

351 Retail Management
 Fall, Spring, Summer. 3(3-0) Interdepartmental with Marketing and Supply Chain Management. Administered by Department of Marketing and Supply Chain Management. P:M: (MSC 300 or MSC 327) R: Open only to juniors or seniors in the Eli Broad College of Business or the Food Industry Management or Merchandising Management major. SA: ML 351, MTA 351

Domestic and international retailing structure, environment, and development. Managerial strategy. Locational, purchasing, organizational, personnel and promotional techniques. Retail budgeting and control. Social and ethical considerations.

400 Public Policy Issues in the Agri-Food System
 Spring. 3(3-0) Interdepartmental with Agribusiness Management. Administered by Department of Agricultural Economics. P:M: (ABM 100) R: Open only to juniors or seniors. SA: FSM 421

Objectives, alternatives and consequences of public policy in the agri-food system. Analysis of economic implications for food and agribusiness firms, farmers, consumers and society.

410 Advanced Professional Seminar in Food Industry Management
 Fall. 1(1-0) P:M: (ABM 210 or FIM 210) R: Open only to Food Industry Management juniors or seniors.

Advanced professional problems and reestablishment of career planning in the agri-food system. Industry trends, career alternatives, and job search strategies. Enhanced verbal, written and visual communication techniques.

422 Vertical Coordination in the Agri-Food System
 Fall. 3(3-0) Interdepartmental with Agribusiness Management. Administered by Department of Agricultural Economics. P:M: (ABM 100 and EC 201) R: Open only to juniors or seniors. SA: FSM 443

Analysis of vertical coordination in the industrialized agri-food system. Agricultural cooperatives, contracts, marketing orders, and trade associations. Analysis of imperfect competition and methods of conducting business. Interaction with legal systems and government.

427 Global Agri-Food Industries and Markets
 Fall. 3(3-0) Interdepartmental with Agribusiness Management. Administered by Department of Agricultural Economics. P:M: (FIM 220 or ABM 225)

Strategic understanding of the international agri-food system. Analysis of global production, marketing, and consumption. Knowledge of changing conditions in international industries and markets. Global trends and opportunities.

439 Food Business Analysis and Strategic Planning(W)
 Fall. 3(3-0) Interdepartmental with Marketing and Supply Chain Management. P:M: (FIM 220) R: Open only to juniors or seniors SA: ML 439, MTA 439, MSC 439

Principles and techniques of business analysis and strategic planning applied to food firms. Food trend forecasts, market potential, competition and cost analyses, business and strategic planning.

490 Independent Study in Food Industry Management

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: (ABM 100) R: Open only to sophomores or juniors or seniors in the Food Industry Management major. Approval of department: Application required. Students are limited to a combined total of 6 credits in ABM 490 and FIM 490. SA: FSM 490

Independent supervised study in topics in food industry management.

493 Professional Internship in Food Industry management

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: (ABM 100) R: Open only to juniors or seniors in the Food Industry Management major. 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, FIM 493, FW 493, HRT 493, PKG 493, PLP 493, PRR 493, and RD 493.

Supervised professional experience in the food industry.

FOOD SCIENCE FSC

Department of Food Science and Human Nutrition College of Agriculture and Natural Resources

120 What's for Dinner: Science on Your Plate
 Fall, Spring. 1(2-0) Not open to students with credit in FSC 229.

Relationship between science and food. Current issues and future challenges in food science. Impact of technology, government, consumers and the media.

150 Introduction to Human Nutrition
 Fall, Spring, Summer. 3(3-0) Interdepartmental with Human Nutrition and Foods. Administered by Department of Food Science and Human Nutrition.

Nutrition needs in life stages from a human ecological perspective. Domestic and international factors affecting the availability of a safe, nutritious food supply. Relationships of food choices to health and disease.

211 Principles of Food Science
 Fall, Spring. 3(3-0)
 Scientific principles, historical perspective, and current status of technology related to food composition, safety, toxicology, processing, preservation, and distribution.

275 Seafood Systems Management
 Spring. 3(3-0) Interdepartmental with Fisheries and Wildlife, Animal Science. Administered by Department of Fisheries and Wildlife.

Domestic and international perspectives on major aquatic foods. Cultural and nutritional value; wild harvest; aquaculture; processing technology; food handling and food safety.

320 Muscle Foods
 Spring. 3(2-3) Interdepartmental with Animal Science. Administered by Department of Animal Science. P:M: (ANS 210 or FSC 211 or HNF 150)

Structure of muscle. Meat technology and merchandising concepts.

325 Food Processing: Unit Operations
 Fall, Spring. 4(2-6) P:M: (ANS 210 or FSC 211) and completion of Tier I writing requirement. SA: FSC 229, FSC 339

Principles, technologies, and applications in conversion of raw products into high quality foods. Unit operations: thermal processing, irradiation, freezing, membrane fractionation, enzyme technologies, dehydration and refrigeration. Field trip required.

329 Fundamentals of Food Engineering
 Spring. 3(3-0) Interdepartmental with Biosystems Engineering. Administered by Department of Agricultural Engineering. P:M: (FSC 229) and (MTH 126 or LBS 118) and (PHY 231 or LBS 164) RB: (FSC 211) SA: FE 329

Unit operations in food industry: fluid mechanics, heat transfer, rate processes, refrigeration, freezing, and dehydration. Thermal process calculations.

342 Food Safety and Hazard Analysis Critical Control Point Program
 Fall. 3(3-0) RB: (FSC 211 or concurrently or HNF 150 or concurrently or HNF 311 or concurrently) or a prior or concurrent basic course in microbiology, chemistry or biological sciences. SA: FSC 442

Sources of microbiological, chemical and physical hazards; minimizing microbial growth and survival; good manufacturing, cleaning and sanitation practices; Hazard Analysis Critical Control Point Programs in food processing and food service.

401 Food Chemistry
 Fall. 3(3-0) P:M: (BMB 200 or CEM 352) or (BMB 401 or concurrently) R: Not open to freshmen or sophomores.

Organic and biological reactions of food constituents. Chemical changes in foods during processing and storage affecting texture, color, flavor, stability, and nutritive qualities.

402 Food Chemistry Laboratory
 Fall. 1(0-3) P:M: (FSC 401 or concurrently) and completion of Tier I writing requirement.
 Chemical changes in food constituents which affect stability of food products and properties such as color, flavor and texture.

407L Toxicology Methods Laboratory
 Fall. 2(0-4) Interdepartmental with Animal Science. Administered by Department of Animal Science. RB: (ANS 407 or concurrently) R: Not open to freshmen or sophomores.

Laboratory techniques for evaluating potential toxicity of chemicals to living systems. Field trip to industrial toxicology laboratory required.

420 Quality Assurance
 Fall. 2(2-0) P:M: (STT 200 or STT 201 or STT 231 or STT 315 or STT 351) and (FSC 211 or concurrently or ANS 210 or concurrently or HRT 204 or concurrently) R: Open only to juniors or seniors or graduate students in the Department of Food Science and Human Nutrition or in the Food Processing and Technology Specialization.

Theory and application of quality assurance programs for food processing industries.

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.