

Food Science—FSC

- 421 Food Laws and Regulations**
Spring. 3(3-0) P:M: (HNF 150 or HNF 311 or FSC 211 or FIM 100)

Adoption, interpretation, and enforcement of laws and regulations governing food processing and foodservice systems. Impact of regulation on food production, availability, marketing, and safety.

- 430 Food Processing: Fruits and Vegetables**
Fall. 3(2-3) P:M: (FSC 211) R: Not open to freshmen or sophomores. SA: FSC 330

Fruit and vegetable composition and quality indices. Harvest technology, post-harvest physiology, and preparatory systems. Principles and applications of thermal processing, freezing, and specialized techniques.

- 431 Food Processing: Cereals**
Spring. 3(2-3) P:M: (FSC 211) R: Not open to freshmen or sophomores. SA: FSC 331

Classification and composition of cereals. Milling processes. Cereal product manufacture.

- 432 Food Processing: Dairy Foods**
Spring. 3(2-3) P:M: (FSC 211 or ANS 210) R: Not open to freshmen or sophomores. SA: FSC 332

Principles for production and processing of safe and wholesome dairy foods. Practical experience in safety and quality assurance systems and in the processing of fluid milk, cultured products, cheese, and frozen desserts.

- 433 Food Processing: Muscle Foods**
Fall. 3(2-3) P:M: (FSC 211 or ANS 210) R: Not open to freshmen or sophomores. SA: FSC 333

Manufacturing practices and principles of fresh, frozen, and cured meats and fish. Processed products from muscle foods. Egg characteristics. Product formulation and quality control.

- 440 Food Microbiology**
Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. P:M: (MMG 205 or MMG 301) and completion of Tier I writing requirement. R: Not open to freshmen or sophomores. SA: MPH 440

Major groups of microorganisms of importance to the food industry. Emphasis on ecological, physiological, and public health aspects.

- 441 Food Microbiology Laboratory**
Spring. 2(0-4) Interdepartmental with Microbiology and Molecular Genetics. P:M: (FSC 440 or concurrently) and completion of Tier I writing requirement. RB: (MMG 206 or MMG 302) SA: MPH 441

Methods for studying major groups of microorganisms important to the food industry. Isolation, enumeration, characterization, identification, and use of microorganisms.

- 455 Food Analysis**
Fall. 3(2-3) P:M: (BMB 200) or (BMB 401 or concurrently) and completion of Tier I writing requirement.

Principles and application of analytical techniques. Analysis for fats, proteins, carbohydrates, minerals, vitamins, and additives. Techniques include spectroscopy, fluorimetry, chromatography, electrophoresis, and proximate composition.

- 470 Integrated Approaches to Food Product Development**

Fall, Spring. 3(2-3) P:M: (FSC 402 or concurrently or FSC 441 or concurrently or FSC 455 or concurrently) RB: (FSC 325 and BE329) R: Open only to seniors or graduate students.

Food product development including obtaining, screening, and selecting ideas. Integration of food processing, chemistry, analysis, and microbiology for the design, production, and evaluation of a food product.

- 477 Food Engineering: Fluids**
Fall. 3(2-2) Interdepartmental with Biosystems Engineering. Administered by Department of Agricultural Engineering. P:M: (BE 350 and BE 351) RB: (CE321 or CHE311 or ME332) SA: FE 465

Unit operations, process engineering, equipment, and industrial practices of the food industry. Manufactured dairy products: thermal processing, pipeline design, heat exchange, evaporation, dehydration, aseptic processing, membrane separation, cleaning, and sanitation.

- 490 Special Problems in Food Science**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Not open to freshmen or sophomores. Approval of department; application required.

Individual study of selected topics in food science. Supervised independent study.

- 493 Professional Internship in Food Science**
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in Food Science. Approval of department; application required. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, AEE 493, ANR 493, ANS 493, CSS 493, EEP 493, FSC 493, FIM 493, FW 493, HRT 493, PKG 493, PLP 493, PRR 493, and RD 493.

Supervised professional experiences in agencies and businesses related to food science.

FORESTRY FOR

Department of Forestry College of Agriculture and Natural Resources

- 101 Michigan's Forests**
Spring. 3(3-0)

Ecological, social and economic roles of Michigan's forests in historic and contemporary context. Geographic similarities and differences in forest resources.

- 201 Tenets of Forestry**
Fall. 1(1-0) R: Open only to students in the Department of Forestry.

History, founding principles, and core concepts of forestry. Stewardship, conservation, professional ethics, and current forestry issues.

- 202 Introduction to Forestry**
Fall, Spring. 3(3-0)

Historical development of forestry. Forest growth, protection, management, and products. Relationship of national and world economy and policy to forestry. Emphasis on multiple uses of forests.

- 204 Forest Vegetation**
Fall. 4(3-3)

Nomenclature, classification, and identification of woody plants. Tree structure as it relates to growth and ecosystem dynamics.

- 206 Natural Resource Data Analysis**
Spring. 3(2-2) RB: (CSE 101 or CSE 131) SA: FOR 207

Quantitative analysis of natural resource data. Modeling and display of biophysical and socio-economic data related to natural resource systems.

- 210 Fundamentals of Soil and Landscape Science**
Fall, Spring. 3(2-3) Interdepartmental with Crop and Soil Sciences. Administered by Department of Crop and Soil Sciences. RB: (CEM 141)

Agricultural and natural resource ecosystems: soil, vegetation and ground water components. Energy, water and nutrient cycles. Soil classification and mapping. Land management and use issues.

- 211 Introduction to Gender and Environmental Issues**
Spring. 3(3-0) Interdepartmental with Fisheries and Wildlife; Environmental Economics and Policy; Resource Development; Women's Studies. Administered by Department of Fisheries and Wildlife. R: Not open to freshmen. SA: PRM 211

The concept of gender. Overview of environment and habitat. Historical gender roles in environmental management. Gender-based theoretical perspectives. Case studies on developing and developed countries. Environmental management with emphasis on fisheries, wildlife and wetlands. Women environmental professionals.

- 220 Forests and the Global Environment**
Fall. 3(3-0)

Relationships between forests, climatic and edaphic factors, and human influences upon forest resources. Deforestation, biodiversity, sustainable forest management and timber trade.

- 230 Communicating Forestry Issues**
Spring. 3(2-2) R: Open only to students in the Department of Forestry.

Identification of targeted publics for forestry issues information strategies. Public presentations, press releases, public participation activities and organizational communication.

- 304 Wood Technology**
Fall. 4(3-2) P:M: (CEM 141 and PHY 231) and (MTH 116 or MTH 104 or LBS 117) R: Not open to freshmen or sophomores.

Structure and identification of wood. Physical and mechanical characteristics. Major industrial timber utilization processes including manufacture of lumber, furniture, composites, and paper.

- 306 Forest Biometry**
Spring. 4(3-2) P:M: (MTH 124 or MTH 132 or LBS 118) RB: (FOR 204 and FOR 206) R: Not open to freshmen or sophomores.

Describing location and area of forest resources. Quantification of site, stand, and tree characteristics. Sampling and inventory. Predicting growth and yield.

- 310 Foundations of Forest Conservation**
Spring. 2(2-0) R: Not open to freshmen or sophomores.

Analysis of current forest conservation issues. Synthesis of classical forest conservation literature.

- 404 Forest and Agricultural Ecology**
Fall. 3(3-0) Interdepartmental with Crop and Soil Sciences. P:M: (CSS 210) and (BOT 105 or BS 110) RB: (ZOL 355)
Ecological interactions crucial to the sustainable management of crop and forest ecosystems. Plant resources, competition, community development and dynamics, biodiversity, primary productivity, nutrient cycling, ecosystem structure and function, and impacts of global environmental change.
- 404L Forest and Agricultural Ecology Laboratory**
Fall. 1(0-3) Interdepartmental with Crop and Soil Sciences. P:M: (CSS 210) and (BOT 105 or BS 110) and (FOR 404 or concurrently) RB: (ZOL 355)
Field studies and data analysis of ecological processes central to the sustainable management of forest and agricultural resources. Field exercises cover primary production, community structure, soil resources, biodiversity, succession, nutrient cycling, critiques of primary literature. Two weekend field trips required.
- 406 Silviculture**
Spring. 4(3-3) P:M: (FOR 204 and FOR 404) R: Not open to freshmen or sophomores.
Ecophysiology of tree growth and reproduction. Stand structure, composition and growth. Intermediate stand treatments. Natural and artificial reproduction. Silvicultural techniques.
- 408 Forest Management**
Spring. 4(3-2) P:M: (FOR 206 and FOR 406)
Management of forests for timber production in a multiple-use context. Yield projections, harvest scheduling, management prescriptions, project analysis and administration.
- 410 Forest Conservation Thesis (W)**
Fall, Spring. 3(3-0) P:M: Completion of Tier I writing requirement. RB: (FOR 310) R: Open only to seniors in the Department of Forestry.
Selecting, researching, and evaluating a forest conservation issue and communicating findings in a thesis and a departmental seminar.
- 419 Applications of Geographic Information Systems to Natural Resources Management**
Spring. 4(2-4) Interdepartmental with Fisheries and Wildlife; Geography; Park, Recreation and Tourism Resources; Resource Development; Biosystems Engineering. Administered by Department of Fisheries and Wildlife. RB: (GEO 221)
The application of geographic information systems, remote sensing, and global positioning systems to integrated planning and management for fish, wildlife, and related resources.
- 420 Forestry Field Studies**
Spring. 3 credits. Spring: Offered at Huron-Manistee Ntl Frst.. P:M: (FOR 306 and FOR 406) R: Open only to juniors or seniors in the College of Agriculture and Natural Resources.
Ecological and silvicultural assessments and planning for multiple uses of forest lands. Forest management concepts including soils, biometry, harvesting and protection.
- 430 Law and Resources**
Fall. 3(3-0) Interdepartmental with Resource Development; Environmental Economics and Policy. Administered by Department of Resource Development. R: Open only to juniors or seniors or graduate students. SA: PRM 430
Legal principles applied to the environment and natural resources. Sovereignty, property rights, land and water use, jurisdiction, public trust doctrine, wetland law, and eminent domain. Case and statutory law analysis.
- 441 Plant Breeding and Biotechnology**
Spring of even years. 4(3-2) Interdepartmental with Crop and Soil Sciences; Horticulture. Administered by Department of Crop and Soil Sciences. P:M: (CSS 350)
Plant improvement by genetic manipulation. Genetic variability in plants. Traditional and biotechnological means of creating and disseminating recombinant genotypes and cultivars.
- 450 Forestry in International Development**
Fall. 3(3-0) Interdepartmental with Sociology. RB: (FOR 404) R: Open only to seniors or graduate students.
Biophysical, social and economic factors influencing design and implementation of farm, village and community level forestry and agroforestry projects.
- 451 Cellular and Molecular Principles and Techniques for Plant Sciences**
Spring. 4(2-6) Interdepartmental with Crop and Soil Sciences; Horticulture. Administered by Department of Crop and Soil Sciences. RB: (CSS 350 or ZOL 341)
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology, transformation, cell tissue, and organ culture in relation to plant improvement.
- 452 Watershed Concepts**
Fall, Spring, Summer. 3(3-0) Interdepartmental with Resource Development; Biosystems Engineering; Crop and Soil Sciences; Fisheries and Wildlife. Administered by Department of Resource Development. P:M: (RD 324 and ZOL 355) RB: organic chemistry
Watershed hydrology and management. The hydrologic cycle, water quality, aquatic ecosystems and social systems. Laws and institutions for managing water resources.
- 460 Arboriculture**
Fall. 3(2-2) P:M: (BOT 105) and (FOR 204 or HRT 211) R: Not open to freshmen or sophomores.
Tree selection and planting to fit climatic, space and edaphic conditions. Diagnosing tree abnormalities. Cultural practices used in the care and maintenance of shade and ornamental trees. Field trip required.
- 461 Urban Forestry**
Spring. 3(3-0) P:M: (FOR 204 or HRT 211) R: Not open to freshmen or sophomores.
Trees in improving the urban environment. Principles of urban forest management: legal, economic, organizational, and cultural. Street tree planning and inventory systems. Utility forestry and commercial arboriculture. Field trips required.
- 464 Natural Resource Economics and Social Science (W)**
Fall. 3(2-2) Interdepartmental with Fisheries and Wildlife; Park, Recreation and Tourism Resources; Resource Development. P:M: (EC 201 or EC 202) and completion of Tier I writing requirement. R: Not open to freshmen or sophomores.
Application of economic and social science principles and techniques to production and consumption of natural resources. Benefit-cost analysis. Regional impact analysis. Social impact assessment.
- 466 Natural Resources Planning and Policy**
Spring. 3(2-2) Interdepartmental with Fisheries and Wildlife; Park, Recreation and Tourism Resources; Resource Development. R: Open only to seniors or graduate students in the Department of Forestry or Department of Fisheries and Wildlife or Department of Park, Recreation and Tourism Resources or Department of Resource Development.
Scientific, environmental, social, and institutional factors affecting planning and policy-making. Focus on ecosystem-based planning and policy issues through development of a multiple-use plan. Case studies.
- 478 Pest Management II: Biological Components of Management Systems (W)**
Spring of even years. 3(2-3) Interdepartmental with Entomology; Crop and Soil Sciences; Fisheries and Wildlife; Horticulture. Administered by Department of Entomology. P:M: (ENT 404 or ENT 470 or PLP 405 or CSS 402 or FW 328) and completion of Tier I writing requirement.
Principles of host plant resistance and biological control and their relationship to the design of agroecosystems. Classification of insect biological control agents.
- 480 Woody Plant Physiology**
Spring. 3(3-0) Interdepartmental with Horticulture. Administered by Department of Horticulture. P:M: (PLB 105 or BS 110) R: Not open to freshmen or sophomores.
Physiology of carbon utilization. Effects of water, temperature, nutrition, and light on apical, vegetative, and reproductive growth of woody plants.
- 486 Biotechnology in Agriculture: Applications and Ethical Issues**
Fall of even years. 3(3-0) Interdepartmental with Horticulture; Crop and Soil Sciences; Philosophy. Administered by Department of Horticulture. P:M: (BOT 105 or BS 111) RB: (CSS 350 or ZOL 341) R: Not open to freshmen or sophomores.
Current and future roles of biotechnology in agriculture: scientific basis, applications. Environmental, social, and ethical concerns.
- 490 Independent Study in Forestry**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to juniors or seniors. Approval of department.
Special problems course for students qualified for advanced study in some phase of forestry.