

**441. Commodity and Futures Marketing**  
Spring. 3(3-0)  
P: FSM 200, EC 201; STT 200 or STT 201 or STT 315.  
R: Not open to freshmen and sophomores.  
Supply, demand and prices in commodity markets. Futures and options and their role in forward pricing. Agricultural and food markets.

**443. Food Industry and Cooperative Marketing**  
Spring. 3(3-0)  
P: FSM 200. R: Not open to freshmen and sophomores.  
Multiple firm and cooperative marketing methods. Organization and operation of cooperatives, marketing orders, trade associations and other forms of group action in the food system.

**462. Agricultural Development in Less Developed Countries**  
Fall. 3(3-0)  
P: EC 201; PRM 260 recommended. R: Not open to freshmen and sophomores.  
Factors responsible for agricultural growth, as well as technical and institutional change. Sustainable strategies for increasing food production and rural incomes.

**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; ML 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. 4(3-3)  
Nomenclature, classification, and identification of woody plants. Tree structure as it relates to growth and ecosystem dynamics.

**207. Natural Resource Data Analysis**  
Spring. 3(2-2)  
P: CPS 100 or CPS 130 or CPS 131 or approval of department.  
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. 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.

**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.

**304. Wood Technology**  
Fall. 4(3-2)  
P: CEM 141, PHY 231. 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: MTH 116, FOR 201, FOR 204. 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.

**404. Forest and Agricultural Ecology**  
Fall. 4(3-3) Interdepartmental with Crop and Soil Sciences.  
P: CSS 210, BOT 105.  
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: CSS 210, FOR 204. 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 420.  
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 of odd-numbered years. 3(2-3) Interdepartmental with Crop and Soil Sciences, and Resource Development.  
P: CSS 210; MTH 116; CPS 100 or CPS 130 or CPS 131.  
R: Not open to freshmen and sophomores.  
Science and technology of the hydrologic cycle and water resources in forest, wildland, wetland, and rural watersheds.

**420. Forestry Field Studies**  
Summer. 3 credits. Offered only at W.K. Kellogg Biological Station and Manistee National Forest.  
P: FOR 304, FOR 306, FOR 404, FOR 406. R: Open only to juniors and seniors in College of Agriculture and Natural Resources.  
Major forest management concepts. Ecology, silviculture, soils, biometry. Timber harvesting and use. Forest protection. Field trips required.

**422. Woody Plant Genetics**  
Fall. 3(2-2)  
P: BOT 105, BOT 301, CSS 350.  
Applications of plant breeding and genetic principles to improve tree species and to preserve biological diversity in forest ecosystems for human benefit.

**430. Law and Resources**  
Fall. 3(3-0) Interdepartmental with Resource Development and Public Resource Management. Administered by Resource Development.  
P: RD 201; EC 201 or GBL 395. R: Not open to freshmen and sophomores.  
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. 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 or FOR 464. 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**  
Fall. 3(2-2) Interdepartmental with Park and Recreation Resources, Fisheries and Wildlife, and Resource Development.  
P: EC 201 or EC 202. R: Not open to freshmen and 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.

**Descriptions — Forestry  
of  
Courses**

- 466. Natural Resources Planning and Policy**  
Spring. 3(2-3) Interdepartmental with Fisheries and Wildlife, Park and Recreation Resources, and Resource Development.  
P: FOR 408; FOR 464 or FW 434 or FW 424; FW 472 or PRR 443 or RD 415 or RD 460. R: Open only to seniors and graduate students in College of Agriculture and Natural Resources.  
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**  
Spring. 3(2-3) Interdepartmental with Entomology, Horticulture, Crop and Soil Sciences, and Fisheries and Wildlife. Administered by Entomology.  
P: ENT 404 or ENT 470 or BOT 405 or CSS 402 or FW 328.  
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-numbered years. 3(3-0) Interdepartmental with Horticulture, Philosophy, and Crop and Soil Sciences. 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
- 801. Forestry Research**  
Fall. 1(1-0)  
R: Open only to graduate students in Forestry.  
The philosophy, nature, and procedures of research in forest science.
- 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**  
Spring of even-numbered years. 3(3-0)  
P: FOR 404.  
Forest productivity, competition and succession. Wildfire, nutrient cycling, timber management. Biodiversity. Gap, wave, and landscape regeneration. Theories and methods of analysis.
- 809. Advanced Wood Technology**  
Spring of even-numbered years. 3(2-2)  
R: Open only to graduate students in College of Agriculture and Natural Resources.  
Mechanical and physical properties of wood. Sorption, swelling, elasticity, and anisotropy. Composite technology and industry practices.
- 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-numbered 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.
- 824. Forest Soils**  
Fall of odd-numbered years. 3(2-2)  
Evaluation and inventory of forest soils and landscape ecosystems. Physical, water, biological, and chemical processes. Nutrient cycling, diagnosis, and fertilization. Variability, geography, and landscape ecology.
- 827. Techniques in Cytogenetics**  
Fall of odd-numbered 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, Resource Development, Park and Recreation Resources, and Economics. 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, jurisdiction, 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-numbered 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-numbered years. 3(3-0) Interdepartmental with Horticulture, and 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.
- 845. Forest Resource Policy**  
Spring of even-numbered years. 3(3-0)  
Models, processes and analytical methods. Interaction of markets, government, and citizens in policy issue development, formulation, implementation and evaluation.
- 864. Agroforestry Systems**  
Spring of even-numbered 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-numbered years. 3(3-0) Interdepartmental with Resource Development.  
P: AEC 821.  
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 or 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.

**910. Modeling for Natural Resources Management**  
Spring of even-numbered years. 3(2-2) Interdepartmental with Resource Development.  
P: AEC 892B.  
Simulation and optimization models for developing resource management strategies. Decision and policy analysis.

**923. Theory of Resource and Environmental Economics**  
Spring of even-numbered years. 3(3-0) Interdepartmental with Agricultural Economics, Resource Development, Park and Recreation Resources, and Economics. Administered by Agricultural Economics.  
P: AEC 829, EC 805.  
Economic theory of environmental change and control. Market and non-market allocation mechanisms. Temporal issues of conservation and growth. Contemporary issues in research and policy.

**930. Advanced Forest Genetics**  
Fall of odd-numbered years. 2(1-2) Interdepartmental with Horticulture, and Crop and Soil Sciences.  
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-numbered 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, Horticulture, and Fisheries and Wildlife. 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.

**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

### 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.

**102. Elementary French II**  
Fall, Spring. 4(4-1)  
P: FRN 101 or designated score on French placement test. R: 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. Review of Elementary French**  
Fall, Spring. 3(3-1)  
R: Open to students with high school credit in French and designated score on French placement test. Not open to students with credit in FRN 101 or FRN 102.  
Review of college first-year French for students who had the language in high school and who need to strengthen communication skills, vocabulary, grammar, and pronunciation before study at the 200 level.

**201. Second-Year French I**  
Fall, Spring. 4(4-0)  
P: FRN 102 or FRN 150 or designated score on French placement test.  
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: FRN 201.  
Further review and development of aural comprehension, speaking, reading, and writing skills. Topics in the cultures of the French-speaking world.

**290. Independent Study**  
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course.  
R: Approval of department.  
Special projects arranged by an individual student and a faculty member in areas supplementing regular course offerings.

**320. Grammar and Composition**  
Fall, Spring. 3(3-0)  
P: FRN 202 or designated score on French placement test.  
Systematic review of grammar. Extensive writing in French.

**330. French Phonetics**  
Fall, Spring. 3(3-0)  
P: FRN 202 or designated score on French placement test.  
Analysis of French pronunciation for listening and speaking.

**340. Introduction to Reading French Literature**  
Fall, Spring. 3(3-0)  
P: FRN 202 or designated score on French placement test.  
Close reading and interpretation of French drama, poetry, fiction, and other prose forms.

## FRN

**350. The Contemporary French Scene**  
Fall. 3(3-0)  
P: FRN 320, FRN 340.  
Institutions, history, arts, and major sociopolitical issues of France and its former colonies from 1945 to the present, with an emphasis on the Fifth Republic; class conducted in French.

**355. French Literature in English Translation**  
Spring of even-numbered years. 3(3-0)  
R: Not open to freshmen.  
Representative works and themes of French literature.

**400. Reading French for Graduate Students**  
Spring. 3(3-0)  
R: Not open to freshmen and sophomores.  
Intensive study of French for graduate students needing a reading knowledge of the language.

**410. Survey of French Literature I**  
Fall. 3(3-0)  
P: FRN 320, FRN 340.  
French literature from the Middle Ages to the Enlightenment.

**420. Survey of French Literature II**  
Spring. 3(3-0)  
P: FRN 320, FRN 340.  
French literature from the Enlightenment to the present.

**425. Advanced Studies in French Language**  
Fall. 3(3-0)  
P: FRN 320, FRN 330; LIN 401 or ROM 401.  
Translation, stylistics, composition, creative writing, prescriptive grammar.

**430. French Linguistics**  
Spring. 3(3-0)  
P: FRN 320, FRN 330; LIN 401 or ROM 401.  
Key issues in French linguistics and contrastive structures of French and English.

**440. Francophone Cultures and Civilizations**  
Spring. 3(3-0)  
P: FRN 350.  
Social, political, intellectual, and artistic life of France and the French-speaking world in relation to the French language, literatures, and other cultural media.

**450. French Literature of the Middle Ages**  
Fall of even-numbered years. 3(3-0)  
P: FRN 410, FRN 420.  
Major currents of the Middle Ages as reflected in the writings of representative authors of the period.

**455. French Literature of the 16th Century**  
Spring of odd-numbered years. 3(3-0)  
P: FRN 410, FRN 420.  
Literature reflecting major currents of the Renaissance and Reformation.

**460. French Literature of the 17th Century**  
Fall of odd-numbered years. 3(3-0)  
P: FRN 410, FRN 420.  
Literature reflecting major currents of the Baroque and classical periods.

**465. French Literature of the 18th Century**  
Spring of even-numbered years. 3(3-0)  
P: FRN 410, FRN 420.  
Literature reflecting major currents of the French Enlightenment.

**470. French Literature of the 19th Century**  
Fall of even-numbered years. 3(3-0)  
P: FRN 410, FRN 420.  
Literature reflecting major currents of nineteenth-century France.