions about their lives. If you are in need of counseling services, please contact the University Counseling Center at 334 William Pitt Union (412) 648-7930. Refer to www.counseling.pitt.edu for details.

TENTATIVE 1920/1933 Schedule – *Subject to Change*

Date	Topic
Jan. 8	Intro to Beer and the Brewing Process
Jan. 10	Styles (BJCP), Tasting, and Off Flavors
Jan. 15	Malting, Malts, and Sugars (incl. lactose, Belgian candy, gluten-free)
Jan. 17	Reaction Engineering – reactants (grain, yeasts, water chemistry, hops)
Jan. 22	Sensory #1
Jan. 24	<i>No Class – Parker at CPC/FOCAPO</i>
Jan. 29	Grain Storage, Transport, and Milling
Jan. 31	Reaction Engineering – mashing
Feb. 5	Sensory #2
Feb. 7	Flows and Pumps
Feb. 12	Oast (hop drying/harvest/fresh hop brews)
Feb. 14	Reaction Engineering – Boil and Hops
Feb. 19	Sensory #3
Feb. 21	Heat Exchange and Boilers
Feb. 26	Heat Integration/Recycling
Feb. 28	Microbiology
Mar. 5	Reaction Engineering – fermentation/maturation
Mar. 7	<i>No Class – Spring Break Travel Day</i>
Mar. 12	<i>No Class – Spring Break</i>
Mar. 14	<i>No Class – Spring Break</i>
Mar. 19	Filtration, Centrifugation, and Separation
Mar. 21	Sensory #4
Mar. 26	Design and Measurement, including parameters (IBU, SRM, gravity, Lovibond) and how they are measured at home and in the lab
Mar. 28	Bottling/Canning
Apr. 2	Sensory #5
Apr. 4	Sanitation/ Clean in Place (CIP)
Apr. 9	Sensory #6
Apr. 11	Scale up (5 gal → 2 barrel → 30 barrel → MACRO)
Apr. 16	Project Pitches – Craft Brewing Processes
Apr. 18	Project Pitches – Craft Brewing Processes
TBD	Final Exam