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### Fermentation Science

The Bachelor of Science (B.S.) in Fermentation Science degree will prepare students for careers in fermentation-related industries and will provide graduates with the requisite background to pursue advanced studies in fermentation-related fields, including but not limited to brewing, distilling, and enology. The program provides interdisciplinary training drawing from disciplines in various schools and the Fermentation Science Institute. Fermentation science involves basic and applied science in several core scientific areas, including microbiology, plant biology, food science and chemistry, as well as the more applied areas of the agricultural sciences.

### B.S. Fermentation Science Degree Requirements

Degree Requirements	Credit Hours
University Core Curriculum Requirements <sup>1</sup>	39
Requirements for Major in Fermentation Science	28
<p>The following courses are required: FERM 100, FERM 101, FERM 390, FERM 460, FERM 462, FERM 491; HND 101, HND 356; choose 9-10 hours minimum from FERM 180, FERM 181, FERM 300, HORT 333, HORT 466, FERM 480, FERM 489</p>	
Major Requirements in Science	47
<p>The following courses are required: BIOL 211, BIOL 212, MICR 301, CHEM 200, CHEM 201, CHEM 202, CHEM 210, CHEM 211, CHEM 212, CHEM 330, CHEM 339 or CHEM 340, CHEM 341; PHYS 203A, PHYS 253A, PHYS 203B, PHYS 253B; MATH 150, MATH 282;</p>	
Major Requirements in Hospitality and Business	4
<p>Choose four (4) hours minimum from HTA 202, HTA 206, HTA 335, ECON 240, MGMT 350</p>	
Total	120

<sup>1</sup> A total of fifteen credit hours of major courses count toward the core.

## Fermentation Science Courses

**FERM100 - Principles of Fermentation Science** Principles of Fermentation Science is a survey course that covers the scientific, technological, and cultural aspects of fermentation. The course will survey various aspects of fermentation, ranging from historical and cultural implication of fermentation as a method to process and preserve food to the modern manufacture of alcoholic beverages, foods, pharmaceuticals, and the production of energy. The process of fermentation will be discussed from basic microbiological and biochemical perspectives, with an emphasis on understanding the physical and chemical changes that occur during the fermentation process. Fermentation topics that will be discussed include alcoholic beverages, food preservation and production, and energy production. Credit Hours: 3

**FERM101 - Fermentation Science Laboratory** The laboratory complement to FERM 100, Principles of Fermentation Science. The laboratory will cover various aspects of fermentation in a hands-on experiential environment with an emphasis on the basic microbiological and biochemical changes that occur during the fermentation process. Co-requisite: FERM 100. Lab fee: \$60. Credit Hours: 1

**FERM180 - The Chemistry of Beer and Brewing** The course covers the science and chemistry of beer and brewing. The history of beer and brewing will be introduced to follow the evolution of beer as a food and beverage, including how beer has impacted society and how brewing has been affected by society. The chemistry of the four basic ingredients of beer (water, malt, hops and yeast) will be explored, as well as the chemistry of the ingredients and process. Home brewing and commercial brewing will be compared. The course does not presume a background in chemistry and various chemical concepts will be introduced on an as needed basis. Credit Hours: 2

**FERM181 - The Chemistry of Beer and Brewing Lab** The laboratory complement to FERM 180, The Chemistry of Beer and Brewing. The laboratory will cover various aspects of beer and brewing in a hands-on experiential environment. A major component will be guided tasting sessions of the various style categories of beer. Students will participate in brewing beer from base ingredients using various brewing techniques. Experiments conveying basic biology, chemistry and physical science concepts will be conducted. In addition, spectroscopic and chromatographic methods will be used to analyze flavor and ingredient components in beer. Special tours may also be arranged to regional breweries and hop yards. Credit Hours: 1

**FERM300 - Wining and Dining in the Ancient World** Since the beginning of time, food and drink have been basic needs for every human being. This course will take you back in time to explore ancient dietary customs and symbolism, including how materials for food and drink were gathered, processed and prepared, and their influence on health. We will explore fermentation as a processing and preservation method and examine evidence of the impact of fermentation on the agricultural revolution and the dawn of civilization. Credit Hours: 3

**FERM390 - Fermentation Research** Research under the direction and supervision of a faculty advisor culminating in a written report. Special approval needed from the instructor. Credit Hours: 1-2

**FERM460 - Sensory Analysis** The course covers the science of the human senses as applied to alcoholic beverages. The physiological and neurological basis of human sensing are covered from the perspective of detecting and identifying both desirable traits and perceived flaws in products. The concepts of experimental design and statistical analysis are covered, as well as practical aspects of designing and maintaining sensory panels. Two hours lecture and three hours laboratory per week. Prerequisite: CHEM 181 or HORT 333 with a grade of C or better or consent of instructor. Age Restricted: Students must be 21 years of age prior to first lab meeting. Lab fee: \$45. Credit Hours: 4

**FERM462 - Yeast Science and Technology** An in-depth look at yeast from the perspective of fermentation science, with an emphasis on brewing science and technology. The effects of genetics will be examined with respect to how various strains and genetic mutations affect the fermentation process and the quality of the final product. The course will emphasize yeast metabolism and the various parameters and conditions that affect fermentation processes. Three hours lecture per week. Prerequisite: MICR 301 with a grade of C or better or consent of instructor. Concurrent enrollment in FERM 463 allowed. Credit Hours: 3

**FERM480 - Advanced Brewing Science & Analysis** An advanced coverage of concepts in brewing, providing in-depth coverage of beer, brewing and quality control processes. Students will gain an

understanding of the raw materials used in the production of beer. Specific coverage will be given to the processing and effects of raw materials, technical and scientific aspects of the brewing process, and the various processes that occur during fermentation, conditioning and packaging. In addition, the concept of beer quality and methods of ensuring quality control will be covered in detail, including the various methods of analysis that are used in the brewing industry. Three hours online lecture per week. Prerequisite: FERM 100, FERM 180, FERM 181, and CHEM 330 all with grades of C or better or consent of instructor. Credit Hours: 3

**FERM489 - Brewing and Distilling Technology** The primary focus of this course is to introduce basic facilities planning for operations of the brewing and distilling industry, and to gain management and technology insight in brewing/distilling production. Prerequisite: FERM 480 with a grade of C or better. Restricted to Junior/Senior standing in Ag Systems Technology or Fermentation Science and instructor approval. Credit Hours: 3

**FERM491 - Fermentation Internship** Internship under the direction and supervision of a mentor in a professional capacity in a fermentation related industry. The internship must be approved by the director of the program. Credit Hours: 1

## Fermentation Science Faculty

**Anderson, Ken B.**, Professor (School of Earth Systems and Sustainability), Ph.D., University of Melbourne, Australia, 1989.

**Bender, Kelly**, Associate Professor (School of Biological Sciences), Ph.D., Southern Illinois University Carbondale, 2003.

**Farrish, John**, Assistant Professor (School of Management and Marketing), Ph.D., University of Nevada-Las Vegas, 2010.

**Jayakody, Lahiru**, Assistant Professor (Fermentation Science Institute, School of Biological Sciences), Ph.D., Kagoshima University, Japan, 2014.

**Lightfoot, David**, Professor (School of Agricultural Sciences), Ph.D., University of Leeds, 1984.

**Liu, Jia**, Assistant Professor (School of Civil, Environmental and Infrastructure Engineering), Ph.D., University of Houston, 2014.

**McCarroll, Matthew**, Professor and Director (Fermentation Science Institute, School of Chemical and Biomolecular Sciences), Ph.D., University of Idaho, 1998.

**Smith, Kevin**, Senior Lecturer (School of Chemical and Biomolecular Sciences), B.S., University of Southern Indiana, 1997.

**Smith, Sylvia**, Associate Professor (School of Management and Marketing), Ph.D., University of Tennessee, 2007.

**Taylor, Bradley H.**, Associate Professor (School of Agricultural Sciences), Ph.D., Ohio State University, 1982.

**Witrick, Katherine**, Assistant Professor (Fermentation Science Institute, School of Human Sciences), Ph.D., Virginia Polytechnic Institute and State University, 2012.

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### **Catalog Year Statement:**

Students starting their collegiate training during the period of time covered by this catalog (see bottom of this page) are subject to the curricular requirements as specified herein. The requirements herein will extend for a seven calendar-year period from the date of entry for baccalaureate programs and three years for associate programs. Should the University change the course requirements contained herein subsequently, students are assured that necessary adjustments will be made so that no additional time is required of them.