927. Comparative Nutrition — Protein Metabolism and Developmental Biology
Winter of even-numbered years. 4(4-0)
BCH 452, PSL 502 or concurrently. Interdepartmental with Animal Husbandry Department.
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 502. Interdepartmental with and administered by the Animal Husbandry Department.
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 course in comparative nutrition. Interdepartmental with and administered by the Animal Husbandry Department.
Chemical and physical properties, standards of activity, occurrence, metabolic roles, antianemia, deficiency and toxicity signs, requirements and factors affecting requirements.

999. Research
(F N 999.) 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 Languages.

FORESTRY

College of Agriculture and Natural Resources

IDC. Resource Ecology and Man
For course description, see Interdisciplinary Courses.

202. Introduction to Forestry
Fall. 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 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 ecology, 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
Fall. 4(3-2) MTH 109 or 111.
Collection and analysis of information pertaining to natural resources. Survey design, field procedures, equipment, and analytical techniques.

305. Silviculture
Fall. 4(3-3) 504.
Interrelationships of trees of the forest community and the environment; natural and artificial forest reproduction methods, intermediate cuttings; field studies of silvicultural conditions.

306. Forest Fire Protection and Use
Winter. 3(3-0) Juniors or approval of department.
Causes and effects of forest fires. Combustion, fire behavior, and fire weather. Prevention and control planning and techniques. Use of fire in forest land management. One-day field trip required.

309. Wood Technology
Fall. 4(3-3)
Structure of wood. Mechanical and physical properties of wood. Wood anatomy and relation to growth.

319. Forestry Today
(419.) Winter. 3(3-0)
Not open to majors.
For the non-forestry student, emphasizing multiple use of forests, scope and practice of forestry, environmental roles of forests, influences, products, non-timber uses of forests and current forest policy.

402. Forest Inventory
(302.) Winter. 3(2-3) 301 or approval of department.
Field and office techniques of forest inventory, with primary emphasis on timber resources.

409. Forest Hydrology
Fall. 3(3-0) SLS 210.
Hydrologic cycle, with emphasis on soil, water, and ground water regimen, 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
Fall. 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) 320. SLS 210. Interdepartmental with Soil Science.
Interrelationships of forest site and the growth of forest and the production of forest soils. Effects of silvicultural and forest management practices on the soil. Two-day field trip required.

430. Manufacture of Lumber and Composite Wood Products
Spring. 3(3-3)
Log and lumber grades, sawmill equipment and practices. Wood working machinery. Gluing of wood. Manufacture of pulp, plywood and other board products.

431. Law and Resources
Spring. 3(3-0) R D 417 or BIO 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 finishing.

446. Range Management
Winter. 4(3-3) 220 or approval of department.
Development of range industry; grazing regions and reconnaissances; planning multiple-use management on forest range and watershed.

449. Field Studies in Forestry
Fall, Spring. 3 credits. 412, 305.
Multiple use forest resource management in various forest regions. Two-week field trip required, prior to the fall term of the senior year.

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

454. World Forestry
Winter. 3(3-0)
Forest resources, forestry practices, and the forest economy throughout the world.

455. Forestry Economics
Winter. 4(3-2) 450 or approval of department.
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 Utilization Planning
Spring. 5(2-4) 455.
Integrative planning for forest management, including multiple-use aspects and timber harvesting systems.

460. Arboriculture
Spring. 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 3 credits. Juniors 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 Resource Development Department 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.

807. Special Problems
Fall, Winter, Spring, Summer. 2 to 5 credits. May re-enroll for credit with approval of instructor.
Advanced study in administration, biometrics, photogrammetry, dendrology, silviculture, management, economics, ecology, genetics, arbuscule, hydrology, soils, recreation, physiology, policy, environmental aspects of timber harvesting, wood conversion, fire, range management, extension and pathology.

809. Natural Resources Economics
Winter. 3(3-0) Approval of department. Interdepartmental with the Resource Development Department.
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. Interdepartmental with Crop Science.
Physiological bases for genetic variation in higher plants including adaptive physiology, quantitative genetics, growth correlations, biochemical genetics, hybrid physiology, and geneology.

549. Recreation Economics
Spring. 4(4-0) 805 or approval of instructor. Interdepartmental with the departments of Recreation and Resource Development and administered by the Department of Recreation and Resource Development.
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.

550. 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. Research Methods
Fall. 3(3-0) Approval of department. Interdepartmental with and administered by the Resource Development Department.
Research techniques applicable to management, and policy-oriented natural resource investigations. Analysis of project designs; preparation of project proposals. Evaluation of representative published research studies.

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 significance 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 Wildlife Management.
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 resource problems.

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

899. Research
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 9 credits. ZOL 441 and approval of instructor.
Topics will be selected from molecular genetics, physiological genetics, population genetics, quantitative genetics, evolution, radiology and mutation, microbial genetics, somatic cell genetics, behavioral genetics, and human genetics.

999. Research
Fall, Winter, Spring, Summer. 12 credits. Major.
Research for the doctoral dissertation in genetics.

GEOGRAPHY GEO

College of Social Science
Courses are classified as follows:
Cultural—170, 201, 404, 801, 901.
Field Techniques—415, 850.
Geographical Education—458, 858.
Environmental—510, 810, 910.
Independent Research—400H, 411, 480, 813, 890, 918, 990.
Political—470, 870, 970.
Recreational and Environmental—307, 309, 835.
Urban—318, 401, 402, 403, 805.

100. Man, Location and Environment
Fall, Spring. 3(3-0) Primarily for majors.
Concepts, theory and methods of modern geography.

122. The World of Maps
Fall. 3(3-0)
Discussion of types, practical applications, and sources of maps.

150. Geography of Selected Current Problems
Winter. 2(2-0)
The geographic perspective is used to examine U.S. and world problems of major concern such as international conflicts, environment quality, spatial change, and economic development.

170. Future Worlds
Fall, Spring. 2(2-0)
Geographical approach to environmental, biological, economic, social and political problems facing mankind between now and year 2000.

IDC. Resource Ecology and Man
For course description, see Interdisciplinary Courses.