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 con­ 
sidered.

408L. Laboratory—Cultural Aspects of Food  
(F N 408.) Spring, 1(0-3) 100 or 200; 406 or concurrently. 
Art and science of cookery in relation to his­ 
torical, national, regional, racial and religious 
customs.

407. Patterns of Food Selection  
(F N 407.) Fall, Winter of even-numbered years. 
3(3-0) 350. 
Sociological and psychological factors Influ­ 
esting 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 teach­ 
ing 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 312 or 341. 
Metabolism of protein, fats and carbohydrates, as 
applied to nutritional requirements and food sup­ 
plies 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. Interdepart­ 
mental with department. 
Physical and physiological growth patterns. Ex­ 
perimental evidence for nutritional requirements, 
Applications to feeding practices, and physical 
avtivity of children.

470. Clinical Nutrition  
(F N 470.) Fall. 4(4-0) 469. 
Changes in physiological and/or biochemical 
functions or processes due to illness and uses of 
modified diets as an essential part of treat­ 
ment.

475. Community Nutrition  
(F N 475.) Spring. 4(3-3) 462 or approval of 
department. 
Identification of nutritional needs of population 
groups and available resources in communities.

495. Independent Study  
(F N 495.) Fall, Winter, Spring. 2 to 6 credits. 
May re-enroll for a maximum of 8 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.

500. Seminar in Foods and Nutrition  
(F N 500.) Winter. 4(2-4) 403; 
402 or 463.

802. Seminar in Food Service Management  
(F A 802.) Winter, Summer. 1 to 3 credits. 
May re-enroll for a maximum of 8 credits. 
Approval of department.

803. Problems in Food Service Management  
(F A 803.) Fall, Winter, Spring, Sum­ 
mer. Variable credit. Approval of depart­ 
ment.

805. Experimental Foods III  
(F N 805.) Spring. 4(1-9) 404 or approval of 
department. 
Planning, executing, and reporting individual 
research projects. Data collection, evaluation 
and interpretation to demonstrate understand­ 
ing 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  
(F A 813C.) Fall, Winter, Spring, 
Summer. Variable credit. Approval of de­ 
partment. 
Special studies in facility management, man­ 
power coordination and tools and methods of 
operational control.

818. Applied Human Nutrition  
(F N 818.) 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.

899. Research  
(F N 899.) Fall, Winter, Spring, 
Summer. Variable credit. Approval of depart­ 
ment.

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 mam­ 
mals. Emphasis on normal and abnormal phys­ 
iological 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. Interde­ 
partmental with Animal Husbandry Department. 
Protein quality assessment, protein status, pro­
tein calorie malnutrition, amino acid metabolism, 
protein turnover, digestion and absorption, hor­
monal control of protein metabolism, develop­
mental aspects of protein metabolism and growth.

928. Comparative Nutrition — 
Minerals  
Spring of even-numbered years. 3 credits.  
BCH 453, PSL 503. 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 453 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, antivita­ 
mins, deficiency and toxicity signs, interrelations, 
requirements and factors influencing requirements.

999. Research  
(F N 999.) Fall, Winter, Spring, Sum­ 
mer. 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 Interdis­

202. Introduction to Forestry  
(101.) Fall. 3(3-0) 
Forestry in its broadest sense, including: his­
toric development, forest growth, protection and 
management, products, national and world 
economy and policy. Emphasis on multiple 
use concepts. One-day field trip required.
Courses

204. Forest Vegetation
Fall, Spring. 3(3-4) BOT 301 or approval of department. Nonnomenclature, classification, and identification of important tree, shrub, 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(3-2) 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(3-3) 301. Field and office techniques of forest inventory, with primary emphasis on timber resources.

305. Silviculture
Fall. 4(3-2) 204. Interrelationships of trees of the forest community with 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(3-2) Structure of wood. Mecchanical 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 watershed and water yields.

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

446. Range Management
Winter. 4(3-3) 220 or approval of department. Development of range industry; grazing regions and reclamation; 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
(451) 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. 3(4-0) 453. 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 tree. 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 resource 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, forestry, genetics, arboriculture, hydrology, soils, recreation, physics, 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 geneology.

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 bureau.

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-
computer 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.
Field Techniques—415, 855.
Geographic Education—458, 858.
Historical—310, 810, 910.
Independent Research—400H, 411, 818, 899, 918, 999.
Medical—470, 870, 970.
Political—416, 809, 908.
Population—320, 858, 934.
Quantitative Methods—427, 428, 811.
Regional—204, 300, 405, 406, 407, 408, 418, 420, 421, 440, 441, 450, 460, 461, 462, 463, 484, 912, 912.
Theorv and Philosophy—150, 425, 450, 825, 826, 827.
Urban—315, 402, 403, 805.

150. Geography of Selected Current Problems
Fall. 2(2-0)

The geographic perspective is used to examine U.S. and world problems of major concerns 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. 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 geologic, distributional and functional interrelationships.

206L Physical Geography Laboratory
Fall, Winter, Spring. 3(0-2) 208 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 human 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) 424.

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.

354. Contemporary Problems of Japan
For course description, see Interdisciplinary Courses.

380. Survey of Subsaharan Africa
For course description, see Interdisciplinary Courses.

381. Survey of Subsaharan Africa
For course description, see Interdisciplinary Courses.

400H. Honors Work
Fall, Winter, Spring. 1 to 6 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.

408. 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 southern 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) 313 or Juniors.

Evaluation of the place to place variation of different types of manufacturing industries, placing 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, field 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 fringes lands of North America and Eurasia, and the Antarctic. Emphasis on exploration, physical geography, and recent developments in settlement and resource use.