

**880. Special Problems**

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 12 credits. Approval of instructor.

Students with special interests and abilities may study published literature in a selected genetics topic or they may carry on research in the laboratory on a selected subject in collaboration with genetics faculty.

**890. Selected Topics in Genetics**

Fall, Winter, Spring, Summer. 2 to 5 credits. ZOL 441 and approval of instructor.

Topics will be selected from molecular genetics, physiological genetics, population genetics, quantitative genetics, evolution, radiology and mutagenesis, microbial genetics, somatic cell genetics, behavioral genetics, and human genetics.

**999. Research**

Fall, Winter, Spring, Summer. 3 to 12 credits. Majors.

Research for the doctoral dissertation in genetics.

**GEOGRAPHY**

**GEO**

**College of Social Science**

Courses are classified as follows:

- Cultural—201, 404, 801, 901.
- Economic—213, 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, 480, 818, 899, 918, 999.
- Medical—470, 870, 970.
- Physical—206, 206L, 429, 430, 431, 432, 451, 834, 902.
- Political—416, 808, 908.
- Population—215, 320, 836, 934.
- Quantitative Methods—427, 428, 811.
- Regional—204, 300, 315, 316, 319, 321, 322, 340, 342, 350, 360, 361, 362, 363, 364, 812, 912.
- Recreational and Environmental—307, 309, 828.
- Theory and Philosophy—150, 280, 425, 480, 825, 826, 827.
- Urban—318, 401, 402, 403, 805.
- Visual Media and Techniques—122, 223, 224, 424, 426, 436.

**100. Man, Location and Environment**

Fall, Spring. 3(3-0) Primarily for non-majors.

Concepts, theory and methods of modern geography.

**122. The World of Maps**

(222.) 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.

**IDC. Resource Ecology and Man**

For course description, see Interdisciplinary Courses.

**201. Geography of Culture**

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

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

**IDC. Introduction to Study of the Moon**

For course description, see Interdisciplinary Courses.

**204. World Regional Geography**

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

Man's relationship with natural and cultural environments.

**206. Physical Geography**

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

Analysis of weather, climate, landforms, soils, water and biotic factors of man's environment, including their spatial, genetic, 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.

**IDC. Introduction to Latin America I**

For course description, see Interdisciplinary Courses.

**213. World Economic Geography**

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

Emphasis on distribution of natural resources, industries and service activities, stressing factors of location and economic concepts of locational change.

**215. World Food Issues**

Spring. 3(3-0) Interdepartmental with Food Science.

Food resources as related to world distributions of population, soil, water, fuel and minerals. Special attention to urbanization, irrigation, and future food needs and global constraints.

**223. Introduction to Cartography**

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

Principles and techniques of constructing maps and other graphic devices. Types of map reproduction.

**224. Remote Sensing: Airphoto Interpretation**

(324.) 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, and stresses application and practice.

**IDC. Continuing Revolution in China: Problems and Approaches**

For course description, see Interdisciplinary Courses.

**280. Perspectives on Geography**

Spring. 2(2-0)

Introduction to the profession of geography for majors.

**300. North America**

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

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

**307. Geography of Environmental Quality**

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

Identification of the physical, cultural and psychological factors which constitute human environments, and how they vary and may be modified or controlled.

**309. Geography of Recreation**

Winter. 3(3-0)

Natural and cultural factors influencing the use of space for recreation. Emphasis on recreation land use in the United States and current problems and conflicts.

**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.

**315. South America**

(405.) Fall, Spring. 4(3-0) Sophomores or approval of department.

Regional geography of South America with special attention to contemporary geographic problems.

**316. Middle America**

(406.) Winter. 4(3-0) Sophomores or approval of department.

Interpretation of physical and cultural environment of Mexico, Central America, and the West Indies. Special attention to contemporary geographic problems.

**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.

**319. Polar Regions**

(418.) Winter of even-numbered years. 4(3-0) Sophomores 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.

**320. Geography of Population**

Fall. 4(3-0)

Relationship of the size, composition, and distribution of population to geographic variations in the nature of places.

**321. Africa**

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

Emphasis on continent south of Sahara: environments, peoples, problems, and potentials.

**322. Africa: Contemporary Problems**

(421.) Spring. 4(3-0) Sophomores or approval of department. 321 recommended.

Major development problems examined from environmental, historical, economic, and social perspectives.

**340. Western Europe**

(440.) Winter. 4(3-0) Sophomores or approval of department.

Geographic analysis of physical and human character and resources of Western Europe (Scandinavia, British Isles, Benelux, Germany, France and Switzerland). Emphasis on major problems.

**IDC. Contemporary Problems of South Asia**

For course description, see Interdisciplinary Courses.

**342. Eastern and Southern Europe**

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

A geographical analysis of countries of Eastern and Southern Europe with emphasis on economic, political, social and ethnic problems.

**350. Australia and Pacific Islands**

(450.) Winter of odd-numbered years. 4(3-0) Sophomores or approval of department.

Physical and cultural geography of Australia, New Zealand, Melanesia, Micronesia, and Polynesia.

**360. The Soviet Union**

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

A geographical analysis of the Soviet Union and its inhabitants with emphasis on economic, social, political and ethnic problems.

**361. South Asia**

(461.) Fall of odd-numbered years. 4(3-0) Sophomores or approval of department.

A geographical analysis of the physical environment and human societies of India, Pakistan and Ceylon.

**362. East Asia**

(462.) Winter. 4(3-0) Sophomores or approval of department.

A geographical analysis of the major developmental (modernization) problems of East Asia. Focus is on China in odd-numbered years; on Japan, Korea, Taiwan and Hong Kong in even-numbered years.

**363. Southeast Asia**

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

A geographical analysis of the major developmental (modernization) problems of Southeast Asia (Philippines, Indochina, Thailand, Burma, Malaysia/Singapore, Indonesia).

**364. Middle East and North Africa**

(464.) Winter. 4(3-0) Sophomores or approval of department.

Socio-political and economic geography and physical environment of southwest Asia and Northern Africa.

**IDC. Contemporary Problems of Japan**

For course description, see Interdisciplinary Courses.

**IDC. Survey of Sub-Saharan Africa**

For course description, see Interdisciplinary Courses.

**IDC. Survey of Sub-Saharan Africa**

For course description, see Interdisciplinary Courses.

**400H. Honors Work**

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

**401. The Ghetto**

Fall, Spring. 4(4-0) Juniors or approval of department. Interdepartmental with and administered by the Department of Urban and Metropolitan Studies.

Analysis of the ghetto including its spatial organization, structure and distribution of non-white and ethnic populations in cities with emphasis on the United States.

**402. The Geography of the City**

Fall, Spring. 4(3-0) Interdepartmental with the Department of Urban and Metropolitan Studies.

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

**403. The American 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) 201 or approval of department.

Geographical analysis of selected aspects of human culture area, landscape, spatial diffusion, cultural ecology, and environmental perception.

**407. Michigan**

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

Selected aspects of the physical and cultural geography of Michigan.

**408. Canada**

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

An analysis of the physical, economic and cultural patterns of Canada.

**409. Geography of Transportation**

Fall. 4(3-0)

Analysis of spatial principles of transportation, including theories of interaction, network structures, 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**

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 distribution of different types of manufacturing industries. Formulation of models of industries and analysis of the role of manufacturing in society, economics and development.

**415. Field Techniques**

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

Basic methods for making physical and cultural observations and measurements including map reading, photo interpretation, field sketch mapping, compass traverses, sampling, questionnaire design, interviewing, analysis and reporting. Requires work off campus.

**416. Man's Geo-Political World**

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

The organization and behavior of man in political space with emphasis on the United States.

**424. Advanced Remote Sensing Techniques**

Spring. 4(2-4) 224.

Extraction, analysis, and interpretation of information obtained from remote sensors including conventional, infrared and radar imagery. Introduction to stereo-plotting devices, stressing theories of remote sensing and applications.

**425. Development of Geographic Thought**

Winter, Spring. 4(3-0) Approval of department.

Evolution of geographic thought from antiquity to the present emphasizing developments in 20th century America. Survey of the theory and methodology of contemporary geography.

**426. Advanced Cartography**

Spring. 4(1-6) 223.

Development of advanced skills in construction of maps, including ink drafting, lettering systems, map projections, scribing and photo reproduction.

**427. Quantitative Methods in Geography**

Fall, Spring. 4(3-0) Approval of department.

Basic quantitative techniques used in the analysis and classification of geographic data.

**428. Computer Mapping in Geography**

Spring. 4(4-0) 223 or approval of department.

The preparation of computer maps and the application of the computer to the development and testing of models in geography.

**429. Landforms of North America**

Winter, Spring. 4(3-0) May re-enroll for a maximum of 8 credits. 206, GLG 201 or approval of department.

Study of the surface features of eastern U.S.A. (winter term) and western U.S.A. (spring term).

**430. Climates of the World**

Spring. 4(3-0) 206 or approval of department.

Regional analysis of the world's weather and climate.

**431. Landform Analysis**

Fall. 4(3-0) 206, GLG 201 or approval of department.

A problem approach is utilized to explain classical and contemporary interpretations of the nature of selected landforms, including treatment of related tools and techniques. Option for some field study.

**432. Biogeography**

Spring. 4(3-0) 206 or approval of department.

Patterns of vegetation, with emphasis on forests of eastern North America. Option for some field study.

**435. Land Use and Location Theory**

Spring. 4(3-0) 213 or approval of department.

Location principles and theories of economic activities, including methods of regional analysis.

**436. Planimetric Cartography**  
Spring. 4(2-4) 224 and 426 or approval of department.  
Principles, theory and practice of precision map compilation and manuscript development.

**451. Climatic Patterns and Atmospheric Circulation**  
Fall, Winter. 4(3-0) 206 or approval of department.  
Relationship between weather, climate, and upper air flow, with emphasis on this climatology of North America.

**454. Geography of Water**  
Fall. 4(3-0) 206 or 213.  
Geographic aspects of global water resources, their utilization patterns, and the role of water in agricultural and industrial production.

**458. Geography for Teachers**  
Winter. 4(3-0)  
Problems and practices of teaching geography in elementary and secondary schools.

**470. Geography of Health and Disease**  
Fall. 4(3-0)  
Spatio-environmental concepts and the techniques applied to health problems: disease transmission cycles, community nutrition and health-care planning.

**IDC. Canadian-American Studies**  
For course description, see Interdisciplinary Courses.

**480. Senior Seminar**  
Spring. 2(2-0) Senior majors or approval of department.  
Current developments in geographic research and theory.

**801. Seminar in Cultural Geography**  
Fall. 3(3-0) Approval of department.  
Theory, methodology, and techniques in cultural geography.

**805. Seminar in Urban Geography**  
Spring. 3(3-0) Approval of department.  
Selected research topics on the geography of the city.

**806. Seminar in Agricultural Geography**  
Spring. 3(3-0) Approval of department, 412.  
Research problems on selected topics of agricultural geography.

**807. Seminar in Manufacturing Geography**  
Spring. 3(3-0) Approval of department, 413.  
Research problems on selected topics of industrial location.

**808. Seminar in Political Geography**  
Spring. 3(3-0) Approval of department.  
Spatial analysis of selected political phenomena.

**809. Seminar in Transportation Geography**  
Winter. 3(3-0) Approval of department, 409.  
Selected research topics.

**810. Seminar in Historical Geography**  
Winter. 3(3-0) Approval of department.  
Approaches in research in historical geography.

**811. Advanced Quantitative Methods in Geographic Research**  
Winter. 4(2-4) Approval of department, 427.  
Statistical and mathematical approaches to spatial distributions and areal data.

**812. Regional Seminar**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 9 credits. Approval of department.  
Selected research topics in regional geography.

**818. Readings in Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. Approval of department.

**825. History and Philosophy of Geography**  
Fall. 3(3-0) Approval of department.  
Analysis of the monographic and serial literature dealing with the theory and evolution of geographic science.

**826. Research Design in Geography**  
Winter, Spring. 3(3-0) Approval of department.

Formalized approach to research and writing in geography: Identification of geographic problems and their relative importance, structuring and stating hypotheses, data acquisitions, and tests for validity.

**827. Contemporary Theory and Methodology in Geographic Research**  
Spring. 3(3-0) Approval of department.

Examination of the forward edges of geographic research, particularly with respect to its relation to other disciplines, scientific methodology in general, and the evolution of geography as a professional scholarly discipline.

**828. Seminar in Recreation Geography**  
Spring. 3(3-0) 309 or approval of instructor.  
Selected current problems in recreation geography in the U.S. and abroad.

**834. Seminar in Physical Geography**  
Winter, Spring. 3(3-0) May re-enroll for a maximum of 9 credits. Approval of department.  
Analysis of classical and contemporary problems in physical geography treated as follows: climatology (winter), biogeography (spring), geomorphology (spring).

**835. Seminar in Location Theory**  
Fall. 3(3-0) Approval of department, 435.  
Recent developments and research in location analysis and regional science.

**836. Population Geography Seminar**  
Spring. 3(3-0) Approval of department.  
Studies of particular topics and problems in population geography.

**IDC. Interdisciplinary Seminar on Africa**  
For course description, see Interdisciplinary Courses.

**850. Advanced Field Techniques**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 6 credits.  
Instruction and practical training in the selection, data-gathering, on-site analysis, and presentation of geographic field problems.

**858. Seminar in Geographic Education**  
Spring. 3(3-0) Approval of department.  
Treatment of selected topics in geographic education.

**870. Seminar in Medical Geography**  
Winter. 3(3-0).  
Spatio-environmental analysis of selected health problems.

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

**901. Problems in Cultural Geography**  
Fall, Winter, Spring. Variable credit. May re-enroll for a maximum of 6 credits. Approval of department.  
Special research problems.

**902. Problems in Physical Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 6 credits.  
Supervised research in specific topics of physical geography.

**906. Problems in Economic Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 6 credits. Approval of department.  
Special research problems.

**908. Problems in Political Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 6 credits. Approval of department, 416.  
Special research problems.

**910. Problems in Historical Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 6 credits. Approval of department.  
Special research problems in historical geography.

**912. Independent Study in Regional Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits. Approval of department.  
Individual studies in regional geography.

**918. Problems in Geography**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 9 credits. Approval of department.  
Research on specific geographical problems.

**934. Problems in Population**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 9 credits. Approval of department.  
Special research problems.

**970. Problems in Medical Geography**  
Fall, Winter, Spring. Variable credit.  
May re-enroll for a maximum of 6 credits.  
Approval of department.  
Selected research topics in medical geography.

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

**GEOLOGY GLG**

**College of Natural Science**

**200. The Geology of Man's Environment**  
Fall, Winter, Spring, Summer. 3(3-0)  
Not open to Geology majors. Credit will be given in only one of the following: 200, 201, 306.

The relation of geological processes and Earth materials to man. The nature and evolution of the Earth and life upon it. Man's exploitation of the non-renewable resources of the Earth.

**200L. Laboratory—Geology of Man's Environment**  
Fall, Winter, Spring, Summer. 1(0-3)  
200 or concurrently.

The geological reasoning concerning the nature and evolution of the Earth.

**201. Earth Processes**  
Fall, Winter, Spring. 4(4-2) Credit will be given for only one of the following: 200, 201, 306.

Physical processes concerning evolution of Earth and its environments. Conservation and interaction of energy and matter through time. Laboratory stresses interpretation of process through studies of geologic data.

**202. Evolution of the Earth**  
Fall, Winter, Spring. 4(4-2) 200; or 201; or 306.

Integration of physical, chemical and biological processes from which man's present environment has evolved; problems and controversies in the development of ideas of geologic and organic evolution.

**IDC. Introduction to Study of the Moon**  
For course description, see Interdisciplinary Courses.

**205. Oceanology—The Marine Environment and Man**  
Fall. 3(3-0)

Physical oceanography, including origin, hydrologic, chemical, geological properties; and environmental quality of the oceans. Man-sea interactions are emphasized including resource utilization and pollution.

**221. Minerals, Rocks and Fossils**  
(326.) Spring 3(2-3) Not open to majors.

Description, occurrence and identification of minerals, rocks, fossils, and additional features of especial significance to general science teachers and other earth science interest groups.

**271. Geophysics and the Earth**  
Spring. 3(3-0) 200 or 201 or 306 or approval of department.

Basic concepts used in geophysics, including description of the Earth and its interior, methods of exploring for mineral and energy resources. Contributions of physical methods to understanding our terrestrial environment.

**281. Mineral Resources of the Earth**  
Fall. 3(3-0)

Mineral resources; their genesis, occurrence, exploitation and use. Future projections from historic and current developments. The impact on international affairs and the welfare of nations. Field trip.

**282. Energy Resources of the Earth**  
Winter. 3(3-0)

World energy resources of petroleum, coal, and atomic fuel. Social, political, economic and environmental problems of fuels.

**302. Vertebrate Life of the Past**  
Fall. 3(3-0) One course in a physical or biological science or Juniors. Interdepartmental with the Zoology Department.

Fossil vertebrates from fish to man.

**303. Introductory Geomorphology**  
Winter. 3(3-0) 200 or 201 or 306.

Descriptive course treating the geological origin and development of important surface features including special consideration of Pleistocene landforms of the Great Lakes region.

**303L. Laboratory—Introductory Geomorphology**  
Winter. 1(0-2) 303 or concurrently.

Methods of map interpretation and use of aerial photographs in geomorphology. Supplemental field trip to study the geology of pertinent landforms.

**304. Geology of Michigan**  
Fall. 3(3-0) 200 or 201 and/or 202; or approval of department.

A historical accounting of the physical, historical and economic geology of Michigan and its environs; a course designed for students seeking an overall picture of the rather unique Michigan geological environment.

**306. Engineering Geology**  
Fall. 3(3-2) Credit will be given for only one of the following: 200, 201, 306. Sophomore Engineering students.

Fundamental principles of geology as applied to civil engineering practice. Minerals and rocks, aerial photographs, topographic and areal geologic maps and geologic cross sections studied in laboratory. Source of geologic literature and maps.

**307. Geology Central Appalachians**  
Winter. 1(0-2) 200, or 201, or 202, or concurrently.

General geology of the Central Appalachians. A preparatory course for 308. Field excursions—Central Appalachians during spring vacation.

**308. Field Excursion—Central Appalachians**  
Spring. 2 or 3 credits. 307.

Training in stratigraphic, sedimentological, paleontologic, and structural principles as applied to field methods.

**321. Mineralogy**  
Fall. 5(4-4) One term of chemistry.

Introduction to crystal systems and forms exhibited by minerals, followed by study of composition, occurrence, classification, and identification of nonmetallic minerals.

**322. Mineralogy**  
Winter. 4(3-4) 321.

Economic and chemical importance of minerals; mineralogy of non-silicates; practical crystallography; geochemistry of minerals.

**335. Fossil Plants, Their History and Paleocology**

Spring. 3(3-0) One course in geology or botany or biology or approval of department. Interdepartmental with the Botany and Plant Pathology Department.

History of plants through geologic time; their form and evolution; how and where found, identified and reconstructed; their use in determining ancient geographic patterns, paleoenvironments, paleoclimates and community structure. Field trip.

**344. Field Geology—Summer Camp**  
Summer. 9 credits. 202, 363. Trigonometry; GLG 446, 437, 451 recommended.

Methods and techniques of geological surveying and mapping. Field interpretation of geological phenomena in igneous, metamorphic and sedimentary rocks in northern Michigan and Wisconsin.

A. Introduction to Field Techniques  
3 credits.

Introduction to field techniques with stress on those that apply to sedimentary rocks. Stratigraphic correlation.

B. Methods of Geological Mapping  
4 credits.

Plane table surveys, aerial photo and reconnaissance mapping. Examination and interpretation of structural and textural relationships in igneous and metamorphic rocks.

C. Geologic Interpretation of Selected Areas  
2 credits.  
Independent mapping and interpretation.

**363. Lithology**  
(323, 423.) Spring. 4(3-4) 321.

Processes that form igneous, metamorphic and igneous rocks, origin, distribution, variation and occurrence of rock. Study of rock properties in the field, in laboratory, and with the microscope.

**400H. Honors Work**  
Fall, Winter, Spring. Variable credit.  
Approval of department.

**401. Environmental Geology**  
Spring of odd-numbered years. 3(3-0)  
200, or 201, or 306, MTH 113, or approval of department.

Quantitative solution of geological problems applied to environmental planning and management, including surface and ground water waste disposal, urban geology, and methods for prediction of geologic hazards and resources.

**411. Hydrogeology**  
Spring. 3(3-2) One term of geology and trigonometry.

Principles of the source, occurrence, and movement of ground water. Surface and subsurface investigations of ground water and elementary ground water hydrology.