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# Food Science and Nutrition

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Food Science and Nutrition  
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Typical employment areas for graduates of the food science and nutrition program include quality assurance, quality control, product development, food processing, sensory science and flavor chemistry. The food science curriculum meets the accreditation standards established by the Institute of Food Technologists.

## Faculty

**Professor** M. Lin\*\*, A. Mustapha\*\*

**Associate Professor** A. D. Clarke\*\*, I. U. Gruen\*\*, B. Vardhanabhati\*\*

**Assistant Professor** K. Krishnaswamy\*, P. Somavat\*, L. Channaiah\*

**Instructor** R. Linhardt

**Adjunct Associate Professor** L. Occena-Po\*

**Adjunct Professor** G. Zheng\*

**Adjunct Instructor** M. Jones, K. Hagely

\* Graduate Faculty Member - membership is required to teach graduate-level courses, chair master's thesis committees, and serve on doctoral examination and dissertation committees.

\*\* Doctoral Faculty Member - membership is required to chair doctoral examination or dissertation committees. Graduate faculty membership is a prerequisite for Doctoral faculty membership.

## Undergraduate

- BS in Food Science and Nutrition (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/foodsciencenutrition/bs-food-science-nutrition/>)
- Minor in Food Science and Nutrition (<http://catalog.missouri.edu/collegeofagriculturefoodandnaturalresources/foodsciencenutrition/minor-food-science-nutrition/>)

The department offers the Bachelor of Science degree with a major in Food Science and Nutrition within four tracks, namely Food Science, Food Business, Enology and Culinary Sciences. A minor is available.

Note: Tracks do not appear on transcripts or diplomas.

## Graduate

The Food and Hospitality Systems Graduate Program offers M.S. and Ph.D. graduate degrees under three track options: Food Science, Hospitality Management and Agricultural Systems Management. We also offer an online graduate certificate program in Food Safety and Defense.

The catalog provides a complete list of these degree options (<http://catalog.missouri.edu/degreesanddegreeprograms/>).

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### F\_S 1010: Introduction to Viticulture and Enology

This course will give a general overview of growing grapes (viticulture) and winemaking (enology) with an emphasis on Missouri wines and wineries. This course is the first course in a sequence of courses in the viticulture and enology track of the food science degree program.

**Credit Hour:** 1

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### F\_S 1020: World Food and You

(same as PLNT\_SCI 1020). Basic scientific principles in food processing, manufacturing, preservation, quality and safety as influenced by cultural, geographical and environmental factors. Students will be exposed to introductory food science concepts that relate to food crops and foods prepared, processed, preserved and eaten around the world.

**Credit Hours:** 3

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### F\_S 1020H: World Food and You - Honors

(same as PLNT\_SCI 1020). Basic scientific principles in food processing, manufacturing, preservation, quality and safety as influenced by cultural, geographical and environmental factors. Students will be exposed to introductory food science concepts that relate to food crops and foods prepared, processed, preserved and eaten around the world.

**Credit Hours:** 3

**Prerequisites:** Honors eligibility required

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### F\_S 1030: Food Science and Nutrition

Basic principles of science and technology as applied to the problem of providing safe, nutritious, and desirable food for man.

**Credit Hours:** 3

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### F\_S 2131: Dairy Products Evaluation

(same as AN\_SCI 2131). Sensory Evaluation and judging of dairy products.

**Credit Hours:** 2

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### F\_S 2172: Elements of Food Microbiology

Introductory microbiology course stressing basic principles as related to foods.

**Credit Hours:** 3

**Prerequisites:** Sophomore standing. Restricted to Food Science Students during Early Registration

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### F\_S 2172H: Elements of Food Microbiology - Honors

Introductory microbiology course stressing basic principles as related to foods.

**Credit Hours:** 3

**Prerequisites:** Sophomore standing; honors eligibility required. Restricted to Food Science Students during Early Registration

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### F\_S 2195: Grapes and Wines of the World

(same as PLNT\_SCI 2195). Explores the world of wine through study of viticultural principles and practices, wine styles, classifying wine, the winemaking process and New World and Old World wine regions. Learn wine tasting skills and experience wines from around the world. World

wine consumption, social and physical health benefits of moderate wine consumption.

**Credit Hours:** 3

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**F\_S 2199: Seminar in Professional Development**

Readings and discussion related to professional development for the industry.

**Credit Hour:** 1

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**F\_S 3190: Study Abroad: International Meat, Dairy and Enology**

(same as AN\_SCI 3190). This study abroad course introduces students to the meat, dairy and wine industries in Germany or in New Zealand (destinations are on a rotational basis). Students will visit small, medium and large-scale producers and learn about differences in comparison to the US industries. May be repeated once for credit. Prerequisites: instructor's consent

**Credit Hours:** 3

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**F\_S 3190H: Study Abroad: International Meat, Dairy and Enology - Honors**

(same as AN\_SCI 3190). This study abroad course introduces students to the meat, dairy and wine industries in Germany or in New Zealand (destinations are on a rotational basis). Students will visit small, medium and large-scale producers and learn about differences in comparison to the US industries. May be repeated once for credit. Enrollment is limited to Honors eligible students.

**Credit Hours:** 3

**Prerequisites:** instructor's consent

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**F\_S 3210: Kitchen Chemistry**

This course is targeted at current Food Science, Hospitality Management, Nutrition or Biochemistry students who wish to study the application of scientific principles to the practice of cooking. This on-line summer class assumes students have access to a working kitchen. Video cooking projects are submitted weekly. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** CHEM 1100 or higher

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**F\_S 3214: Principles of Meat Science**

(same as AN\_SCI 3214). Study of the principles involved in the conversion of living animals to meat and by-products; efficient utilization of meat as a food.

**Credit Hours:** 3

**Recommended:** one course in Biological Sciences

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**F\_S 3231: Principles of Dairy Foods Science**

(same as AN\_SCI 3231). Technology, chemistry and microbiology related to milk and its transformation into fluid milk products, fermented dairy foods and spreads. (2 hours of lecture and two hours of laboratory per week.)

**Credit Hours:** 3

**Recommended:** One course in Chemistry or Biological Sciences

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**F\_S 3240: Principles of Viticulture I**

(same as PLNT\_SCI 3240). Grapevine growth, development, selection, propagation, training systems, pruning, and harvesting; vineyard site selection, design, and development. Graded on A-F basis only. Prerequisites: F\_S 1010 and one of the following: F\_S 2195 or PLNT\_SCI 2195 or SOIL 2100 or PLNT\_SCI 2110 or PLNT\_SCI 2125.

**Credit Hours:** 4

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**F\_S 3385: Problems in Food Science**

Supervised study in a specialized phase of food science and nutrition.

**Credit Hour:** 1-99

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**F\_S 4050: Zero Hunger Challenge**

(same as F\_S 4050H, BIOL\_EN 4050, BIOL\_EN 4050H; cross-leveled with F\_S 7050, BIOL\_EN 7050). Students from multidisciplinary background are formed into teams to address food and nutrition security. Students will learn about Sustainable Development Goal (SDG) 2: Zero Hunger, importance of partnership for the goals (SDG-17) to address grand global challenges. Transdisciplinary student teams will develop a proposal at the end of the course and are encouraged to participate in challenge competitions.

**Credit Hours:** 3

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**F\_S 4050H: Zero Hunger Challenge - Honors**

(same as F\_S 4050, BIOL\_EN 4050, BIOL\_EN 4050H; cross-leveled with BIOL\_EN 7050). Students from multidisciplinary background are formed into teams to address food and nutrition security. Students will learn about Sustainable Development Goal (SDG) 2: Zero Hunger, importance of partnership for the goals (SDG-17) to address grand global challenges. Transdisciplinary student teams will develop a proposal at the end of the course and are encouraged to participate in challenge competitions.

**Credit Hours:** 3

**Prerequisites:** Honors eligibility required

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**F\_S 4160: Food Process Engineering**

(same as BIOL\_EN 4160, CH\_ENG 4160; cross-leveled with BIOL\_EN 7160, CH\_ENG 7160, F\_S 7160). This course introduces underlying engineering principles in food processing, and unit operations in food industries. Topics include fluid flow, heat transfer in food processing, preservation process, dehydration, refrigeration, food freezing, psychrometrics, emerging technologies, food packaging, and sustainability. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** PHYSCS 1210, AG\_S\_TCH 1040 or Consent of Instructor

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**F\_S 4199: Food Industry Senior Seminar**

The course explores the structure and the various branches of the food industry. Emphasis is placed on industry trends and the manufacture of specific selected food products and their ingredients. Graded on A-F basis only.

**Credit Hour:** 1

**Prerequisites:** F\_S 1030 or equivalent, F\_S 2199 or equivalent; junior or senior standing

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**F\_S 4301: Topics in Food Science**

Instruction in specific subject matter areas in the field of food science and nutrition.

**Credit Hour:** 1-99

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**F\_S 4310: Food Chemistry and Analysis**

(cross-leveled with F\_S 7310). Structure, composition and chemical properties of food.

**Credit Hours:** 4

**Recommended:** 5 hours Chemistry or Biochemistry

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**F\_S 4311: Investigation of Food Properties**

(cross-leveled with F\_S 7311). Study of the chemical and physical properties of foods and the interaction of food components.

**Credit Hours:** 3

**Recommended:** F\_S 4310 or equivalent, or instructor's consent

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**F\_S 4315: Food Chemistry and Analysis Laboratory**

(cross-leveled with F\_S 7315). The quantitative determination of the constituents of food.

**Credit Hours:** 3

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**F\_S 4315W: Food Chemistry and Analysis Laboratory - Writing Intensive**

(cross-leveled with F\_S 7315). The quantitative determination of the constituents of food.

**Credit Hours:** 3

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**F\_S 4330: Principles of Food Processing**

(same as AG\_S\_TCH 4330; cross-leveled with F\_S 7330, AG\_S\_TCH 7330). Introduction to basic engineering concepts used to process raw materials. Principle topics include energy, material balance, fluid flow, heat transfer, refrigeration and freezing, and preservation.

**Credit Hours:** 3

**Prerequisites:** MATH 1100 and AG\_S\_TCH 1040 or PHYSCS 1210

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**F\_S 4331: Technology of Dairy Products and Ingredients**

(cross-leveled with F\_S 7331). Technology, chemistry, and nutrition of dairy foods as well as functional properties of dairy ingredients.

**Credit Hours:** 3

**Prerequisites:** F\_S 3231 or equivalent

**Recommended:** one Chemistry course

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**F\_S 4340: Principles of Viticulture II**

(same as PLNT\_SCI 4340). Environmental and biological factors influencing vine physiology and winegrape quality. Irrigation, canopy management, pest and disease control, budgets and current trends in viticulture. Graded on A-F basis only.

**Credit Hours:** 4

**Prerequisites:** F\_S 3240 or PLNT\_SCI 3240

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**F\_S 4344: Processing Muscle Foods**

(same as AN\_SCI 4344; cross-leveled with F\_S 7344, AN\_SCI 7344). Materials and technologies for the manufacture of muscle food products

from red meats, poultry and seafood. Experience problem-solving through further processing of complex ingredients and develop skills by practicing operations in a pilot plant facility.

**Credit Hours:** 3

**Recommended:** One Chemistry course

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**F\_S 4345: Principles of Viticulture and Winemaking**

(same as PLNT\_SCI 4345; cross-leveled with PLNT\_SCI 7345, F\_S 7345). This course will cover the basics needed by viticulturists and winemakers to understand grape vine growth and vineyard considerations along with winemaking principles. Viticultural topics will include grapevine growth and development, vineyard design and development, cultivar selection, grapevine propagation, training systems, and harvest and pruning. Winemaking topics will include sensory analysis of grapes, chemical, microbiological and technological aspects of winemaking, and the analytical methods used for juice and wine analysis. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** BIO\_SC 1010 and BIO\_SC 1020 or BIO\_SC 1030 or BIO\_SC 1200 or BIO\_SC 1500

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**F\_S 4354: Physiology and Biochemistry of Muscle as Food**

(same as AN\_SCI 4354; F\_S 7354, AN\_SCI 7354). Basic concepts in muscle growth and development of livestock evaluating the effects of environment, welfare, nutrition and genetics regarding muscle metabolism, physiology, and the ultimate condition of muscle as food.

**Credit Hours:** 3

**Prerequisites:** AN\_SCI 3254 or MPP 3202 or BIO\_SC 3700; AN\_SCI 2001 or AN\_SCI 2214 or AN\_SCI 2114 or AN\_SCI 3214 or F\_S 3214 or AN\_SCI 3231 or F\_S 3231

**Recommended:** Any Biochemistry or Organic Chemistry course

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**F\_S 4370: Food Microbiology**

(cross-leveled with F\_S 7370). Study of bacteria, yeast and molds. Includes dominant flora, public health significance, characterization of organisms, examination of foods representative of major food groups, spoilage, preservation, food fermentations and physiological groups.

**Credit Hours:** 3

**Prerequisites:** F\_S 2172

**Recommended:** one Biochemistry course

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**F\_S 4375: Food Microbiology Laboratory**

(cross-leveled with F\_S 7375). Examination of foods for microorganisms and characterization of major species.

**Credit Hours:** 2

**Prerequisites or Corequisites:** F\_S 4370

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**F\_S 4380: Sensory Analysis of Food and Beverages**

(cross-leveled with F\_S 7380). Methodological principles of the sensory analysis of food and beverages.

**Credit Hours:** 3

**Prerequisites:** F\_S 1030; junior or senior standing

**Recommended:** one statistics course

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**F\_S 4385: Problems in Food Science**

Advanced problems in a selected field of food science and nutrition.

**Credit Hour:** 1-99

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**F\_S 4390: Optimization and Management of Food and Agricultural Systems**

(same as AG\_S\_TCH 4390; cross-leveled with F\_S 7390; AG\_S\_TCH 7390). This course is designed to introduce the student to the concept of layers and interacting systems within an operation and the analytical methods of modeling and simulation to make effective management decisions for optimal system design and function.

**Credit Hours:** 3

**Prerequisites:** MATH 1100 or higher

**Recommended:** AG\_S\_TCH 1040

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**F\_S 4440: Principles of Winemaking and Wine Chemical Analysis**

(cross-leveled with F\_S 7440). The theoretical and practical basics needed by enologists/winemakers including sensory analysis of grapes; chemical, microbiological and technological aspects of winemaking; and the analytical methods used for juice and wine analysis. Graded on A-F basis only.

**Credit Hours:** 4

**Recommended:** 5 credit hours inorganic chemistry and organic chemistry or concurrent, or instructors consent

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**F\_S 4441: Cellar Operations and Special Vinifications**

(cross-leveled with F\_S 7441). The theoretical and practical basics needed by winemakers to supervise the operations of the winemaking, wine stabilization and packaging equipment. The theoretical and practical basics needed by winemakers to make special wines including rose, dessert, carbonic maceration, and sparkling wines. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** F\_S 4440

**Recommended:** 5 credit hours inorganic chemistry and organic chemistry or instructor's consent

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**F\_S 4941: Internship in Food Science**

Combines study, observation and employment in an area of food science and nutrition. Written reports, faculty evaluation.

**Credit Hour:** 1-6

**Prerequisites:** instructor's consent

**Recommended:** one Food Science course

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**F\_S 4945: Experiential Learning in Industry Internship in Food Science**

Learning experience combining observation, application, and reflection in a discipline-based industry internship. Course appears on transcript for zero credit and does not count toward full-time enrollment. No tuition or fees are charged. Graded on S/U basis only.

**Credit Hours:** 0

**Prerequisites:** instructor's consent

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**F\_S 4970: Food Product Development**

(cross-leveled with F\_S 7970). Capstone course integrating the various disciplines of food science to create new food products.

**Credit Hours:** 3

**Prerequisites:** Junior or Senior standing, or instructor's consent.

ENGLSH 1000 required if course is taught Writing Intensive

**Recommended:** 9 credit hours of Food Science

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**F\_S 4970W: Food Product Development - Writing Intensive**

Capstone course integrating the various disciplines of food science to create new food products.

**Credit Hours:** 3

**Prerequisites:** Junior or Senior standing, or instructor's consent.

ENGLSH 1000 required if course is taught Writing Intensive

**Recommended:** 9 credit hours of Food Science

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**F\_S 4980: Food Quality Assurance**

(cross-leveled with F\_S 7360). Capstone course integrating various food science disciplines to comply with regulations concerned with protection of the nation's food supply. Applies practices to insure consumers of healthful foods.

**Credit Hours:** 3

**Prerequisites:** Junior or Senior standing or instructor's consent

**Recommended:** 9 credit hours of food science

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**F\_S 7050: Zero Hunger Challenge**

(same as BIOL\_EN 7050; cross-leveled with F\_S 4050, F\_S 4050H, BIOL\_EN 4050, BIOL\_EN 4050H). Students from multidisciplinary background are formed into teams to address food and nutrition security. Students will learn about Sustainable Development Goal (SDG) 2: Zero Hunger, importance of partnership for the goals (SDG-17) to address grand global challenges. Transdisciplinary student teams will develop a proposal at the end of the course and are encouraged to participate in challenge competitions.

**Credit Hours:** 3

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**F\_S 7160: Food Process Engineering**

(same as with BIOL\_EN 7160, CH\_ENG 7160; cross-leveled with F\_S 4160, BIOL\_EN 4160, CH\_ENG 4160). This course introduces underlying engineering principles in food processing, and unit operations in food industries. Topics include fluid flow, heat transfer in food processing, preservation process, dehydration, refrigeration, food freezing, psychrometrics, emerging technologies, food packaging, and sustainability. Graded on A-F basis only.

**Credit Hours:** 3

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**F\_S 7301: Topics in Food Science**

(cross-leveled with F\_S 4301). Instruction in specific subject matter areas in the field of food science. Graded on A-F basis only.

**Credit Hour:** 1-5

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**F\_S 7310: Food Chemistry and Analysis**

(cross-leveled with F\_S 4310). Structure, composition and chemical properties of food.

**Credit Hours:** 4

**Prerequisites:** 5 hours Chemistry or Biochemistry

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**F\_S 7311: Investigation of Food Properties**

(cross-leveled with F\_S 4311). Study of the chemical and physical properties of foods and the interaction of food components. Lecture.

**Credit Hours:** 3

**Prerequisites:** F\_S 4310 or F\_S 7310 or equivalent, or instructor's consent

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**F\_S 7315: Food Chemistry and Analysis Laboratory**

(cross-leveled with F\_S 4315). The quantitative determination of the constituents of food.

**Credit Hours:** 3

**Prerequisites:** F\_S 4310 or concurrent enrollment

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**F\_S 7330: Principles of Food Processing**

(same as AG\_S\_TCH 7330; cross-leveled with F\_S 4330). Basic principles of food processing, with emphasis on blanching, pasteurization, commercial sterilization, refrigeration, freezing, concentration, dehydration and packing. Impacts of processing on product quality are evaluated.

**Credit Hours:** 3

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**F\_S 7331: Technology of Dairy Products and Ingredients**

(cross-leveled with F\_S 4331). Technology, chemistry, and nutrition of dairy foods as well as functional properties of dairy ingredients.

**Credit Hours:** 3

**Prerequisites:** one Chemistry course and F\_S 3231 or equivalent

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**F\_S 7344: Processing Muscle Foods**

(same as AN\_SCI 7344; cross-leveled with F\_S 4344, AN\_SCI 4344). Materials and technologies for the manufacture of muscle food products from red meats, poultry and seafood. Experience problem-solving through further processing of complex ingredients and develop skills by practicing operations in a pilot plant facility.

**Credit Hours:** 3

**Prerequisites:** one Chemistry course

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**F\_S 7345: Principles of Viticulture and Winemaking**

(same as PLNT\_SCI 7345; cross-leveled with PLNT\_SCI 4345, F\_S 4345). This course will cover the basics needed by viticulturists and winemakers to understand grape vine growth and vineyard considerations along with winemaking principles. Viticultural topics will include grapevine growth and development, vineyard design and development, cultivar selection, grapevine propagation, training systems, and harvest and pruning. Winemaking topics will include sensory analysis of grapes, chemical, microbiological and technological aspects of winemaking, and the analytical methods used for juice and wine analysis. Graded on A-F basis only.

**Credit Hours:** 3

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**F\_S 7350: Microbiology of Fermented Foods**

Physiology, biochemistry, and genetics of microorganisms important in food fermentations. How microorganisms are used in fermentations

and how raw materials are converted into finished fermented foods and beverages. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 7351: Food Laws and Regulations**

Policy, law and regulation development related to food. Introduction to major US regulatory agencies impacting food law and discussion on major food safety and food labeling laws and regulations. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 7354: Physiology and Biochemistry of Muscle as Food**

(same as AN\_SCI 7354; cross-leveled with F\_S 4354, AN\_SCI 4354). Basic concepts in muscle growth and development of livestock evaluating the effects of environment, welfare, nutrition and genetics regarding muscle metabolism, physiology, and the ultimate condition of muscle as food.

**Credit Hours:** 3

**Prerequisites:** AN\_SCI 3254 or MPP 3202 or BIO\_SC 3700; AN\_SCI 2001 or AN\_SCI 2214 or AN\_SCI 2114 or AN\_SCI 3214 or F\_S 3214 or AN\_SCI 3231 or F\_S 3231

**Recommended:** Any Biochemistry or Organic Chemistry course

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**F\_S 7360: Food Quality Assurance**

(cross-leveled with F\_S 4980). Capstone course integrating various food science disciplines to comply with regulations concerned with protection of the nation's food supply. Applies practices to insure consumers of healthful foods.

**Credit Hours:** 3

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**F\_S 7370: Food Microbiology**

(cross-leveled with F\_S 4370). Study of bacteria, yeast and molds. Includes dominant flora, public health significance, characterization of organisms, examination of foods representative of major food groups, spoilage, preservation, food fermentations and physiological groups.

**Credit Hours:** 3

**Prerequisites:** F\_S 2172 and one Biochemistry course or concurrent enrollment

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**F\_S 7375: Food Microbiology Laboratory**

(cross-leveled with F\_S 4375). Examination of foods for microorganisms and characterization of major species.

**Credit Hours:** 2

**Prerequisites:** F\_S 4370 or concurrent enrollment

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**F\_S 7380: Sensory Analysis of Food and Beverages**

(cross-leveled with F\_S 4380). Methodological principles of the sensory analysis of food and beverages.

**Credit Hours:** 3

**Prerequisites:** F\_S 1030; junior or senior standing

**Recommended:** one statistics course

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**F\_S 7390: Optimization and Management of Food and Agriculture Systems**

(same as AG\_S\_TCH 7390; cross-leveled with F\_S 4390, AG\_S\_TCH 4390). This course is designed to introduce the student to the concept of layers and interacting systems within an operation and the analytical methods of modeling and simulation to make effective management decisions for optimal system design and function.

**Credit Hours:** 3

**Prerequisites:** MATH 1100 or higher

**Recommended:** AG\_S\_TCH 1040

---

**F\_S 7440: Principles of Winemaking and Wine Chemical Analysis**

(cross-leveled with F\_S 4440). The theoretical and practical basics needed by enologist/winemakers including sensory analysis of grapes; chemical, microbiological and technological aspects of winemaking; and the analytical methods used for juice and wine analysis. Graded on A-F basis only.

**Credit Hours:** 4

**Prerequisites:** 5 hours inorganic chemistry and organic chemistry or concurrent, or instructor's consent

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**F\_S 7441: Cellar Operations and Special Vinifications**

(cross-leveled with F\_S 4441). The theoretical and practical basics needed by winemakers to supervise the operations of the winemaking, wine stabilization and packaging equipment. The theoretical and practical basics needed by winemakers to make special wines including rose, dessert, carbonic maceration, and sparkling wines. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** 5 credit hours inorganic chemistry and organic chemistry and F\_S 4440 or instructor's consent

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**F\_S 7941: Internship in Food Science**

Combines study, observation and employment in an area of food science and nutrition. Written reports, faculty evaluation.

**Credit Hour:** 1-6

**Prerequisites:** One Food Science course and instructor's consent

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**F\_S 7970: Food Product Development**

Capstone course integrating the various disciplines of food science to create new food products.

**Credit Hours:** 3

**Prerequisites:** ENGLSH 1000, and instructor's consent

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**F\_S 8085: Problems in Food Science**

Individual studies include a minor research problems.

**Credit Hour:** 1-99

**Prerequisites:** Restricted to Food Science MS Students only

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**F\_S 8087: Seminar in Food Science**

Provides students with opportunities for development in depth of advanced aspects of food science through reviews of research in progress and of current scientific publications.

**Credit Hour:** 1

**Prerequisites:** Masters standing

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**F\_S 8090: Research in Food Science**

Original investigations, usually in connection with one of the research projects of Agricultural Experiment Station. Written report required. Graded on S/U basis only.

**Credit Hour:** 1-99

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**F\_S 8100: Strategic Human Resource Management in Hospitality**

This course is designed to familiarize students with a wide range of theories, concepts, business practices and applications associated with managing human resources in business. Topics include micro-human resource issues such as recruitment, hiring, performance measurements, employee relations, and retention, macro human resource topics such as organizational performance measurement, and interrelationship between micro and macro human resources such as individual differences and job performance and organizational performance. Students will learn the key theories and applications through reading, discussion, research, and writings. Graded on A-F only.

**Credit Hours:** 3

**Prerequisites:** HSP\_MGMT 7100

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**F\_S 8110: Advanced Hospitality Marketing**

This course provides students with an advanced-level view of marketing strategies with the focus in hospitality and tourism. Students will be exposed to a general overview of theoretical frameworks and seminal work in this field. They will gain appreciation of the contemporary social-scientific research on marketing and persuasion. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** HSP\_MGMT 7110 or instructor's consent

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**F\_S 8180: Strategic Management and Competitive Strategy in the Hospitality Industries**

This course introduces to students and enables them to develop a comprehensive understanding of the concepts and principles of strategic management and competitive strategy as applied to the hospitality industries. Students will be acquainted with the key concepts of strategic management through discussions, research, critiquing and writings. This course will cover a wide variety of topics related to environmental scanning, strategic direction, organizational structure and culture, administration and evaluation of existing and challenging business practices, concepts and theories in the management distinctive to that of hospitality, tourism and service. Emphasis will place on the identification of relevant interdisciplinary paradigms and theory and research techniques for analysis, using advanced concepts and quantitative methods in the scientific investigation problems related to hospitality. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** HSP\_MGMT 7180 or instructor's consent

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**F\_S 8200: Theory Construction**

This course focusses on theory construction in the area of hospitality management, identification of relevant interdisciplinary paradigms in theory development, and evaluation of theory and research models in the context of social science research. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** Graduate level research methods course or instructor's consent

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**F\_S 8263: Service Operations Management: Revenue Management**

This course offers an opportunity for students to learn the theory, concepts, and knowledge applied in service operations management. Students will find them useful in trying to cope with the dilemmas faced by operating managers in the hospitality industry. Especially, the course focuses on revenue management.

**Credit Hours:** 3

**Prerequisites:** HSP\_MGMT 3310 or instructor's consent

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**F\_S 8301: Ethnic Foods: Food Safety, Food Protection and Defense Challenges**

An overview of the safety concerns and risks associated with ethnic and imported ethnic foods. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8302: Food Protection and Defense-Essential Concepts**

This course presents foundational concepts relevant to protecting the food supply from intentional contamination. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8303: A Multidisciplinary Overview of Food Safety and Security**

This course provides students with an understanding of a host of multidisciplinary aspects of food safety, particularly in the context of public health. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8304: HACCP**

This course focuses on procedures and processes which can affect the overall microbiological safety of food and the Hazard Analysis Critical Control Point (HACCP) system. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8401: Topics in Food Science**

Specialized topics in the area of food science and nutrition.

**Credit Hour:** 1-99

**Prerequisites:** instructor's consent

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**F\_S 8402: Research Methods in Food Science**

(same as BIOL\_EN 8402). Introduction to research. Defining research problems, developing hypotheses, searching scientific literature, designing experiments, presenting data, writing scientific papers and theses, making oral presentations.

**Credit Hours:** 2

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**F\_S 8404: Advanced Food Microbiology and Biotechnology**

Covers basic principles in biotechnology and applied food microbiology, including current topics of interest in food biotechnology. May be repeated for credit. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8405: Advanced Food Microbiology and Biotechnology**

Advanced applied food microbiology and microbial physiology, and basic principles in biotechnology and genetic engineering, including current topics of interest and case studies in food biotechnology.

**Credit Hours:** 3

**Prerequisites:** F\_S 4370 or equivalent or instructor's permission

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**F\_S 8406: Foodborne Toxicants**

This course covers human risks from foodborne toxicants, remediation and detoxification strategies for key foodborne toxicants and major modes of toxicity of key foodborne toxicants. Principles of food toxicology will be applied to optimize hazard analysis within HACCP for the prevention of foodborne toxicities. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8408: Risk Assessment for Food, Agriculture and Veterinary Medicine**

Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis. Graded on A-F basis only.

**Credit Hours:** 2

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**F\_S 8410: Food Chemistry II**

Study of chemical content of food, emphasizing aspects that exist uniquely in food.

**Credit Hours:** 4

**Prerequisites:** F\_S 4310 or equivalent

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**F\_S 8414: Meat Quality**

(same as AN\_SCI 8414). Discussion of factors affecting meat quality in beef, pork, lamb and poultry. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** F\_S 3214 or equivalent

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**F\_S 8424: Meat Investigations**

(same as AN\_SCI 8424). Discussion of literature, special reports, assigned readings, techniques, interpretation of results.

**Credit Hours:** 3

**Prerequisites:** F\_S 4344 and F\_S 4310 or equivalent

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**F\_S 8440: Functional Foods and Nutraceuticals**

Principles and challenges involved in developing foods with health benefits beyond basic nutrition; efficacy, safety, regulatory and marketing aspects of functional foods and nutraceutical; current controversies and evidence of therapeutic properties of functional foods and Dietary supplements. Graded on A-F basis only.

**Credit Hours:** 3

**Prerequisites:** BIOCHM 3630 or equivalent and F\_S 4310 or equivalent, or instructor's consent

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**F\_S 8460: Food Biopolymers**

Study of physical, chemical, and functional properties of food biopolymers and their applications in food and other industries. Graded on A-F basis only.

**Credit Hours:** 3

**Recommended:** Organic chemistry and food chemistry

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**F\_S 8470: Advanced Food Technology**

To understand the physical and chemical changes that occur during the processing and storage of food; study the quality and safety issues of foods and learn traditional and recent advances in food science and technology.

**Credit Hours:** 3

**Prerequisites:** F\_S 4310, or equivalent or instructor's consent

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**F\_S 9085: Problems in Food Science**

Individual studies includes minor research problems.

**Credit Hour:** 1-99

**Prerequisites:** Food Science PhD students

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**F\_S 9087: Seminar in Food Science**

Provides students with opportunities for development in depth of advanced aspects of food science through reviews of research in progress and of current scientific publications. Prerequisites: PhD standing

**Credit Hour:** 1

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**F\_S 9090: Research in Foods Science**

Original investigation of advanced nature, leading to dissertation. Graded on a S/U basis only.

**Credit Hour:** 1-99

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**F\_S 9402: Advanced Research Methods in Food and Hospitality Systems**

This course provides doctoral students with introduction and review of research methods available for use in the study of food science, hospitality management and agricultural system management. Hence, the emphasis of this course is on empirical studies in the field, and will examine research conducted by scholars in the academic area. This course assists as baseline preparation for graduate students' continuing work in the graduate program. Specifically, the course provides students with knowledge and research experience in regard to 1) research fundamentals and backgrounds, 2) types of research, and 3) data analysis.

**Credit Hours:** 3

**Prerequisites:** Introductory research method course or statistics course; instructor's consent required

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