

937. Comparative Nutrition-Minerals
(A H 928.) Spring of even-numbered years. 3 credits. BCH 452, PSL 801. Interdepartmental with and administered by the Department of Animal Science.

Forms and location in body, metabolic roles, deficiency and toxicity signs, interrelationships, requirements and biological availability of sources.

938. Comparative Nutrition-Vitamins
(A H 929.) Spring of odd-numbered years. 4(4-0) BCH 452, BCH 453 or approval of department. Interdepartmental with the Department of Animal Science.

Advanced concepts in function and metabolism of vitamins; mechanism of action at cellular/molecular level. Biosyntheses, deficiencies, toxicity. Modern approaches to isolation and assay. Use of animal models in research.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

FOOD SYSTEMS ECONOMICS AND MANAGEMENT

See Agricultural Economics.

FOREIGN LANGUAGES

See Linguistics and Germanic, Slavic, Asian and African Languages, and Romance and Classical Languages.

FORESTRY FOR

College of Agriculture and Natural Resources

In 305 and 430, field trips are scheduled for several consecutive days away from the campus for integrated field experience, primarily in the second half of spring term of the junior year, so that these courses must be taken concurrently. This precludes enrollment in other courses during that term. The approximate cost of these field trips is \$200.

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

Forestry in its broadest sense, including: historic development, forest growth, protection and management, products, national and world economy and policy. Emphasis on multiple use concepts. One-day field trip required.

203. Resource Ecology
(IDC 200.) Fall, Winter, Spring, Summer. 3(3-0) Interdepartmental with the departments of Fisheries and Wildlife, Geography, Resource Development, and Zoology. Administered by the Department of Fisheries and Wildlife.

Basic concepts of ecology which are the unifying basis for resource management, conservation policy and the analysis of environmental quality. Extensive use of guest lecturers.

204. Forest Vegetation
Fall, Spring. 4(3-2)

Nomenclature, classification, and identification of important trees, shrubs, and herbaceous plants of forest and field.

209. Wood and Its Uses
Fall. 4(3-2)

Macroscopic and microscopic features of wood, species identification, moisture relations, physical and mechanical properties, growth characteristics, fungi and insect attack, and description of products.

220. Plants and Their Environment
Winter. 3(3-0) Intedepartmental with Agriculture and Natural Resources.

Relationships between plants and fundamental climatic, edaphic, and biotic factors; structure and function of different ecosystems in relation to environmental factors.

304. Forest Ecology
Spring. 4(3-3) BOT 205, CSS 210, FOR 204 or BOT 318.

Structure and function of forest ecosystems. Community dynamics in response to disturbance. Life histories of trees related to environment. Extended field trips required.

305. Silviculture
Spring. 4(2-4) FOR 204, CSS 210.

Natural and artificial forest reproduction methods; intermediate stand treatments; nontimber aspects of silviculture; field studies of silvicultural methods. Extended field trips required.

320. Forest Measurements
Spring. 4(3-3) MTH 109 or MTH 111 or approval of department.

Individual tree measurements. Estimation of site quality, stand volume, density, and stocking. Alternative sampling methods; systematic, simple random, and stratified sampling. Plot sampling and point sampling. Extended field trips required.

329. Timber Harvesting
(FOR 429.) Spring. 3(2-3) FOR 309, FOR 305, FOR 402, FOR 424, FOR 425 concurrently.

Felling, bucking and transport of trees to mill site. Capabilities and limitations of mechanical devices, vehicles, and logging systems related to timber size and terrain. Extended field trips required.

330. Forest Protection
Fall. 4(4-0) FOR 304, FOR 305, FOR 320. Interdepartmental with the departments of Botany and Plant Pathology and Entomology.

Procedures used to detect and respond to pest, fire and environmental problems in a variety of forest types.

409. Forest Hydrology
Winter. 3(3-0) FOR 424, Seniors; or approval of department.

Hydrologic cycle, with emphasis on soil, water and ground water regimes; instrumentation and measurement of the various components. Effects of forest management on watersheds and water yields.

410. Forest Tree Improvement
Fall. 3(2-2)

Distribution of genetic variation in natural tree populations. Introduction, selection, progeny testing, species hybridization, and polyploidy to obtain superior tree populations.

411. Tree Physiology
Winter of even-numbered years. 3(3-0) BOT 301.

The fundamental principles of plant physiology with particular reference to the growth and development of woody plants, and consideration of the influence of genetic and environmental factors on physiological processes in trees.

420. Modeling Forest Growth
Winter. 4(3-2) FOR 320, CPS 115 or approval of department.

Individual tree and stand-level growth models. Basic models for individual tree volume. Parameters to estimate growth and yield. Computer models for Lake States species.

424. Forest Soils
Spring. 3(2-3) CSS 210; Juniors or approval of department. Forestry majors: FOR 305, FOR 402, FOR 425, FOR 429 concurrently. Interdepartmental with the Department of Crop and Soil Sciences.

Interrelationships of forest site and the growth of trees. Properties, classification, inventory, productivity and management of forest soils. Effects of silvicultural and forest management practices on the soil.

428. Seminar
Fall. 1(1-0) Seniors.

Current forestry topics.

430. Industrial Timber Utilization Processes
Winter. 3(2-2) FOR 429.

Mechanics and technologies of industrial wood conversion processes, including grading logs and lumber, manufacture of furniture, plywood, particleboard, fiberboard, and paper. Field trips required.

431. Finishing, Preservation and Drying of Wood
Winter. 3(3-0) FOR 309.

Properties, selection, application of decorative and protective coatings, wood preservatives and fire retardants. Air and kiln drying of lumber.

435. Law and Resources
Fall. 3(3-0) R D 417 or GBL 430. Interdepartmental with and administered by the Department of Resource Development.

Legal theories, cases, statutes and constitutional considerations are applied to natural resource utilization. Private and public property interests in natural resources are illustrated through case studies of use conflicts.

446. Range Management
Winter of even-numbered years. 4(4-0) FOR 220 or FOR 304 or approval of department.

The science of range management, with emphasis on range regions, range vegetation management, livestock management practices, range improvements and multiple use values of rangelands.

450. Natural Resource Administration
Spring. 4(4-0) Seniors. Interdepartmental with Agriculture and Natural Resources and the departments of Fisheries and Wildlife, Park and Recreation Resources, and Resource Development.

Concepts and methods of administering wildland properties. The legal, economic and social environment. Benefit-cost analysis of management changes. Unit organization, personnel management and accounting. Presents a systems view of administration.

Description — Forestry

of Courses

- 454. Forestry in International Development**
Winter. 3(3-0)
Assessment of the world's forest resources, forest products industrial development and trade, and restraints of developmental objectives on forestry goals. Issues, policy approaches, and prospects for individual countries.
- 455. Natural Resource Economics**
Fall. 4(3-2) EC 200 or EC 201. Interdepartmental with Agriculture and Natural Resources and the departments of Fisheries and Wildlife, Park and Recreation Resources, and Resource Development.
Basic economic and institutional principles and techniques that govern the production and consumption of renewable natural resources. Natural resource evaluation, project analysis, and distributional considerations.
- 458. Timber Management**
Fall. 4(3-2) FOR 305, FOR 455 or concurrently.
Managing forest lands for timber production and other uses. Compartment examination, silvicultural prescription, yield projection and economic evaluation of timber management programs. Timber sales, harvest scheduling, access roads.
- 460. Arboriculture**
Fall. 3(2-2) Approval of department.
Principles and techniques of species selection, establishment, and cultural practices used in the care and maintenance of shade and ornamental trees. Two-day field trip required.
- 461. Urban Forestry**
Spring. 3(3-0) FOR 460 or approval of department.
Principles of urban forest management: organizational, legal, economic, cultural and environmental. Inventories, utility forestry and commercial arboriculture. Field trips required.
- 465. Forest and Wood Science Problems**
Fall, Winter, Spring, Summer. 1 to 5 credits. Seniors with a 2.80 average, or approval of department.
Special problems course for students qualified for advanced study in some phase of forestry or wood science.
- 466. Natural Resource Planning**
Winter. 3(2-2) FOR 455 or R D 417 or approval of department. Interdepartmental with the departments of Park and Recreation Resources and Resource Development.
Natural resource planning concepts and techniques applicable to area-level and subarea-level planning. Case studies in comprehensive, multiple resource public planning and single resource private planning.
- 491. Natural Resources and Modern Society**
Spring. 3(3-0) Juniors. Interdepartmental with Agriculture and Natural Resources and the Department of Resource Development.
A survey of the social and economic significance of natural resources in modern industrial and urban society. Current problems of natural resources management and use are examined in terms of the society in which they exist.
- 804. Forest Ecology**
Winter. 3(3-0) Approval of department.
Theories, methods of analysis, and discussion of current investigations of energy, nutrients, and biomass dynamics in forest ecosystems.
- 807. Special Problems**
Fall, Winter, Spring, Summer. 2 to 5 credits. May reenroll for credit with a maximum of 10 credits. Approval of department.
Advanced study in administration, biometrics, photogrammetry, dendrology, silviculture, management, economics, ecology, genetics, arboriculture, hydrology, soils, recreation, physiology, policy, entomology, products harvesting, wood preservation, timber mechanics, wood conversion, fire, range management, extension and pathology.
- 809. Natural Resources Economics**
Winter. 3(3-0) Approval of department. Interdepartmental with the Department of Resource Development.
Applications of economic analysis to natural resource problems.
- 814. Plant Breeding and Genetics Seminar**
Winter. 1(1-0) May reenroll for a maximum of 2 credits. Approval of department. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Crop and Soil Sciences.
- 815. Selected Topics in Plant Breeding and Genetics (MTC)**
Fall, Winter, Spring, Summer. 2 to 5 credits. May reenroll for a maximum of 12 credits if different topics are taken. Approval of department. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Crop and Soil Sciences.
Selected topics in plant breeding including: host-plant resistance, nutrition and quality, computerized records and data analysis, classical literature and strategies for improving field, horticulture and forestry crops.
- 816. Special Problems in Plant Breeding and Genetics**
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 8 credits. Approval of department. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Horticulture.
Students may conduct research in a laboratory, greenhouse or field-plot on a selected subject or study selected published literature under the supervision of a faculty member.
- 817. Plant Breeding Methods**
(FOR 823.) Fall. 3(3-0) STT 422 or concurrently. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Crop and Soil Sciences.
Methods, strategies and practices in organization and operation of plant breeding programs. Emphasis on practical application of classical, modern and futuristic approaches to plant breeding.
- 819. Plant Breeding Systems**
(FOR 822.) Winter. 3(3-0) CSS 821, STT 422. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Horticulture.
Breeding systems for improvement of self and cross pollinated and of vegetatively propagated crops. The genetic basis for parent selection.
- 821. Genetic Concepts in Plant Breeding**
Fall. 3(3-0) CSS 350 or ZOL 441. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Crop and Soil Sciences.
Genetic structure of plant populations, gene action, inbreeding, outbreeding, heterosis, linkage and recombination, genetic architecture of traits, genetic distance.
- 828. Seminar**
Fall. 1(1-0)
Critical study and discussion of advanced forestry topics.
- 835. Silviculture**
Fall. 3(3-0) FOR 305 or approval of department.
Biological basis of intensive forest management including seedling production, site evaluation and preparation, plantation establishment, intermediate stand treatments and natural reproduction methods. Field trip optional.
- 836. Evolution of Crop Plants**
Fall of even-numbered years. 3(3-0) CSS 821 or approval of department. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Horticulture.
Cultural and biological aspects of evolution under domestication; origin and diversity of cultivated plants.
- 838. Tissue Culture for Plant Breeding**
Winter of even-numbered years. 3(2-2) BOT 414, CSS 821. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Horticulture.
The application of plant cell, protoplast and tissue culture methodologies and principles to crop improvement.
- 840. Recreation Economics**
Spring. 4(4-0) FOR 809 or approval of instructor. Interdepartmental with the departments of Park and Recreation Resources, and Resource Development. Administered by the Department of Park and Recreation Resources.
Applications of economic analysis to recreation resource problems including measurement of demand and supply, valuation of recreation resources, determination of economic impact, economic decision making and policy considerations.
- 850. Administering the Public Land Agency**
Spring. 4(4-0) FOR 450 or approval of department.
Case studies of administrative problems in land management agencies. Students are organized as teams and prepare team reports on specified aspects of each case.
- 855. The Research Process in Natural Resources**
Fall. 3(3-0) Approval of department. Interdepartmental with and administered by the Department of Resource Development.
Research and decision processes as applied in natural resource investigations. Research organization and applications of research results. Oriented to management, social science, and policy studies. Preparation of project proposals.
- 899. Master's Thesis Research**
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

910. Resource Economics Proseminar
Spring, 3(3-0) May reenroll for a maximum of 9 credits. Approval of department. Interdepartmental with the departments of Agricultural Economics and Resource Development.

A seminar wherein advanced graduate students in the fields of resource economics participate with faculty in the joint conduct of a major research project in resource economics and policy.

940. Theoretical Population Genetics
Winter, 4(4-0) MTH 113, STT 422 or approval of department. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture.

Discussion of mathematical theories in population genetics and experimental works on natural and laboratory populations.

941. Quantitative Genetics in Plant Breeding

Spring of even-numbered years. 4(4-0) STT 423, CSS 823 or approval of department. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture. Administered by the Department of Crop and Soil Sciences.

Calculation and implication of genetic parameters. Linkage. Coancestry and inbreeding. Covariance between relatives. Heritability and selection. Genotype by environment interaction. Emphasis on relationship of quantitative genetics to plant breeding.

944. Physiological Genetics

(830.) Winter of odd-numbered years. 3(3-0) BOT 413; CSS 821. Interdepartmental with the departments of Crop and Soil Sciences, and Horticulture.

Control of variation in higher plants including adaptive physiology, quantitative genetics, growth correlation, biochemical genetics, hybrid physiology, and genealogy.

960. Simulation Models in Natural Resource Management

Winter of odd-numbered years. 3(3-0) R D 855 and knowledge of FORTRAN programming or approval of department. Interdepartmental with and administered by the Department of Resource Development.

The role of simulation models in developing management strategies. Applications of computer simulation in natural resources. Modeling of decision systems in natural resources management.

976. Multivariate Methods in Forestry Research

Winter of even-numbered years. 4(4-0) MTH 334, STT 423.

Application of multivariate techniques such as principal components, canonical analysis, factor analysis, and clustering to problems in forestry research. Case studies drawn from several forestry disciplines.

999. Doctoral Dissertation Research

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

GENERAL BUSINESS AND BUSINESS LAW GBL

(Name change effective July 1, 1984. Formerly the Department of Business Law and Office Administration.)

College of Business and Graduate School of Business Administration

341. Survey of Business Law

Fall, Winter, Spring, 4(4-0) Juniors. Not open to students with majors in the College of Business.

Historical development of the law; courts, court procedures and civil remedies, torts, crimes; contracts, agency, sales, negotiable instruments, real and personal property, including bailments and liens. Textbook and lecture rather than case approach.

345. Business Ethics

Fall, 4(4-0) Juniors. Interdepartmental with and administered by the Department of Philosophy.

Ethical dimensions of the relationships between a business and employees, consumers, other businesses, society, government, and the law. Readings from philosophical and business sources.

400H. Honors Work

Fall, Winter, Spring, Summer. 1 to 15 credits. Approval of department.

Independent and informal study in law, office administration or business communications.

430. Law and Society

Fall, Winter, Spring, Summer. 4(4-0) Seniors or approval of instructor.

Legal reasoning and legal institutions. Court systems and court procedures. Contracts and sales. Sources of and limits on legislative and judicial authority. Property, torts, and crimes.

431. Law and Business

Fall, Winter, Spring, Summer. 4(4-0) GBL 430.

Law of business associations, administrative agencies and process, the constitution and the business enterprise, liability to consumers, securities, regulation of business conduct and structure, business ethics and social responsibility.

447. Hotel Law

Winter, Spring, 4(4-0) GBL 430.

Legal aspects of the hospitality industry.

450. Contracts and Business Organizations

Fall, Winter, Spring, 4(4-0)

Law of contracts, including concept of freedom of contract and limitations, agency, and business organizations, including sole proprietorships, partnerships, and corporations. Accountant's professional responsibility.

451. Commercial Transactions

Fall, Winter, Spring, 4(4-0) GBL 450.

Law of sales, commercial paper, secured transactions, negotiable instruments, documents of title, and debtor-creditor relationships.

468. Field Studies

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits. Approval of department.

Planned program of observation and work in selected business firms. Analysis and reports.

805. Business Ethics

Spring, 4(4-0) Graduate student in the College of Business or approval of instructor. Interdepartmental with and administered by the Department of Philosophy.

Ethical dimensions of such topics as corporate responsibility, preferential hiring, profit and taxation, deception and bribery, self-regulation versus government regulation, "whistleblowing", and advertising. Readings from philosophical and business sources.

848. The Legal Environment of Business

Fall, Summer. 4(4-0)

Critical examination of the environment in which business operates. Analysis of the component elements of the legal environment of business and the structural framework in which law functions.

878A. Seminar in Business Law

Winter, 4(4-0) GBL 848 or approval of department.

Contracts, sales, secured transactions and consumer legislation viewed from the judicial, legislative and executive vantage points.

878B. Seminar in Business Law

Spring, 4(4-0) GBL 848 or approval of department.

Agency, partnerships and corporations, viewed from legislative, judicial and executive vantage points, as they affect entrepreneurial decision making.

890. Special Problems

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits. Approval of department.

GENETICS GEN

College of Natural Science

800. Genetics Seminar

Fall, Winter, Spring, 1(1-0) May reenroll for a maximum of 12 credits. Approval of director.

Student seminar to cover genetics subjects not considered in formal courses. Course is also intended to give students experience in reviewing and organizing literature in a subject, and orally presenting and defending the analysis.

842. Chromosome Structure and Genetics

Winter of even-numbered years. 4(4-0) Introductory genetics course. Interdepartmental with the departments of Botany and Plant Pathology, and Zoology.

Mechanisms of mitosis and meiosis, classical and molecular genetics of chromosome structure, alterations in chromosome number and structure, transposable elements, meiotic drive.

844. Plant Organelle Genetics

Winter of odd-numbered years. 3(3-0) Approval of department. Interdepartmental with and administered by the Department of Botany and Plant Pathology.

Organization, structure, function, heredity, molecular biology and manipulation of chloroplasts and mitochondria. Biological interactions between the nucleus and organelles.

FRENCH

See Romance and Classical Languages.