404. Role of Proteins in Food Systems

(F N 404.) Winter. 4(3-3) 341 or approval of department.

Physical and chemical reactions with protein foods, meats, eggs, cheese, seeds. Emphasis on time-temperature data in relation to quality.

406. Cultural Aspects of Food

(F N 406.) Spring, Summer of odd-numbered years. 3(3-0) Juniors.

A cross cultural investigation of food and its consumption. Factors such as history, religion, food sources and socio-economic status are considered.

406L. Laboratory—Cultural Aspects of Food

(F N 406.) Spring. 1(0-3) 100 or 200; 406 or concurrently.

Art and science of cookery in relation to historical, national, regional, racial and religious customs.

407. Patterns of Food Selection

Fall, Summer of even-numbered years. 3(3-0) 350.

Sociological and psychological factors influencing food choices. Evaluation of dietary habits in relation to nutritional needs of individuals.

409. Presentations in Foods and Nutrition

(F N 409.) Winter. 4(2-4) 340; 350 or 461.

Principles and techniques of presenting foods and nutrition information as applied to teaching or promotional work.

453. Readings in Nutrition

(F N 453.) Winter. Summer of odd-numbered years. 3(3-0) 462 or approval of department.

A study of recent developments in research in human nutrition.

454. Readings in Foods

(F N 454.) Fall. Summer of even-numbered years. 340.

Selected topics in foods research. Emphasis on experimental data and basic scientific principles related to food quality.

461. Energy Nutrient and Proteins for Human Nutrition

(F N 461.) Fall. 4(4-0) BCH 200; PSL 332 or 241.

Metabolism of protein, fats and carbohydrates, as applied to nutritional requirements and food supplies of people.

462. Vitamins and Minerals for Human Nutrition

(F N 462.) Winter. 3(3-0) 461.

Metabolism of vitamins and minerals as applied to the nutritional requirements and food supplies of people.

463. Nutrition and Human Development

(F N 463.) Spring. 3(3-0) 462.

The role of nutrients in physiological systems and biochemical processes as related to the perspective of human growth and development.

469. Physical and Physiological Growth of Children

Winter, Spring. 4(3-2) HNF 102. Three terms of Natural Science. Interdepartmental with and administered by the Family and Child Sciences Department.

Physical and physiological growth patterns. Experimental evidence for nutritional requirements. Applications to feeding practices, and physical activity of children.

470. Clinical Nutrition

Fall. 4(4-0) 462.

Changes in physiological and/or biochemical functions or processes due to illness and uses of modified diets as an essential part of treatment.

475. Community Nutrition

Spring. 4(3-3) 462 or approval of department.

Identification of nutritional needs of population groups and available resources in communities.

495. Independent Study

(I A 400.) Fall, Winter, Spring. 2 to 6 credits. May re-enroll for a maximum of 6 credits. Seniors; approval of department.

Individual study of selected topics in foods, nutrition and food service management under staff guidance.

498. Field Study

Fall, Winter, Spring, Summer. 4 to 12 credits. May re-enroll for a maximum of 12 credits. Approval of department.

Planned program of research, observation, study or work in selected organizations under staff guidance.

800. Seminar in Foods and Nutrition

(F N 800.) Fall, Winter, Spring. 1(1-0) 403 or 463.

802. Seminar in Food Service Management

(I A 800.) Winter, Summer. 1 to 3 credits. May re-enroll for a maximum of 8 credits. Approval of department.

803. Problems in Food Service Management

(I A 803.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

805. Experimental Foods III

(F N 805.) Spring. 4(1-9) 404 or approval of department.

Planning, executing, and reporting individual research project. Data collection, evaluation and interpretation to demonstrate understanding of research techniques and attitudes, and an awareness of significant problems in the field.

813A. Special Studies in Nutrition

(F N 813A.) Fall, Winter, Spring, Summer. Variable credit. 461.

813B. Special Studies in Experimental Foods

(F N 813B.) Fall, Winter, Spring. Summer of odd-numbered years. Variable credit. 404; BCH 200 or 451 and 804.

813C. Special Studies in Food Service Management

(I A 813.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Special studies in facility management, manpower coordination and tools and methods of operational control.

816. Applied Human Nutrition

(F N 816.) Spring. 3(3-0) 462.

825. Techniques in Nutrition Research

(F N 825.) Winter of odd-numbered years. 1 to 3 credits. CEM 333; approval of department. Interdepartmental with and administered by the Animal Husbandry Department.

Use of specialized instruments and techniques. Laboratory safety. Management of laboratory animals. Development of abilities in areas of particular interest to individual students.

899. Research

(F N 899.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

926. Comparative Nutrition — Lipids and Carbohydrates

Winter of odd-numbered years. 4(4-0) BCH 452. Interdepartmental with the Animal Husbandry Department.

Regulatory aspects of carbohydrate and lipid metabolism as influenced by nutrition in mammals. Emphasis on normal and abnormal physiological states such as obesity, ketosis and diabetes.

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

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

Chemical and physical properties, standards of activity, occurrence, metabolic roles, antivitamins, 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 FOR

College of Agriculture and Natural Resources

200. Resource Ecology and Man

For course description, see **Interdisciplinary Courses.**

202. Introduction to Forestry

(101.) 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 multiple use concepts. One-day field trip required.

204. Forest Vegetation

Fall, Spring. 5(3-4) BOT 301 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

Fall. 4(3-3) MTH 109 or 111.

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

302. Forest Inventory

Winter. 3(2-3) 301.

Field and office techniques of forest inventory, with primary emphasis on timber resources.

305. Silviculture

Fall. 4(3-3) 204.

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

Spring. 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

(F P 309.) Fall. 4(3-3)

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

319. Forestry Today

(419.) Spring. 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.

409. Forest Hydrology

Winter. 3(3-0) SLS 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

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) 220; SLS 210. Interdepartmental with Soil Science.

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. Manufacture of Lumber and Composite Wood Products

(F P 310.) Winter. 3(3-0) 309.

Log and lumber grades, sawmill equipment and practices. Wood working machinery. Gluing of wood. Manufacture of pulp, plywood and other board products.

431. Finishing, Preservation and Drying of Wood

(F P 410.) Spring. 3(3-0) 309.

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

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(3-3) 220 or approval of department.

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

449. Field Studies in Forestry

Fall. 3 credits. 302, 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) Interdepartmental with Fisheries and Wildlife, Parks and Recreation Resources and Resource Development Departments 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. Forestry Economics

(421.) 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(4-2) 455.

Integrative planning for forest management, including multiple-use aspects and timber harvesting systems.

460. Arboriculture

(360.) 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 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 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 a maximum of 10 credits.

Advanced work in any of the following forestry specialties: administration biometrics, photogrammetry, dendrology, silviculture, management, economics, influences, ecology, genetics, arboriculture, hydrology, soils, recreation, physiology, policy, entomology, products harvesting, wood preservation, timber mechanics, wood conversion.

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

Fall, Winter, Spring. 1 to 3 credits. May re-enroll for a maximum of 12 credits if a different topic is taken.

Critical study and discussion of advanced forestry topics including natural resource economics, forest biology, and natural resource program budgeting.

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 genecology.

851. Public Program Budgeting

Fall. 3(3-0) Approval of department. Interdepartmental with the Resource Development Department.

Survey of the federal government's planning-programming-budgeting system, stressing executive branch budget decision-making and budget administration in the natural resource bureaus.

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.

960. Simulation Models in Natural Resource Management

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

The role of simulation models in developing management strategies. Applications of com-

puter simulation in natural resources. Modeling of decision systems in natural resources management.

999. *Research*

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

FRENCH

See Romance Languages

GEOGRAPHY GEO

College of Social Science

Courses are classified as follows:

Cultural—301, 404, 419, 801, 901.
Economic—213, 309, 409, 412, 413, 435, 454, 806, 807, 809, 835, 906.
Field Techniques—415, 850.
Geographic Education—458, 858.
Historical—310, 810, 910.
Independent Research—400H, 411, 818, 899, 918, 999.
Medical—470, 870, 970.
Physical—206, 206L, 429, 430, 431, 432, 451, 834, 902.
Political—416, 808, 908.
Population—320, 836, 934.
Quantitative Methods—427, 428, 811.
Regional—204, 300, 405, 406, 407, 408, 418, 420, 421, 440, 441, 450, 460, 461, 462, 463, 464, 812, 912.
Theory and Philosophy—150, 425, 480, 825, 826, 827.
Urban—318, 402, 403, 805.
Visual Media and Techniques—222, 223, 324, 424, 426.

150. *Geography of Selected Current Problems*

Fall. 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.

200. *Resource Ecology and Man*

For course description, see **Interdisciplinary Courses.**

204. *World Regional Geography*

Fall, Winter, Spring, Summer. 4(3-0)

Analysis of the world's major natural habitats and man's relation to them.

206. *Physical Geography*

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

Principal earth surface elements of physical geography including weather, climate, landforms, soils, water and biotic resources, in their genetics, distributional and functional interrelationships.

206L. *Physical Geography Laboratory*

Fall, Winter, Spring. 1(0-2) 206 or concurrently.

Laboratory study of geographic aspects of map interpretation, aerial photographs, weather, climate, soils, landforms, and vegetation.

213. *Economic Geography*

Fall, Winter, Spring, Summer. 3(3-0)

Emphasis on world distribution of economic and business activities, stressing factors of location and economic concepts of locational change.

222. *The World of Maps*

Fall. 3(3-0).

Discussion of types, practical applications, and sources of maps.

223. *Introduction to Cartography*

Fall, Winter. 4(2-4)

Principles and techniques of constructing maps and other graphic devices. Types of map reproduction, application of quantitative methods to cartography.

300. *Geography of North America*

Fall, Winter, Summer. 4(3-0)

Human and physical geography of North America, north of the Mexican border.

301. *Geography of Culture*

(401.) Fall, Winter, Spring, Summer. 4(3-0) 204.

A systematic discussion of cultural geography, stressing cultural processes and relationships.

309. *Geography of Recreation*

Winter. 3(3-0)

Recreational land use and services in the United States, including analysis of resources basic to such land use and their distribution.

310. *Historical Geography of the United States*

Spring, Summer. 4(3-0)

Reconstruction of geographies of the United States as they existed in the past.

318. *Cities of the World*

Fall, Winter, Spring, Summer. 4(3-0)

A cross-cultural examination of cities, their historic growth, regional functions, and internal dynamics.

320. *Geography of Population*

Fall. 4(3-0).

A geographical analysis of world population including demographic characteristics, growth rates, and distributional patterns.

324. *Remote Sensing: Airphoto Interpretation*

Fall, Winter. 4(2-4) Sophomores.

Use of aerial photographs in the identification and interpretation of physical and cultural features of the terrestrial environment. Includes principles of photogrammetry.

341. *Contemporary Problems of South Asia*

For course description, see **Interdisciplinary Courses.**

384. *Contemporary Problems of Japan*

For course description, see Interdisciplinary Courses.

390. *Survey of Subsaharan Africa*

For course description, see **Interdisciplinary Courses.**

391. *Survey of Subsaharan Africa*

For course description, see **Interdisciplinary Courses.**

400H. *Honors Work*

Fall, Winter, Spring. 1 to 16 credits. Approval of department.

402. *The Geography of the City*

Fall. 4(3-0).

Spatial theories, concepts, and designs of internal urban economic, social, and political structures.

403. *The City and Its Region*

Winter. 4(3-0).

The regional system of cities in terms of size, spacing, and functional relationships.

404. *Advanced Cultural Geography*

Spring. 4(3-0) 301 or approval of department.

Geographical analysis of selected aspects of human culture.

405. *Geography of South America*

Winter, Spring. 4(3-0) 204 or approval of department.

Regional geography of South America excluding countries bordering the Caribbean Sea; and the interpretation of present cultural-physical patterns.

406. *Geography of Middle America*

Fall. 4(3-0) 204 or approval of department.

Description and interpretation of the physical and cultural environment of Mexico, Central America, West Indies, and northern South America.

407. *Geography of Michigan*

Spring, Summer. 4(3-0) 204 or approval of department.

Selected aspects of the geography of Michigan, including the physical environment and cultural and economic considerations.

408. *Geography of Canada*

Spring. 4(3-0) 204 or approval of department.

Analysis of the cultural, economic, and physical regions of Canada and the role played by Canada in world affairs.

409. *Geography of Transportation*

(308.) Fall. 4(3-0).

Analysis of spatial principles of transportation, including factors of route, location, theories of interaction, and the role of transport in space-economy.

411. *Problems in Geography*

Fall, Winter, Spring, Summer. 1 to 6 credits. Approval of department.

Research on specialized geographic problems.

412. *Geography of Agriculture*

(312.) Winter. 4(3-0).

Analysis of the nature and world distribution of agricultural activities and settlements.

413. *Geography of Manufacturing*

Winter. 4(3-0) 213 or Juniors.

Evaluation of the place to place variation of different types of manufacturing industries, phasing the changes in regional structure of manufacturing and industrial location theory.

415. *Field Techniques in Geography*

Fall, Spring. 4(1-7) May re-enroll for a maximum of 8 credits. Approval of department.

Geographic field work including recognition and classification of natural and cultural features, interview procedures, and preparation of reports and maps based on field data.

416. *Political Geography*

Winter, Summer. 4(3-0) 204 or Juniors.

Spatial aspects of territoriality, boundaries, voting patterns, government programs, formation of political units, political development and integration, and environmental policy.

418. *Geography of Polar Regions*

Winter of even-numbered years. 4(3-0) 204 or approval of department.

The arctic, including the continental fringe lands of North America and Eurasia, and the Antarctic. Emphasis on exploration, physical geography, and recent developments in settlement and resource use.