490. Independent and Supervised Study
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 7 credits in all enrollments for this course. P: FSM 200; MSC 335 or FSM 330. R: Open only to FSM majors. Approval of department; application required.
In-depth independent study of topics and issues affecting the food system. Complementary to previous coursework, adapted to career aspirations.

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 Forestry students. Completion of Tier I writing requirement.
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, Spring. 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) P: CSE 101 or CSE 131 or approval of department. Interdepartmental with Resource Development.
Quantitative analysis of natural resource data. Modeling and display of biophysical and socioeconomic data related to natural resource systems.
SA: FOR 207

210. Fundamentals of Soil and Landscape Science
Fall, Spring. 3(2-3) Interdepartmental with Crop and Soil Sciences. Administered by Crop and Soil Sciences. P: (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; Public Resource Management; Resource Development; and Women's Studies. Administered by Fisheries and Wildlife. R: Not open to freshmen.
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 Forestry major.
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: CEM 141, PHY 231, MTH 116 R: Not open to freshmen and 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: FOR 204, FOR 207; MTH 124 or MTH 132. R: Not open to freshmen and 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 and sophomores.
Analysis of current forest conservation issues. Synthesis of classical forest conservation literature.

404. Forest and Agricultural Ecology
Fall. 4(3-3) Interdepartmental with Crop and Soil Sciences. P: CSS 210; BOT 105 or BS 110
Structure and function of ecosystems managed for crop and wood production. Productivity, nutrient cycling, community dynamics as affected by management intensity and natural disturbance. Dynamics of managed versus natural ecosystems.

406. Silviculture
Spring. 4(3-3) P: FOR 204, FOR 404 R: Not open to freshmen and 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: FOR 206, 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; and Resource Development. P: CSS 210, MTH 116 R: Not open to freshmen or sophomores.
Science and technology of the hydrologic cycle and water resources in forest, wildland, wetland, and rural watersheds.

410. Forest Conservation Thesis (W)
Fall, Spring. 3(3-0) P: FOR 310 R: Open only to seniors in the Forestry major.
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; and Biosystems Engineering. Administered by Fisheries and Wildlife. P: (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 Ntll Frst.. P: FOR 306, FOR 404, FOR 406, or concurrently. 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 credits. Interdepartmental with Resource Development; and Public and Resource Management. Administered by Resource Development. P: RD 200; EC 201 or GBL 395.
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; and Horticulture. Administered by Crop and Soil Sciences. P: (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. P: FOR 404 R: Open only to seniors and 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; and Horticulture. Administered by Crop and Soil Sciences. P: (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.

460. Arboriculture
Fall. 3(2-2) P: BOT 105; FOR 204, or HRT 211. R: Not open to freshmen and 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: FOR 204 or HRT 211. R: Not open to freshmen and 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; and Resource Development. P: EC 201 or EC 202. R: Not open to freshmen and sophomores. Completion of Tier I writing requirement.
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; and 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 credits. Interdepartmental with Entomology; Crop and Soil Sciences; Fisheries and Wildlife; and Horticulture. Administered by Entomology. P: ENT 404 or ENT 470 or BOT 405 or CSS 402 or FW 328. R: 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 Horticulture. P: BOT 301. R: Not open to freshmen and 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
Spring of even years. 3(3-0) Interdepartmental with Horticulture; Crop and Soil Sciences; and Philosophy. Administered by Horticulture. P: BS 111 or BOT 105. R: Not open to freshmen and sophomores.
Current and future roles of biotechnology in agriculture: scientific basis, applications. Environmental, social, and ethical concerns.

490. Independent Study in Forest and Wood Science
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 and seniors. Approval of department.
Special problems course for students qualified for advanced study in some phase of forestry or wood science

802. Forest Science Research
Fall. 2 credits.
The philosophy, nature, and procedures of research in the forestry sciences.

803. Research Processes in Natural Resources
Fall. 3(3-0) Interdepartmental with Resource Development. Administered by Resource Development.
Research planning and implementation. Structure of research organizations. Applications of research results.

804. Forest Ecology
Fall of odd years. 3(3-0) P: (FOR 404)
Processes controlling population, community, ecosystem, landscape, and global ecology of forested systems. Extrapolation across scales, succession, spatial models of forest dynamics, causes and consequences of biodiversity, nutrient cycling, sustainability of managed ecosystems and human-accelerated environmental change.

819. Advanced Plant Breeding
Fall. 3(3-0) Interdepartmental with Horticulture; and Crop and Soil Sciences. Administered by Horticulture. P: CSS 450, STT 422.
Genetic expectations resulting from breeding strategies with cross- and self-pollinated crop plants. Germplasm collections, mapping populations, and modifications of reproductive biology useful for crop improvement.

823. Methods in Genetic Engineering of Plants
Fall of even years. 4(0-8) Interdepartmental with Crop and Soil Sciences; and Horticulture. Administered by Crop and Soil Sciences.
Bacterial transformation. Plant transformation via Ti-plasmid, protoplast/PEG, and electroporation methods. Detection of foreign gene integration and expression.

826. International Development and Sustainability
Summer. 3(3-0) Interdepartmental with Anthropology; Political Science; Resource Development; and Social Science. Administered by Resource Development.
Environmental, economic, political, legal, management, and cultural components of sustainable development.

827. Techniques in Cytogenetics
Fall of odd years. 1(0-3) Interdepartmental with Crop and Soil Sciences; and Horticulture. Administered by Crop and Soil Sciences.
Preparation of chromosomes from commercially important plants for cytogenetic analysis.

829. The Economics of Environmental Resources
Fall. 3(3-0) Interdepartmental with Agricultural Economics; Economics; Park, Recreation and Tourism Resources; and Resource Development. Administered by Agricultural Economics.
Economic principles related to environmental conflicts and public policy alternatives. Applications to water quality, land use, conservation, development, and global environmental issues.

832. Environmental and Natural Resource Law
Fall. 3(3-0) Interdepartmental with Resource Development; Agricultural Economics; Crop and Soil Sciences; and Geography. Administered by Resource Development. P: RD 430.
Origin and development of environmental law. Theories of power, jurisdication, sovereignty, property interests, pollution, and other bases for legal controls of natural resources. Common law and constitutional limitations on governmental power.

835. Silviculture
Fall of even years. 3(3-0) R: Open only to graduate students in Forestry, Fisheries and Wildlife, Botany and Plant Pathology, and Resource Development.
Ecological, genetic, physiological, and societal impacts of silvicultural practices. Current problems in stand management and forest regeneration in temperate and tropical zones.

836. Plant Evolution and the Origin of Crop Species
Fall of even years. 3(3-0) Interdepartmental with Horticulture; Crop and Soil Sciences. Administered by Horticulture. P: CSS 350.
Cultural and biological aspects of the evolution of domestic plants. Origin and diversity of cultivated plants.

837. Water Law
Spring. 3(3-0) Interdepartmental with Resource Development; and Agricultural Economics. Administered by Resource Development. P: RD 430.
Legal principles applicable to surface water and groundwater, private and public water rights, and controls over water resources. Cases, statutes, and administrative procedures.

838. Land Use Law
Spring. 3(3-0) Interdepartmental with Resource Development; Agricultural Economics; and Urban Planning. Administered by Resource Development. P: RD 430.
Public and private land use controls in the U.S. Civil rights, housing, energy problems, growth management, waste management, and land conservation. Cases, statutes and other regulations.
SA: RD 834

842. Population Genetics, Genealogy and Genomics
Fall. 3(3-0) Interdepartmental with Animal Science; Crop and Soil Sciences; Genetics; Fisheries and Wildlife; and Horticulture. RB: Pre-calculus, basic genetics
Population genetic processes underlying patterns of molecular genetic variation. Genealogical approaches to the study of genomic diversity, phylogenetic reconstruction, and molecular ecology.

852. Systems Modeling and Simulation
Fall of even years. 3(3-0) Interdepartmental with Fisheries and Wildlife; Biosystems Engineering; and Resource Development. Administered by Fisheries and Wildlife. P: STT 422 or STT 442 or STT 464 or GEO 463.
General systems theory and concepts. Modeling and simulation methods. Applications of systems approach and techniques to natural resource management, and to ecological and agricultural research.

853. Applied Systems Modeling and Simulation for Natural Resource Management
Spring of odd years. 3(2-2) Interdepartmental with Fisheries and Wildlife; Biosystems Engineering; Resource Development; and Zoology. Administered by Fisheries and Wildlife. P: FW 820 or BE 486 or ZOL 851 or approval of department. R: Open only to seniors and graduate students
Mathematical models for evaluating resource management strategies. Stochastic and deterministic simulation for optimization. System control structures. Team modelling approach.

864. Agroforestry Systems
Spring of even years. 3(3-0) R: Open only to graduate students majors in Botany and Plant Pathology, Crop and Soil Sciences, Forestry, and Horticulture.
Biophysical and ecological aspects of agroecology and agroforestry. Nutrient cycling and the soil, root, tree and crop interface.

866. Economics of Renewable Resources
Spring of odd years. 3(2-2) Interdepartmental with Resource Development. P: 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.

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.

891B. 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; and Crop and Soil Sciences. Administered by 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; and Crop and Soil Sciences. Administered by Horticulture.
Experience in review, organization, oral presentation, and analysis of research.

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.

923. Advanced Environmental and Resource Economics
Spring of even years. 3(3-0) Interdepartmental with Agricultural Economics; Economics; Park, Recreation and Tourism Resources; and Resource Development. Administered by Agricultural Economics. P: (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.

925. Environmental and Resource Economics Research
Spring of odd years. 3(3-0) Interdepartmental with Agricultural Economics; Resource Development; Park, Recreation and Tourism Resources; and Economics. Administered by Agricultural Economics. P: (AEC 829 and EC 805)
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.
SA: AEC 991H

930. Advanced Forest Genetics
Fall of odd years. 2(1-2) Interdepartmental with Crop and Soil Sciences; and Horticulture. P: HRT 819 or HRT 836.
Applications of genetics, plant breeding, and biotechnology to the improvement, and preservation of diversity, of tree species.

941. Quantitative Genetics in Plant Breeding
Spring of even years. 3(3-0) Interdepartmental with Crop and Soil Sciences; and Horticulture. Administered by Crop and Soil Sciences. P: CSS 450, STT 422.
Theoretical genetic basis of plant breeding with emphasis on traits exhibiting continuous variation. Classical and contemporary approaches to the study and manipulation of quantitative trait loci.

943. Techniques of Analyzing Unbalanced Research Data
Spring. 4(4-0) Interdepartmental with Animal Science; Crop and Soil Sciences; Fisheries and Wildlife; and Horticulture. Administered by Animal Science. P: STT 464. R: Open only to graduate students in the College of Agriculture and Natural Resources.
Linear model techniques to analyze research data characterized by missing and unequal number of observations in classes. Simultaneous consideration of multiple factors. Estimable comparisons. Hypothesis testing. Computational strategies. Variance and covariance components. Breeding values.
SA: ANS 943

976. Multivariate Methods in Agriculture and Natural Resources
Spring. 4(4-0) Interdepartmental with Animal Science; and Fisheries and Wildlife. P: STT 422, 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.

FRENCH FRN

Department of Romance and Classical Languages
College of Arts and Letters

101. Elementary French I
Fall, Spring. 4(4-1) R: No previous experience in French or designated score on French placement test. 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.