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### Fermentation Science

The Bachelor of Science (B.S.) in Fermentation Science degree prepares students for careers in fermentation-related industries and provides graduates with the requisite background to pursue advanced studies in fermentation-related fields, including but not limited to alcoholic beverage production, food fermentation and industrial fermentation. The program provides interdisciplinary training drawing from the Fermentation Science Institute and various schools across campus. Fermentation science involves basic and applied science in several core scientific areas, including chemistry, microbiology, food science, as well as areas of the agricultural sciences. Pilot facilities located in the Fermentation Science Institute provide hands-on experience in research and development and production.

### Bachelor of Science (B.S.) in Fermentation Science Degree Requirements

Degree Requirements	Credit Hours
University Core Curriculum Requirements	39
Foundational Skills	13
CMST 101	3
ENGL 101, ENGL 102	6
MATH 282	3
UNIV 101	1
Disciplinary Skills	23
Fine Arts	3
HND 101	2
Humanities	6
CHEM 200	3
BIOL 211 (4)	3
Social Science	6
Integrative Studies (Multicultural/Diversity)	3

Degree Requirements	Credit Hours
Requirements for Major	(2) + 36
FERM 100, FERM 101, FERM 390, FERM 450, FERM 451, FERM 462, FERM 463, FERM 480, FERM 481, FERM 482, FERM 491, HND 101 (2), HND 356	(2) + 26
FERM Electives Choose from FERM 180, FERM 181, FERM 300, FERM 480, FERM 489, HORT 333, HORT 466	10
Requirements in Science	(9) + 38
BIOL 211 (3), BIOL 212, CHEM 200 (3), CHEM 201, CHEM 202, CHEM 210, CHEM 211, CHEM 212, CHEM 330, CHEM 339 or CHEM 340, CHEM 341, MATH 150, MATH 282 (3), MICR 301, PHYS 203A, PHYS 203B, PHYS 253A, PHYS 253B	
Requirements in Hospitality and Business Choose from ECON 240, ECON 350, HTEM 202, HTEM 206, HTEM 335	4
General Electives	3
Total	120

## Technology Fee

The College of Agricultural, Life, and Physical Sciences assesses undergraduate majors a technology fee of \$4.58 per credit hour up to 12 credit hours. The fee is charged Fall and Spring semester.

## 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. Lab fee: \$90. Credit Hours: 1

**FERM190 - Fermentation Science Seminar** Weekly seminar course for fermentation science majors. Activities will range from hosting external seminar speakers to discussions on research methods and trends in the fermentation industry. Maximum of one hour per semester. 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

**FERM410 - Fermentation in Spain: Exploring Wellness in the Healthiest Country in the World** Spain ranks #1 healthiest country in the world according to the Bloomberg Global Health Index. The objective of this faculty-led global seminar is to explore the factors that make this nation the healthiest, with a special emphasis on the role that fermented foods and beverages play in Spanish gastronomy. In addition to studying the origins and benefits of the Mediterranean diet, this course will also cover other aspects of national health, including environmental, intellectual, emotional, physical and social wellness. Student must be in good academic standing. Credit Hours: 3

**FERM450 - Sensory Analysis** The course covers the science of the human senses as applied to food and 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 techniques and procedures for designing and carrying out sensory programs and sensory studies are also covered. Three hours lecture per week. Prerequisite: FERM 181 or HORT 333 with a grade of C or better or consent of instructor. Credit Hours: 3

**FERM451 - Sensory Analysis Laboratory** The laboratory complement to FERM 450, Sensory Analysis. The laboratory will cover various aspects of the concepts of experimental design and statistical analysis, as well as practical aspects of designing and maintaining sensory panels. One hour laboratory, in-class per week. Co-requisite: FERM 450. Age Restricted: Students must be 21 years of age prior to first lab meeting. Prerequisite: CHEM 181 or HORT 333 with a C or better. Lab fee: \$45. Credit Hours: 1

**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

**FERM463 - Yeast Science & Technology Lab** The laboratory complement to FERM 462, Yeast Science & Technology. The laboratory will cover the techniques class dealing with yeast collection; storage and culturing will be covered from both theoretical and practical perspectives. One hour laboratory, in-class per week. Co-requisite or prerequisite: FERM 462 with a grade of C or better. Lab fee: \$60. Credit Hours: 1

**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

**FERM481 - Advanced Brewing Science & Analysis Laboratory** The laboratory complement to FERM 480, 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. Age Restricted: Students must be 21 years of age prior to the first class meeting. Prerequisite: FERM 100, FERM 180, FERM 181 and CHEM 330 all with grades of C or better or consent of instructor. Co-requisite: FERM 480. Lab fee: \$60. Credit Hours: 1

**FERM482 - Distillation Science and Technology** The course covers the theoretical and practical aspects of distillation science and technology, with an emphasis on the production of beverage spirits. Students will learn aspects of production operations of the distilling industry, the sourcing and importance of raw materials, and the influence of production and maturation methods on flavor and quality of finished spirits. Testing and quality control of spirits is also covered. Age Restricted: Students must be 21 years of age prior to the first class meeting. Prerequisite: FERM 480 with a grade 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

**FERM490 - Capstone Fermentation Research** Capstone research under the direction and supervision of a faculty advisor culminating in a written report. Special approval needed from the instructor. Credit Hours: 1-3

**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, Ph.D., University of Melbourne, Australia, 1989.

**Bender, Kelly**, Associate Professor, Ph.D., Southern Illinois University Carbondale, 2003.

**Farrish, John**, Assistant Professor, Ph.D., University of Nevada-Las Vegas, 2010.

**Jayakody, Lahiru**, Assistant Professor, Ph.D., Kagoshima University, Japan, 2014.

**Liu, Jia**, Assistant Professor, Ph.D., University of Houston, 2014.

**McCarroll, Matthew**, Professor and Director, Ph.D., University of Idaho, 1998.

**Smith, Kevin**, Senior Lecturer, B.S., University of Southern Indiana, 1997.

**Smith, Sylvia**, Associate Professor, Ph.D., University of Tennessee, 2007.

**Taylor, Bradley H.**, Associate Professor, Ph.D., Ohio State University, 1982.

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