Pathway to Recognition Program

Summary of Essential Learning Outcomes for a Four-Year B.A. Degree in Brewing

A 4-year B.A. degree in brewing or fermentation science should be built on a foundation of science and demonstrated by the completion of coursework equal to or greater than a degree or specialization in one of the following areas: food science, fermentation science, microbiology, biology, chemical engineering, biochemistry.

A brewing or fermentation science degree should provide students with an additional strong body of knowledge, experience, and skill sets in the science of brewing/fermentation through completion of a minimum set of capstone courses, such as those suggested below, that target the following learning outcomes and through which students can attain these learning outcomes. It is essential that the courses encompass a mix of lecture and practical classes, with student access to hands-on brewing and analytical work in an operational small-scale brewing system.

Capstone Courses

Suggested Capstone Courses for Brewing Science Degrees

- Brewing science
- Brewing analysis and quality assurance
- Practical malting and brewing

Learning Outcomes

Brewing Science and Brewhouse Operations

- Explain the compositional features of the four-essential brewing raw materials: malt, hops, water, and yeast
- Articulate the technological and manufacturing processes required to transform the four essential raw materials into forms suitable for brewing
- Demonstrate an ability to measure, report, and interpret the basic process analytics required in a brewing context (e.g., brewhouse performance, bitterness recovery, etc.)
- Identify the raw material composition and processing regimes required to produce various traditional styles of beers
- Explain the unit processes leading from raw materials to packaged beer
- Identify the key microbial chemical and physical threats to brewing and beer quality and determine the method of detection, prevention, and elimination from wort to packaged beer
- Summarize the basics of brewery cleaning and sanitation
- Demonstrate the ability to design and brew a beer that meets generally accepted standards

Sensory and Product Design

- Explain the quality attributes of beer, such as foam, stability, color, aroma, and attenuation, and interpret the reasons why a product deviates from expected performance
- Identify and describe the key contributors to beer flavor, including defects, the pathways by which they arise, and how these flavors can be controlled
- Formulate brewing recipes that reflect characteristics of primary beer styles

Quality Assurance and Control

- Differentiate between the principles of QA and QC and outline the essential components of a quality system within a brewery
- Explain the relevance of key analytical parameters applied to malt, hops, water, and yeast
- Show competency in interpreting key analytical parameters for malt, adjuncts, water, hops, yeast, wort, and beer
- Explain the concept of “standard methods of analysis” and how these methods are employed from raw materials to finished beer
- Perform analytical measurements using industry-recognized standard methods and instrumentation on raw materials, in-process streams, finished products, and packaged beer for the purpose of assessing their quality

Best Practices

- Demonstrate knowledge of in-line instrumentation and critical process measurement points (CPMP)
- Demonstrate knowledge of the regulatory environment with regards to overseeing breweries—food safety, brewhouse safety, environmental compliance, labeling, etc.
- Show competency in understanding the history and culture of beer (beer stewardship)
- Demonstrate knowledge of sustainability practices for raw materials, water, energy, processing, and brewery waste
- Demonstrate knowledge of social and regulatory environments regarding reasonable standards for responsible consumption