927. *Comparative Nutrition — Protein Metabolism and Developmental Biology*

Winter of even-numbered years. 4(4-0) BCH 452, PSL 802 or concurrently. Interdepartmental with the Department of Animal Husbandry.

Protein quality assessment, protein status, protein calorie malnutrition, amino acid metabolism, protein turnover, digestion and absorption, hormonal control of protein metabolism, developmental aspects of protein metabolism and growth.

928. *Comparative Nutrition — Minerals*

Spring of even-numbered years. 3 credits. BCH 452, PSL 802. Interdepartmental with and administered by the Department of Animal Husbandry.

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

929. *Comparative Nutrition — Vitamins*

Spring of odd-numbered years. 3(3-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with and administered by the Department of Animal Husbandry.

Chemical and physical properties, standards of activity, occurrence, metabolic roles, antivitamins, deficiency and toxicity signs, requirements and factors affecting requirements.

999. *Research*

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

FOOD SYSTEMS ECONOMICS AND MANAGEMENT

See Agricultural Economics

FOREIGN LANGUAGES

See German and Russian, Linguistics and Oriental and African Languages, and Romance and Classical Languages.

FORESTRY FOR

College of Agriculture and Natural Resources

In 305, 306, 402 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.

IDC. *Resource Ecology and Man*

For course description, see Interdisciplinary Courses.

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.

204. *Forest Vegetation*

Fall, Spring. 5(3-4) BOT 205 or approval of department.

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

220. *Plants and Their Environment*

Winter. 3(3-0) Interdepartmental with Natural Resources.

Fundamental ecological relationships between various climatic, edaphic and biotic environmental factors of the ecosystem and plant response, including structure, function and evaluation of species.

301. *Quantitative Methods for Natural Resources*

Winter. 4(3-2) MTH 109 or 111.

Collection and analysis of information pertaining to natural resources. Survey design, field procedures, equipment, and analytical techniques.

304. *Forest Ecology*

Fall. 4(3-3) 204; BOT 205.

The forest is viewed as a biological community. Forest site relationships are quantified by examining the existing physical environment and relating it to the forest species occupying that community.

305. *Silviculture*

Spring. 4(3-3) 204, 304. Must be taken concurrently with 306, 402 and 430.

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

306. *Forest Fire Protection and Use*

Spring. 3(2-3) Juniors or approval of department. Must be taken concurrently with 305, 402 and 430.

Causes and effects of forest fires. Combustion, fire behavior and fire weather. Prevention and control planning and techniques. Fire in forest land management. Extended field trips required.

309. *Wood Technology*

Fall. 4(3-3)

Structure of wood. Mechanical and physical properties of wood. Wood anatomy and relation to growth.

402. *Forest Inventory*

(302.) Spring. 4(2-6) 301. Must be taken concurrently with 305, 306 and 430.

Field and office techniques of forest inventory, with primary emphasis on timber resources. Extended field trips required.

409. *Forest Hydrology*

Fall. 3(3-0) CSS 210.

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. 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.

424. *Forest Soils*

Spring. 4(3-3) 220 or 304, CSS 210. Interdepartmental with the Department of Crop and Soil Sciences.

Interrelationships of forest site and the growth of forests. Classification and productivity of forest soils. Effects of silvicultural and forest management practices on the soil. Two-day field trip required.

430. *Timber Harvesting and Utilization*

Spring. 4(3-3) 309. Must be taken concurrently with 305, 306 and 402.

Felling and bucking trees. Log transportation. Log and lumber grades. Sawmill practices. Wood working machinery. Gluing wood, manufacture of pulp, plywood and other board products. Extended field trips required.

431. *Finishing, Preservation and Drying of Wood*

Winter. 3(3-0) 309.

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

435. *Law and Resources*

Spring. 3(3-0) R D 417 or BOA 440. 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.

432. *Methods in Wood Science*

Spring. 3(2-2) 309.

Application of standard laboratory testing procedures to the evaluation of basic properties of solid wood and wood products. Laboratory exercises in wood microtechnique and wood finishings.

446. *Range Management*

Winter. 4(4-0) 220 or 304 or approval of department.

Development of range industry; grazing regions and reconnaissance; planning multiple-use management on forest range and watershed.

450. *Natural Resource Administration*

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

Concepts and methods of administering wildlife 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.

454. *World Forestry*

Winter. 3(3-0)

Forest resources, forestry practices, and the forest economy throughout the world.

455. Natural Resource Economics

Winter. 4(4-0) 450 or approval of department. Interdepartmental with the departments of Fisheries and Wildlife, Park and Recreation Resources, Resource Development, and Natural Resources.

Basic economic and political principles and techniques that govern the production and consumption of forest land products, including basic forest valuation procedures.

457. Forest Management and Planning

Winter. 4(3-2) 455 or concurrently.

Integrative planning for forest management, including multiple-use aspects. One day field trip required.

460. Arboriculture

Fall. 3(2-3) 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.

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.

491. Natural Resources and Modern Society

Spring, Summer. 3(3-0) Juniors. Interdepartmental with the Department of Resource Development and Natural Resources.

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 re-enroll for credit with a maximum of 10 credits.

Advanced study in administration, biometrics, photogrammetry, dendrology, silverculture, management, economics, ecology, genetics, arbiculture, 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.

828. Seminar

Winter. 1(1-0)

Critical study and discussion of advanced forestry topics.

830. Physiological Genetics

Winter. 3(3-0) Approval of department. Interdepartment with the Department of Crop and Soil Sciences.

Physiological bases for genetic variation in higher plants including adaptive physiology, quantitative genetics, growth correlations, biochemical genetics, hybrid physiology, and genecology.

835. Silviculture

Spring. 3(3-0) 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.

840. Recreation Economics

Spring. 4(4-0) 809 or approval of instructor. Interdepartmental with the departments of Park and Recreation Resources and Resource Development and 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) 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.

860. Forest Inventory

Fall of even-numbered years. 3(3-0) 402, STT 422, MTH 112.

Literature based study of the state of the art and current research topics in methods of forest inventory. World-wide in scope, but emphasis on North American systems.

899. Research

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

909. Timber Economics

Fall of odd-numbered years. 3(3-0) 457, 809, EC 800, 801, 802.

Economic theory relevant to study of timber production, regional and national timber supply, demand and price, the effect of institutional factors, and other topics by review of past research.

910. Resource Economics Proseminar

Spring. 3(3-0) May re-enroll 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.

960. Simulation Models in Natural Resource Management

Winter of odd-numbered years. 3(3-0) 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.

975. Least Squares Analysis and Linear Programming in Forestry Research

Fall of odd-numbered years. 4(4-0) MTH 112, STT 423, CPS 110 or 120.

Application of least squares analysis and linear programming to problems in forestry research. Include both linear and nonlinear least squares models. Case studies from several forestry disciplines.

976. Multivariate Methods in Forestry Research

Winter of even-numbered years. 4(4-0) 975 or approval of department.

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. Research

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

FRENCH

See Romance and Classical Languages

GENETICS GEN

College of Natural Science

800. Genetics Seminar

Fall, Winter, Spring. 1(1-0) May re-enroll 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.

804. Gene Transmission

(801.) Fall. 3(3-0) ZOL 441 or approval of instructor.

Molecular and formal genetic studies of the replication, recombination, repair and segregation of genetic information in procaryotes and eucaryotes. Experimental design and methodology will be emphasized.

805. Genetic Organization, Action and Regulation

(803.) Winter. 3(3-0) 804.

Molecular and formal genetic studies of the organization, expression and regulation of gene activity in procaryotes and eucaryotes. Experimental design and methodology will be emphasized.

806. Population and Quantitative Genetics

(802.) Spring. 3(3-0) ZOL 441 or approval of instructor.

Genetics of quantitative characteristics in populations with special reference to polygenic variation and its interactions with environment, gene action and its measurement, mating systems, and selection.