801 Chemistry of Food Lipids
Fall of odd years. 3(3-0) RB: (FSC 401 and BMB 461)
Composition and structure of lipids: physical and chemical properties in relation to their function in foods.

802 Food Proteins
Spring of even years. 3(3-0) RB: (BMB 461 and FSC 401)
Use of proteins and enzymes in the food industry. Functional properties of proteins and enzymes in food systems.

807 Advanced Food Toxicology
Fall of even years. 3(3-0) Interdepartmental with Animal Science; Human Nutrition and Foods. R: Approval of department.
Toxicology related to food safety. Metabolism of toxicants as influenced by food constituents, mutagenesis, and chemical carcinogenesis. Risk assessment.

831 Advanced Cereal Science
Fall of even years. 3(3-0) RB: (BMB 401 and FSC 331 and FSC 401) or approval of department.
Physico-chemical properties of major constituents in cereal grains. Relationship of constituent structures to functionality in the processing of cereal grains into food products, with emphasis on wheat.

840 Advanced Food Microbiology
Spring of odd years. 3(3-0) RB: (FSC 440)

842 Foodborne Diseases
Spring of odd years. 3(3-0) RB: (FSC 440 or FSC 840)
Epidemiology, isolation, characterization, clinical manifestations, pathogenicity, incidence and control of bacterial, parasitic and viral foodborne pathogens and associated toxins.

850 Analytical Techniques in Food Science
Summer of odd years. 2(1-2) R: Open only to graduate students in Food Science or Human Nutrition.
Theory and application of dynamic rheological testing, nucleic acid and protein analysis, and immunological techniques. Other new technologies related to food science.

860 Research in Food Processing Technology
Summer of even years. 2(1-2) R: Open only to graduate students in Food Science, Human Nutrition, Animal Science, and Horticulture.
Theory, application, and evaluation of food processing technology: ultrafiltration, food irradiation, and critical point extraction.

890 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: Open only to graduate students in Food Science. Approval of department; application required.
Individual investigation of an area of food science.

891 Selected Topics in Food Science
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in Foods or Food Science or Human Nutrition.
Topics of current interest and importance in basic and applied areas of food science.

892 Food Science Seminar
Fall, Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to graduate students in Food Science.
Critical review of literature. Organization and communication of scientific data in food science.

898 Master's Research
Fall, Spring. Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. R: Open only to master's students in Food Science. Approval of department.
Directed research in support of Plan B master's degree requirements.

899 Master's Thesis Research
Fall, Spring. Summer. 1 to 10 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to M.S. students in Food Science.
Master's thesis research.

900 Doctoral Dissertation Research
Fall, Spring. Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Food Science.
Doctoral dissertation research.

999 Doctoral Thesis Research
Fall, Spring. 1 to 10 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Food Science.
Doctoral dissertation research.

999 Doctoral Dissertation Research
Fall, Spring. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Food Science.
Doctoral dissertation research.

809 Issues in Forensic Science
Fall, Spring. 2 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
Forensic science research, practice and legal processes.

890 Independent Study
Fall, Spring. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Individual research and writing under faculty supervision.

894 Practicum
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Observation, study, and work in selected forensic science agencies.

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Planned research and writing directed by student's thesis committee.

FORENSIC SCIENCE FRS

School of Criminal Justice
College of Social Science

899 Doctoral Dissertation Research
Fall, Spring. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course.
Doctoral dissertation research.

FOR—Forestry

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: (CEM 101 or CEM 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)

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

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, 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) 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

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.

409 Forest Hydrology
Spring. 3(2-2) Interdepartmental with Crop and Soil Sciences; Resource Development. RB: (CSS 210 and MTH 116) or (MTH 104 or LBS 117) R: Not open to freshmen or sophomores. Science and technology of the hydrologic cycle and water resources in forest, wildland, and rural watersheds.

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; Parks, 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. 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. RB: (RD 301) R: Open only to juniors or seniors or graduate students. SA: PRM 430 Legal principles applied to natural resource use. Sovereignty, property rights, land and water use, jurisdiction, public trust doctrine, fish and game law, mineral rights, 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 credits. 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 in 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.
858 **Gender, Justice, and Environmental Change: Issues and Concepts**  
Spring of odd years. 3(3-0)  
Interdepartmental with Anthropology; Fisheries and Wildlife; Resource Development; Sociology. Administered by Department of Anthropology. RB: Background in social science, environmental science, or natural resources. Issues and concepts related to gender, ecology, and environmental studies. Key debates and theoretical approaches to addressing environmental issues from a gender and social justice perspective. Gender and environment issues and processes from a global perspective.  
859 **Gender, Justice, and Environmental Change: Methods and Application**  
Spring of even years. 3(3-0)  
Interdepartmental with Anthropology; Fisheries and Wildlife; Resource Development. Administered by Department of Anthropology. RB: Background in social science, environmental science, or natural resources. Methods and case studies related to gender, ecology, and environmental studies. Methodological and fieldwork issues from a feminist perspective and in international/intercultural contexts. Qualitative and quantitative methods for integrating social and environmental data.  
860 **Economics of Renewable Resources**  
Spring of odd years. 3(2-2)  
Interdepartmental with Resource Development. RB: (AEC 829 or EC 803 or EC 805)  
Applications of economic theory and analysis to renewable natural resources problems. Focus on renewable resource interactions, including multiple-use forestry and agroforestry.  
861 **Techniques of Analyzing Unbalanced Research Data**  
Spring. 4(4-0)  
Interdepartmental with Animal Science; Crop and Soil Sciences; Fisheries and Wildlife; Horticulture. Administered by Department of Animal Science. RB: (STT 464) R: Open only to graduate students in the College of Agriculture and Natural Resources. SA: ANS 943 Not open to students with credit in ANS 943. Linear model techniques to analyze biological research data characterized by missing and unequal number of observations in classes. Simultaneous consideration of multiple factors. Prediction of breeding values and estimation of population parameters from variance and covariance components.  
890 **Special Problems**  
Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 7 credits in all enrollments for this course. R: Approval of department; application required. Advanced individual study in an area of forestry.  
891 **Selected Topics in Plant Breeding and Genetics**  
Fall, Spring, Summer. 1 to 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Horticulture; Crop and Soil Sciences. Administered by Department of Horticulture. R: Open only to graduate students in Plant Breeding and Genetics or Genetics. Approval of department. Selected topics in plant breeding.  
892 **Plant Breeding and Genetics Seminar**  
Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Horticulture; Crop and Soil Sciences. Administered by Department of Horticulture. Experience in review, organization, oral presentation, and analysis of research.  
893 **Advanced Environmental and Resource Economics**  
Spring of even years. 3(3-0)  
Interdepartmental with Agricultural Economics; Economics; Park, Recreation and Tourism Resources; Resource Development. Administered by Department of Agricultural Economics. RB: (AEC 829 and EC 805) Advanced economic theory of environmental management and policy. Treatment of externalities and market and non-market approaches to environmental improvement. Topics in conservation and sustainable economic growth. Applications to research and policy.  
895 **Environmental and Resource Economics Research**  
Spring of odd years. 3(3-0)  
Interdepartmental with Agricultural Economics; Resource Development; Park, Recreation and Tourism Resources; Economics. Administered by Department of Agricultural Economics. RB: (AEC 829 and EC 805) SA: AEC 991H Topics such as contingent or non-market valuation, institutional analysis, pollution prevention, environmental quality and location, recreational demand modeling, and environmental risk management. Research process in environmental and resource economics.  
941 **Quantitative Genetics in Plant Breeding**  
Spring. 2(1-2)  
Interdepartmental with Crop and Soil Sciences; Horticulture. Administered by Department of Crop and Soil Sciences. RB: CSS 819 and STT 464 Theoretical and genetic basis of statistical analysis of quantitative traits using genetic markers. Computational tools for the study of quantitative traits.  
976 **Multivariate Methods in Agriculture and Natural Resources**  
Spring. 4(4-0)  
Interdepartmental with Animal Science; Fisheries and Wildlife. RB: (STT 422 and MTH 314) R: Open only to graduate students in the College of Agriculture and Natural Resources and in the Interdepartmental Graduate Specializations in Ecology and Evolutionary Biology. Application of multivariate methods to research problems. Hotelling’s T-test, profile analysis, discriminant analysis, canonical correlation, principal components, principal coordinates, correspondence analysis, and cluster analysis.  
999 **Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Forestry. Doctoral dissertation research.  

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**FRENCH**  

**Department of Romance and Classical Languages**  

**College of Arts and Letters**  

101 **Elementary French I**  
Fall, Spring. 4(4-1) Not open to students with credit in FRN 150. Practice in using and understanding French to develop listening, speaking, reading, and writing skills. Pronunciation, grammar, vocabulary, and cultural topics.  
102 **Elementary French II**  
Fall, Spring. 4(4-1) P:M: (FRN 101) or designated score on French placement test. Not open to students with credit in FRN 150. Further practice in using and understanding French to develop listening, speaking, reading, and writing skills. Pronunciation, grammar, vocabulary, and cultural topics.  
150 **Intensive Review of Elementary French**  
Fall, Spring. 5(5-1) P:M: Designated score on French placement test. RB: Two years of high school French or the equivalent. R: Open to students with high school credit in French. Not open to students with credit in FRN 101 or FRN 102. Intensive review of elementary-level French for students who have had at least two years of French at the secondary level and who need to strengthen communication skills and knowledge of French language and culture.  
201 **Second-Year French I**  
Fall, Spring. 4(4-0) P:M: (FRN 102 or FRN 150) or designated score on French placement test. RB: Intermediate-level review and development of aural comprehension, speaking, reading, and writing skills. Topics in the cultures of the French-speaking world.  
202 **Second-Year French II**  
Fall, Spring. 4(4-0) P:M: (FRN 201) Further review and development of aural comprehension, speaking, reading, and writing skills. Topics in the cultures of the French-speaking world.  
250 **Intensive Intermediate French**  
Fall, Spring. 6(5-2) P:M: (FRN 102 or FRN 150) or designated score on French placement test. RB: Study Abroad experience in a French-speaking country. R: Approval of department. Not open to students with credit in FRN 201 or FRN 202. Intensive intermediate-level French. Development of oral comprehension, speaking, reading and writing skills. Topics in the cultures of the French-speaking world. Strengthen communication skills, cross-cultural understanding, critical thinking.