General Catalog

82 84

The University of Iowa

Medical Scientist Training Program

Students may combine study toward an M.D. and a Ph.D. in genetics. Further information about this program can be obtained from the director of the Medical Scientist Training Program in the College of Medicine.

Departmental Ph.D. Programs

The departments of Biochemistry, Botany, Microbiology, and Zoology offer degree programs in which students may specialize in a particular aspect of genetics. See departmental descriptions elsewhere in the *Catalog* for further information about these programs.

Courses

The following genetics courses are available to graduate students:

99:150 Biochemistry of Informational Molecules	3 s.h.
99:223 Topics in Molecular Biology	1-2 s.h.
2:104 Cytogenetics	3 s.h.
2:160 Genetics and Biogenesis of Cell Organelles	arr.
2:215 Genetics Seminar	0-2 s.h.
50:175 Human Genetics	2 s.h.
61:170 Microbial Genetics	3 s.h.
61:175 Microbial Genetics Laboratory	1 s.h.
61:179 Comparative Microbial Genetics and Physiology	3 s.h.
61:270 Topics in Molecular Biology	arr.
37:162 Population and Evolutionary Genetics	3 s.h.
37:163 Behavioral Genetics	3 s.h.
37:165 Quantitative Genetics	3 s.h.
37:170 Eukaryotic Molecular Biology	3 s.h.
37:171 Molecular Genetics	4 s.h.
37:172 Topics in Molecular Genetics	2 s.h.
37:175 Topics in Evolutionary Genetics	1-2 s.h.
37:176 Topics in Eukaryotic Molecular Biology	2 s.h.
37:178 Advanced Genetics	2 s.h.
37:260 Developmental Genetics	2 s.h.

Geography

Department chair: James B. Lindberg
Faculty: *professors* John W. Fuller, James B. Lindberg, Michael L. McNulty, David R. Reynolds, Gerard Rushton
professors emeriti Clyde F. Kohn, H.H. McCarty
associate professors Rex D. Honey, Andrew M. Isserman, Joel L. Horowitz, R. Rajagopal
assistant professors Mary Ann B. Lee, Graham A. Tobin
adjunct faculty Marie P. Klugman
Degrees offered: B.A., B.S., M.A., Ph.D.

Geography seeks to explain spatial organization and areal differentiation through detailed studies of significant patterns and processes. The discipline is concerned with 'place' or 'environment' and ongoing forces which promote change within and between human and physical systems. Geography is a composite science, in that a broad base of knowledge from many related disciplines is required, as well as an analytical science which seeks explanations of specific research questions from a distinctly geographic perspective.

Students who elect courses in geography find they develop insights and methods of inquiry which are particularly applicable to understanding many of the complex problems confronting different societies. For instance, the distribution and consumption of natural resources, air and water pollution, the growth and development of urban areas, increasing populations, transportation problems, spatial inequalities, location of services, and conflicts between nations are some of the issues which will be dealt with during geographical training.

Studies in geography also provide students with concepts and methods for organizing such spatial units as urban areas, marketing regions, school districts, health service areas, drainage basins, and areas of environmental concern. Thus, geographers can make substantial contributions towards understanding the behavior of individuals, of societies, and of their relations with the environment.

Career opportunities for majors in geography exist in many branches of government and in business. There is a demand for persons capable of dealing with resource management, economic development, market area analysis, and other problems related to the distribution and spatial interaction of physical, economic, social, and political phenomena.

Courses in geography are commonly required of students preparing to enter the teaching profession at the elementary and secondary school levels, of students who want to work in urban and regional planning, and as a background for many related professions, including law, health care, environmental or transportation engineering, and business administration.

Undergraduate Program

The geography faculty has developed an undergraduate instructional program which provides educational opportunities for a variety of students: for the nonmajor interested in one or more elective courses as they relate to a liberal education; or for students interested in electing a cluster of courses in conjunction with another discipline or for the B.G.S. degree; and for students interested in acquiring a major in geography. The department also joins in significant interdepartmental programs involving global, urban, and environmental components.

Programs for the Undergraduate Major

Students majoring in geography may choose alternative programs depending on their interests. The substantive strengths of the department fall into three areas: environmental studies, urban and regional studies, and international development studies. Students may choose to develop expertise in one of these areas, or they may choose to develop an individualized program within the curriculum offered by the department.

Students planning advanced training or seeking careers in geography should elect the Bachelor of Science degree. Those who wish to pursue a liberal arts objective are advised to elect the Bachelor of Arts degree.

Requirements

All geography majors must complete a minimum of 26 semester hours of geography course work, at least 15 of which must be at the 100 level. Many students will find that they will need more than the minimum requirements for mastery of a specific subfield.

All geography majors must complete:

44:110 Spatial Organization
44:150 Undergraduate Seminar for Geography Majors

and one of the following statistical courses:

22S:127 Applied Statistical Methods and Computations
22S:25 Elementary Statistics and Inference
22S:101 Biostatistics
22S:102 Introduction to Statistical Methods

In addition, Bachelor of Science students must complete a mathematics requirement consisting of:

22M:3 Mathematical Techniques II
or
22M:10 Fundamentals of College Mathematics I

and
22M:20 Elementary Functions
or
22M:15 Mathematics for the Biological Sciences
or
22M:16 Calculus for the Biological Sciences
or
22M:25 Calculus I
or
22M:35 Engineering Calculus I

and a computer science requirement consisting of:

22C:7 Introduction to Computing with FORTRAN
or
22C:16 Introduction to Programming with PASCAL

With the consent of the geography faculty, equivalent courses, which have similar objectives as these, may be accepted in fulfillment of the statistical, mathematical, and computer requirements.

Recommendations

Students majoring in geography are advised to:

Take both the introductory level courses 44:1 Introduction to Human Geography and 44:2 Introduction to Physical Geography during their freshman or sophomore years;

Take first 44:110 Spatial Organization followed by 44:150 Undergraduate Seminar for Geography Majors during their senior year;

Take the statistical and mathematical requirements as early as possible because many advanced level geography courses assume prior knowledge of the subjects.

Students are also strongly recommended to take 22M:25 Calculus I or its equivalent in fulfillment of the mathematics requirement. Students equipped with these skills will find themselves with greater flexibility regarding further geographic studies and later career opportunities.

Courses for the Nonmajor

Students in the College of Liberal Arts or other schools and colleges of the University may find geography courses meaningful to their own program of study. The beginning-level courses 44:1 Introduction to Human Geography, 44:2 Introduction to Physical Geography, 44:11 Introduction to Social Geography, 44:19 Contemporary Environmental Issues, and 44:30 Introduction to Economic Geography are available for general education credit in social science, and serve as part of a liberal education.

Other courses may also be attractive as individual electives. These include 44:15 Introduction to Political Geography, 44:35 World Cities, 44:115 Locational Conflict, 44:128 Drainage Basin: Form and Process, 44:162 The Third World, 44:191 Energy in Contemporary Society.

Students in related disciplines may take groups of courses leading to a minor in geography. Bachelor of General Studies students may also take a group of geography courses as part of their degree. The geography courses listed below under the different programs for the major in geography will serve as a guide to course selection. Additional information about a minor in geography is available in the department office.

Environmental Studies

The undergraduate program in environmental studies is designed for students with career expectations or personal interests in resource management or environmental protection, or who have interests in physical geography per se. The program provides a knowledge of physical processes in landform development, atmospheric conditions, soil development, and biotic communities. It stresses the interrelationships among those processes and gives the student knowledge necessary to assess the impact of human activities on physical systems. Training in field observation, quantitative analysis, computer methods, and cartographic representation should be included in this concentration.

Students concentrating in environmental studies should take 44:2 Introduction to Physical Geography and 44:19 Contemporary Environmental Issues at the beginning of their program. They are advised to select additional geography courses from among the following:
44:1 Introduction to Human Geography
44:30 Introduction to Economic Geography
44:101 Weather and Climate
44:115 Locational Conflict
44:120 Natural Hazards
44:122 Environmental Conservation in the United States
44:123 Geography of Natural Resources
44:124 Introduction to Global Environment
44:125 Environmental Impact Analysis
44:128 Drainage Basin: Form and Process
44:129 Water Resources Management
44:180 Field Studies
44:191 Energy in Contemporary Society
44:107 Maps and Mapping and 44:109 Computer Methods in Geographical Analysis are strongly recommended.

Under the direction of an adviser, students should select courses (at least 12 semester hours) from among one of the following clusters:

Physical Systems
12:5 Introduction to Geology
12:108 Introduction to Oceanography
12:110 Introduction to Remote Sensing
12:166 Hydrogeology
12:171 Geomorphology
523:150 Principles of Environmental Engineering
523:181 Irrigation and Drainage
523:188 Hydrology
523:189 Water Resources Systems

Environmental Science
11:22 Ecology and Evolution
11:25 Chemistry and Physics of the Environment
11:26 Technology and Man
2:11 Plant Diversity
2:95 Plants and Human Affairs
2:111 Plant Ecology
2:119 Plant-Animal Interactions
2:116 Field Ecology
2:132 Ecology
37:133 Topics in Ecology
37:135 Quantitative Field Ecology
37:169 Quantitative Methods in Biology

Environmental Management
6E:1 Principles of Economics
6E:2 Principles of Economics
6E:103 Microeconomics
6E:105 Macroeconomics
6E:119 Economics of the Government Sector
6E:127 Natural Resources in the World Economy: Control and Conflict
6E:133 Economic Growth and Environmental Decay
6L:100 Administrative Management
6K:161 Individual Behavior in Organizations
6K:163 Design and Management of Organizations
102:101 Introduction to Planning and Policy Development
102:102 Case Studies in Urban and Regional Planning
102:104 Introduction to Environmental Planning

91:136 Resource Planning
527:102 Technology of Environmental Pollution Control
527:104 Environmental Planning and Assessment

Urban and Regional Studies

Students with interests in urban and regional analysis will find this concentration relevant, either as background training for graduate work or as preparation for entry-level positions in government and private businesses. This concentration focuses on the problems and potentials of towns, cities, and regions, and the decision-making processes of individuals and institutions. Dealing with such problems as assessing sites for development potential, locating public facilities, and gauging neighborhood change brings the student inside the dynamic of contemporary cities. Requisite skills in quantitative analysis, cartography, and computer usage are developed. Opportunities for experience in working with real problems are included.

Students concentrating in urban and regional studies are advised to select substantive courses (at least 21 semester hours) from among the following:
44:1 Introduction to Human Geography
44:2 Introduction to Physical Geography

44:11 Introduction to Social Geography
44:15 Introduction to Political Geography
44:30 Introduction to Economic Geography
44:35 World Cities
44:115 Locational Conflict
44:116 Urban Political Geography
44:125 Environmental Impact Analysis
44:130 Location of Services
44:131 Medical Geography: Health Services
44:132 Industrial Location
44:133 Introduction to Transportation
44:134 Urban Transportation
44:135 Urban Geography
44:136 The Inner City
44:137 Urban and Regional Modeling
44:139 Urban Problems

Also strongly recommended:
44:107 Maps and Mapping
44:109 Computer Methods in Geographical Analysis

Under the direction of their advisers, students should select courses in related disciplines from the following:
113:119 Urban Anthropology
16:187 Afro-American History 1914-Present
30:111 Municipal Government and Politics
34:172 Social Dynamics of Urban Life
102:101 Introduction to Planning and Policy Development
102:102 Case Studies: Urban and Regional Planning
102:115 Regional Development Policy and Planning
6E:113 Health Economics
6E:135 Regional and Urban Economics
6E:137 Problems in Urban Economics
6M:134 Marketing Research

International Development Studies

The concentration in international development studies is designed for students interested in international affairs; in the economic, social, and political development of new and old nations; in the solution of regional problems that have global implications; and in cross-cultural comparisons. This concentration aims to give students a deeper understanding of the world in which they will live and work by emphasizing the variety of cultures and societies which exist outside of the United States and to which our country must relate.

Students concentrating in international development studies are advised to select courses (at least 21 semester hours) from among the following:
44:1 Introduction to Human Geography
44:2 Introduction to Physical Geography
44:11 Introduction to Social Geography
44:15 Introduction to Political Geography
44:30 Introduction to Economic Geography
44:35 World Cities
44:115 Locational Conflict
44:124 Introduction to Global Environment
44:161 African Development
44:162 The Third World
44:165 The Changing World
44:191 Energy in Contemporary Society

Under the direction of an adviser, students should select courses in related disciplines from among the following:
30:60 Introduction to World Politics
30:127 Policy Problems in Industrial Societies
30:150 The Political Economy of the Third World
30:160 International Politics
30:166 Politics of War and Peace
6E:123 Political Economy of the Military-Industrial Complex
6E:129 Economic Development of Underdeveloped Areas
16:89 Culture and Politics of Latin America
16:90 Introduction to Modern Latin America
16:170 Modern African History
16:196 China: Opium War to Mao

Appropriate foreign language training might also be a part of the student's degree program.

The department cooperates in the interdisciplinary Global Studies Program.

Individual Programs

Students with more general interests who wish to pursue a Bachelor of Arts degree may design their own individual programs of instruction with the help of their advisers. Such programs must include 26 semester hours of geography, at least 15 of which must be at the 100 level. They also must include the following courses:
44:110 Spatial Organization
44:150 Undergraduate Seminar for Geography Majors
and
one of the following statistics courses:
22S:127 Applied Statistical Methods and Computations
22S:25 Elementary Statistics and Inference
22S:101 Biostatistics
22S:102 Introduction to Statistical Methods

The Cooperative Education Program

The Department of Geography is a participant in the University's Cooperative Education Program, which provides opportunities for both undergraduate and graduate students to secure cooperative training assignments related to their academic programs.

Graduate Program

The goals of the department at the graduate level are to prepare students to carry on creative and productive research in geography involving the use of theory, modeling, and formal verification methods, and to prepare students for positions in research, teaching, or some area of applied geography. The achievement of these goals is demonstrated in large measure by the demand for University of Iowa graduates to fill positions on college and university faculties, in research-oriented institutions, and in business and government.

The department offers specialized instruction in the teaching of geography at the college level for those interested in academic careers. Opportunities are provided for all graduate students to gain practical teaching experience through service as departmental teaching assistants or through other supervised teaching duties.

Master of Arts

The department offers an M.A. program that emphasizes the acquisition of problem-solving skills. Within an overall analytical framework, students develop a broad area of competence that can be tailored to meet the contemporary demands of business, government, or the teaching profession. Recent graduates have obtained positions in health planning, community planning, transportation, and market research. The M.A. degree is also frequently taken by students whose ultimate goal is the Ph.D. degree.

As soon as possible during the first year of residence, students, in close consultation with their adviser and other faculty members, develop a plan of study for their degree program. This should include a description of the student's interests and should identify clearly the general area (or areas) within geography in which the student wishes to concentrate. The program of study should also emphasize relevant problem-solving methods, and philosophy and epistemology in geography.

The M.A. degree requires a minimum of 30 semester hours of graduate work, of which 15 semester hours must be 200-level courses or above. Specific requirements for the degree are:
At least 4 semester hours chosen from among the mini-courses 44:201-202 Geographical Analysis I-II;
Satisfaction of the department's B.S. degree requirements in mathematics, statistics, and computer programming or its equivalent (see above);
44:208 Quantitative Analysis I
and
An additional 12 semester hours in geography.

Additional courses in geography or related fields complete the student's program.

Students who enter with sufficient background are frequently able to complete the program in one full year.

The M.A. degree is available with or without thesis. A maximum of 6

semester hours of credit may be earned for thesis work.

Students must pass a written and/or oral final examination.

Doctor of Philosophy

The Doctor of Philosophy program is designed to prepare students for positions in college and university teaching and in advanced research. It provides programs of study leading to (1) broad knowledge of a field of geography and its literature as well as (2) a specific field of competence and special expertise. The former might represent the general area in which the Ph.D. holder seeks employment, whereas the latter would represent the area of active research involvement.

Students whose objective is the Ph.D. degree in geography are required to complete 8 semester hours of 44:201-202 Geographical Analysis I-II and 44:208-209 Quantitative Analysis I-II. The eight mini-courses comprising 44:201-202 should be taken within the first two years in residence, and must include mini-courses offered by at least six different faculty members. The courses 44:208-209 Quantitative Analysis I-II should be taken during the first year in residence. Students may meet these requirements with a satisfactory performance in written examinations.

All doctoral students must also complete two research seminars, preferably during the second year in residence, under the direction of different faculty members. Unless excused by the faculty, Ph.D. candidates are also required to register for 44:350 Research Seminar: Staff each semester while they are in residence.

The remainder of the Ph.D. program includes appropriate graduate courses, seminars, and independent research in geography; courses in disciplines closely related to the student's objectives and interests; and courses which satisfy the tool requirements.

Research tool requirements for Ph.D. candidates are the course 44:209 Quantitative Analysis II and another appropriate course, as approved by the faculty at the time the student declares his or her specific area of specialization.

By their fourth semester in residence, doctoral students should submit a written report that includes an assessment of progress to date, an outline of the area within geography in which they intend to specialize, and a proposed plan of study for the following year.

Preferably during the second year in residence, doctoral students who have been admitted to the graduate program without advanced credit must submit an original research paper to the faculty, with the approval of their advisers. Students who have been admitted with advanced graduate credit of 24 semester hours or more, are encouraged to submit this paper earlier. The faculty will pass upon the merits of the research thus demonatrated. Students become Ph.D. candidates when their qualifying papers have been accepted.

All doctoral candidates are expected to have supervised experiences as classroom instructors and research assistants before being awarded the Ph.D. degree.

Regional Science

The department also offers graduate study in regional science. In addition to the requirements for the M.A. or Ph.D. degree in geography, students selecting regional science as their field of study are required to take courses in location theory and analysis, regional economic development, methods of regional analysis, microeconomic theory, macroeconomic theory, and operations research. Doctoral candidates in the field of regional science also are expected to complete courses in philosophy and epistemology in geography and in econometrics as well as three courses in a field of specialization such as location theory, regional economic development, environmental systems management, transportation modeling and policy, or population studies. Students may choose to apply to the Department of Economics to earn master's degrees in economics in addition to their master's and doctorate in Geography, because completing the regional science requirements entails satisfying most requirements for the master's in economics.

Graduate Admission

In addition to the general rules and regulations set forth in the *Manual of Rules and Regulations of the Graduate College*, the department considers the applicant's undergraduate grade-point average, especially of his or her junior and senior years; scores on the Graduate Record Examination Aptitude Test; three letters of recommendation; and an essay in which the applicant sets forth the reasons for wanting to study geography at The University of Iowa.

An applicant with an undergraduate grade-point average between 2.3 and 2.75 will be admitted only for the M.A. degree and on the condition that he or she achieves a grade-point average of 2.75 or better on the first 12 semester hours of graduate work as approved by the department.

Foreign students, and those from undergraduate institutions that evaluate students on a basis other than grade-point averages, will be considered according to their relative academic standing in their respective institutions.

Financial Assistance

A number of graduate appointments as teaching or research assistants are available. Awards are based on merit and a student must ordinarily have achieved a combined score of 1100 on the Graduate Record Examination verbal and quantitative sections, and have a 3.0 undergraduate or graduate grade-point average, to be appointed to an assistantship. Applications for graduate appointments should ordinarily be received by February 15.

Facilities

The department possesses a unique complete graphics hardware system in the IMLAC PDS-4 mini-computer that supports a GRAF PEN GP-3 sonic digitizer. The PDS-4 is a 24K system with a CRT for on-line editing and an accompanying software support package, DIGIT SERIES, developed locally that allows for a broad range of computer graphic applications. This system is linked to one of four PRIME 750 systems, each supporting 48 terminals and all linked to the IBM 370/168. Complementing these hardware systems are an increasing number of sophisticated software packages that will dramatically improve interactive computing capabilities.

The Map Library contains more than 75,000 maps, a total of 2,050 atlases and reference works, and about 80,000 aerial photographs, primarily of Iowa. The library is a depository for maps of the U.S. Army Topographic Command, formerly Army Map Service.

The Geology Library contains approximately 50,000 maps, including both geologic maps and U.S. Geological Survey topographic maps. The Department of Geography has its own collection of topographic maps, maps of large urban centers, and aerial photographs for use by students in laboratory exercises.

Courses

Most courses open to undergraduate students may be taken in any order or simultaneously. It is recommended, however, that majors take 44:110 and 44:150 in that sequence. All courses below the 100-level are open to freshmen; 44:1, 44:2, 44:11, 44:19, and 44:30 are available for credit for the general education requirement in social sciences.

Primarily for Undergraduates

44:000 Cooperative Education Training Assignment 0 s.h.

44:1 Introduction to Human Geography 4 s.h.
Application of geographic principles to contemporary social, economic, and political problems; urban growth; problems of the ghetto; diffusion of innovations; territoriality and perception.

44:2 Introduction to Physical Geography 4 s.h.
Elementary principles of physical geography: physics of weather and climate, hydrological systems, geomorphological and geological forces, pedological processes and spatial factors in vegetation distribution; geographic explanation of physical environment, with principles applied to the human-use system: environmental pollution and natural hazards.

44:11 Introduction to Social Geography 3 s.h.
Spatial considerations of population growth and distribution; minorities within a population; poverty; housing; social organization and disorganization; social systems including education, religion, recreation, medical and social services; diffusion of ideas and traits over space.

44:15 Introduction to Political Geography 3 s.h.
Geographic principles applied to political and economic problems at international, national, and local levels; topics include regional disparities in social well-being, service outputs of governments, political dimensions of environmental quality, spatial organization of political systems.

44:19 Contemporary Environmental Issues 3 s.h.
Problems associated with population growth, technology, and resource consumption; protection of natural, historic, and cultural resources; air pollution; water pollution; energy and environment; alternative approaches to the resolution of environmental problems; real world case studies.

44:22 Environmental Management 3 s.h.
Introduction to environmental management issues; interaction of the natural environment and the human use system from a physical geography perspective, culminating in studies of current problems facing societies; topics ranging from considerations of physical processes to land-use management aspects in different environments; based on a seminar/lecture format and designed for those in the honors program.

44:30 Introduction to Economic Geography 3 s.h.
Location and spatial organization of world's major types of economies; agriculture, energy and minerals, manufacturing, transportation; trade and service centers.

44:35 World Cities 3 s.h.
Introductory course on urban geography examining urbanization as a process through lectures, films, readings, and discussions; specific concepts and theories of urbanization through global patterns, regional urban systems, and individual metropolitan areas. Offered spring semesters.

44:100 Readings for Undergraduates arr.
Supervised readings in geography. Prerequisite: consent of instructor.

For Undergraduates and Graduates

44:101 Weather and Climate 3 s.h.
Spatial distribution of weather elements and analyses of atmospheric processes: wind circulation, air mass movement, storm activity, and global climatic conditions; application of principles to urban and forest climates, weather modification and climatic change. Prerequisite: 44:2 or consent of instructor.

44:107 Maps and Mapping 2 s.h.
Qualities of a good map or diagram; types of maps or diagrams for particular uses; major types of cartographic presentations; available tools for constructing maps and diagrams; procedures for the compilation of maps and diagrams; laboratory experiences in compiling maps and diagrams.

44:108 Introduction to Quantitative Methods in Geography 3 s.h.
Applications of mathematical and statistical techniques in geography.

44:109 Computer Methods in Geographical Analysis 2 s.h.
Use of computer mapping as a tool in geographic analysis; various mapping programs including SYMAP, CALFORM, and others. Prerequisite: 22C:7, 22C:16, or consent of instructor.

44:110 Spatial Organization 3 s.h.
Approaches to spatial analysis of human activities and natural processes. Offered fall semesters.

44:115 Locational Conflict 3 s.h.
Behavioral and institutional bases of locational conflict, with emphasis on microeconomic, public choice, and social justice perspectives, politicizing processes, strategies of resolution in selected contexts: environmental management problems, facility siting, service provision/taxation policy. Prerequisite: 44:15 or consent of instructor.

44:116 Urban Political Geography 3 s.h.
Relationships between individual political behavior and the functional and geographical organization of urban political systems; U.S. metropolitan areas and the satisfaction of citizen preferences for public goods and services.

44:120 Natural Hazards 3 s.h.
Human-physical environment interrelationships under extreme geophysical conditions; causes, characteristics, and consequences of natural hazards, such as earthquakes, tornadoes, hurricanes, floods and droughts; human adjustments to these events. Prerequisite: 44:2 or consent of instructor.

44:122 Environmental Conservation in the United States 3 s.h.
The varied natural environments of the United States, and the problems arising from conflicting land uses; consideration of public land use policy, environmental impacts of different land uses, and problems of habitat preservation and endangered species. Prerequisites: 44:2 and 44:19 or consent of instructor.

44:123 Geography of Natural Resources 3 s.h.
Nature and patterns of global differences in the natural resource base for agriculture and industry; environmental problems arising from resource development.

44:124 Introduction to Global Environment 3 s.h.
Survey of the major global ecosystems; the physical and biological processes which create these ecosystems and problems resulting from the impact of human activities on them. Prerequisite: 44:2 or consent of instructor.

44:125 Environmental Impact Analysis 4 s.h.
Environmental impact assessment methodologies; emphasis on cost-benefit-risk analysis, overlay and graphic techniques, optimal resource use, and system simulation; field trips to local environmental control facilities. Prerequisite: senior standing or consent of instructor.

44:128 Drainage Basin: Form and Process 3 s.h.
Hydrological principles, stream channel processes and fluvial geomorphology within the drainage basin system: spatial and temporal variations in water distribution, analyses of hydrological data, flow mechanisms, sediment transport, forecasting procedures, hydrograph construction and modeling. Prerequisite: 44:2 or consent of instructor.

44:129 Water Resources Management 3 s.h.
Application of hydrological information in water resources management; aspects of water quantity and quality, groundwater availability, water use and treatment, resource development, political and administrative issues, basin management problems: forestry, agriculture, urbanization, floods and droughts. Prerequisite: 44:128 or consent of instructor.

44:130 Location of Services 3 s.h.
Problems in the effective spatial organization of public and private facilities; central place theory; modeling spatial choices between service sites; spatial outcomes of alternative behavioral strategies for reorganizing service systems; location-allocation algorithms and their use in planning and evaluating the spatial delivery of social and economic services.

44:131 Medical Geography: Health Services 2-3 s.h.
Geographical distribution of health resources and services; defining health-shortage areas; location decision-making by providers of health services, optimal location of health services.

44:132 Industrial Location 3 s.h.
Theory and practice of manufacturing location and its application to different industries and types of economy; investigations of selected case studies.

44:133 Introduction to Transportation 3 s.h.
Overview of (1) transportation markets: intercity, rural, and urban; (2) transportation modes: railroads, highways, air carriage, and waterways; and (3) discussion of regulation, finance, and physical distribution issues. Same as 102:133.

44:134 Urban Transportation 3 s.h.
Interaction between urban form and transportation; public policies towards transport; transport technologies for cities; energy consumption; planning and management of transit systems and road networks; and urban freight transport related to economic development. Same as 102:134.

44:135 Urban Geography 3 s.h.
Models of urban growth and urban forms; spatial patterns of selected activities; processes that generate these patterns; current problems.

44:136 The Inner City 3 s.h.
Residential segregation of minorities, spatial structure of ghetto areas; environmental quality of inner city neighborhoods; spatial aspects of problems of economic and social stress. Same as 45:136.

44:137 Urban and Regional Modeling 3 s.h.
Description, forecasting, and planning methodology applications to urban land use, population and employment projections, regional economic growth, transportation planning, and environmental management.

44:139 Urban Problems 3 s.h.
Geographical perspective on problems of urban life; processes involved and policy implications of such topics as sprawl, redevelopment, housing, segregation, transportation, crime, health care, air pollution. Prerequisite: 44:135 or consent of instructor.

44:150 Undergraduate Seminar for Geography Majors 2 s.h.
Participation in a term project and preparation of a documented report. Offered spring semester only. Prerequisites: 44:110, completion of departmental statistics requirement, or consent of instructor.

44:161 African Development 3 s.h.
Problems of economic, political, and spatial integration in Africa; patterns and processes of economic development and nation-building. Same as 30:146.

44:162 The Third World 3 s.h.
Geographical patterns and processes of underdevelopment; spatial implications of colonialism and neocolonialism; alternate concepts of spatial planning in the Third World.

44:165 The Changing World 3 s.h.
Conceptualization of the world as an increasingly interconnected system; similarities and differences in the ways diverse regions are participating in the changing world.

44:167 The Geography of the Soviet Union 3 s.h.

44:170 The World of Wines 2 s.h.
Production, distribution, and consumption of wines throughout the world, with emphasis on quality of wine as related to landforms, soils, weather conditions; viticultural practices in the different grape-growing areas.

44:180 Field Studies arr.
Problem definition and research design in a field setting; sampling procedures, collection of primary data, data analyses and interpretation; topics encompass the spectrum of geographic discipline. Prerequisite: 12 semester hours in geography or consent of instructor.

44:191 Energy in Contemporary Society 3 s.h.
Technical, legal, economic, and behavioral issues in energy production, delivery, and use; emphasis on cross-disciplinary implications of energy systems. Prerequisite: junior, senior, professional, or graduate status. Same as 527:101, 12:114, and 91:191.

For Graduates Only

44:200 Readings arr.
Graduate students interested in pursuing specific topics of their choice may do so by registering for supervised readings in geography. Prerequisite: consent of instructor.

44:201 Geographical Analysis I 1-4 s.h.
Four mini-courses on selected topics of current interest to faculty; focus is on methodological, theoretical, and substantive issues.

44:202 Geographical Analysis II 1-4 s.h.
Four mini-courses on selected topics of current interest to faculty. Continuation of 44:201.

44:206 Teaching College Geography 2 s.h.
Roles of college faculties; goals and objectives of geography teaching; alternative instructional methods; evaluation systems; emphasis on application in the college classroom.

44:208 Quantitative Analysis I 3 s.h.
Problems of drawing inferences from data in studies using simple measures; research design; commonly-used measures of statistical and spatial association; logic of statistical inference and hypothesis testing; simple correlation and regression analysis; introduction to computer modeling. Prerequisite: introductory statistics or consent of instructor.

44:209 Quantitative Analysis II 3 s.h.
Statistical and mathematical analysis in current geographical research, with emphasis on problem formulation and research design; multiple correlation and regression; analysis of variance; testing causal models; selected topics in multivariate analysis, scaling, and network analysis. Continuation of 44:208. Prerequisite: 44:208 or consent of instructor.

44:210 Philosophy and Epistemology in Geography 2 s.h.
Analysis of philosophies and methodologies of modern geography, with emphasis on epistemological and ontological issues; discussion of positivism (empiricism), its variants, and alternatives, in light of past and current research.

44:215 Political-Economic Analysis in Geography 3 s.h.
Theories of the political-economic organization of space at the subnational level, with an emphasis on political geography, public choice, social welfare, and collective decision-making approaches; locational conflict, philosophical and methodological issues in public policy analysis.

44:216 Behavioral Analysis in Geography 2 s.h.
Various behavioral model-building strategies pertaining to spatial behavior and spatial structure, with emphasis on environmental perception approaches. Prerequisite: 44:208 or consent of instructor.

44:218 Drainage Basin: Form and Process 2-3 s.h.
Theoretical and empirical studies into hydrological principles, stream channel processes and fluvial geomorphology in the drainage basin: spatial and temporal variations in water distribution, analyses of hydrological data, flow mechanisms, sediment transport, forecasting procedures, hydrograph construction and modeling. Prerequisite: background in physical geography or consent of instructor.

44:219 Stream Process and Water Resources 1-3 s.h.
Theoretical and empirical studies in the application of hydrological information to water resource management problems: aspects of water quantity and quality, groundwater availability, water use and treatment, resource development, political and administrative issues, basin management problems including: forestry, agriculture, urbanization, floods, and droughts. Prerequisite: 44:218 or consent of instructor.

44:222 Environmental Conservation and Management 2-3 s.h.
The ecological and economic problems of preservation of the natural environment; management strategies of minimizing environmental disruption and reclaiming and restoring environments. Prerequisite: consent of instructor.

44:223 Geography and Natural Resources 2-3 s.h.
The natural resource base for agriculture and industry with a particular emphasis on environmental problems arising from resource development in the lesser developed world. Prerequisite: consent of instructor.

44:225 Environmental Systems Analysis 2-3 s.h.
Linear optimization and continuous system simulation models; recent applications in water resources management, solid-waste disposal, land management planning, nutrient cycling, facility siting, population dynamics, epidemiology, forest management, transportation, and natural resource allocation and efficiency. Prerequisite: consent of instructor.

44:236 Travel Behavior in Urban Areas 3 s.h.
Theoretical and conceptual basis of urban travel behavior; current models of travel behavior; interaction between intra-urban spatial structure and travel behavior; new research strategies and experimental behavior models helpful for insight into urban travel behavior processes. Prerequisite: 44:208 or consent of instructor.

44:237 Urban Spatial Analysis 2 s.h.
Research issues, findings, and methodologies in urban geography; spatial aspects of economic, social, and political processes in urban settings; preparation of review papers.

44:265 Transportation Regulation and Finance 3 s.h.
Explores public policy options for improving passenger and commodity movements within and between cities, as these policies relate to air, water, and land-based transportation modes. Same as 6E:278, 102:265.

44:275 Urban Growth in Developing Countries 3 s.h.
Cross-cultural and interdisciplinary analysis of problems associated with urbanization and development in the developing nations. Same as 113:275, 6E:234, 42:275, 34:275, 102:275, 7F:275.

44:280 Advanced Field Studies arr.
Problem definition and research design in a field setting at the graduate level; sampling procedures, collection of primary data, data analyses and interpretation. Topics may encompass the spectrum of the geographic discipline and can be tailored to individual requirements. Prerequisite: 44:208, 44:209 or consent of instructor.

44:290 Methods of Regional Analysis: Economic and Demographic 2-3 s.h.
Methods of regional science, including input, output and econometric models; migration and multiregional demographic models; spatial interaction modeling; and interregional economic-demographic models. Emphasis on theoretical foundations and on applications to forecasting and impact analysis. Same as 6E:290, 102:290.

44:292 Locational Theory 2 s.h.
Economics of location; location of the firm; transportation cost and location; urban spatial structure; and spatial price theory. Same as 6E:292, 102:292.

44:293 Locational Analysis of Economic Behavior 3 s.h.
Classical theories for location of economic activities contrasted with alternate approaches of spatial analysis school of economic geography; contemporary efforts to develop behavioral models of decision making contrasted with mathematical programming and heuristic programming approaches to solutions of spatial allocation problems. Prerequisite: 44:130, 44:209, or consent of instructor.

44:294 Geographic Perspectives on Development 3 s.h.
Theoretical and empirical studies of the development process, with special emphasis on spatial implications of socioeconomic changes attendant upon development. Prerequisite: 44:208 or consent of instructor.

44:295 Regional Development: Theory and Policy 2 s.h.
Theories of regional growth and development; factors contributing to regional problems and spatial inequality; regional economic and demographic trends and their causes; objectives, strategies, and evaluation of regional policy. Same as 6E:295, 102:295.

44:296 Regional Development: Mathematical Models 2 s.h.
Models of regional growth and development; central place associated with urbanization and development and the developing nations. Prerequisites: 6E:203 and consent of instructor. Same as 6E:296, 102:296.

44:300 Seminar in Applied Problems 4 s.h.
Geographic skills, knowledge, and analytical methods needed to solve real world problems presented in a case studies format, including problems in human geography, locational analysis, and human-environment interactions. Prerequisites: 44:208, 44:107, and 22C:7, or their equivalents.

44:306 Research Seminar: Quantitative Methods, Computer Methods, and Modeling arr.

44:315 Research Seminar: Locational Analysis of Political Behavior arr.

44:319 Research Seminar: Physical Geography arr.

44:321 Research Seminar: Urbanization and Environment arr.

44:323 Research Seminar in Natural Resources arr.

44:330 Research Seminar: Geographic Analysis of Economic Behavior arr.

44:331 Research Seminar: Location Theory arr.

44:335 Research Seminar: Urban arr.

44:336 Research Seminar: Urban Travel Behavior arr.

44:350 Research Seminar: Staff arr.

44:380 Field Seminar arr.

44:390 Seminar in Regional Science arr.

44:406 Research: The Teaching of Geography arr.

44:419 Research: Physical Geography arr.

44:440 Research: Environmental Systems Analysis arr.

44:441 Research: Locational Analysis arr.

44:442 Research: Models of Spatial Behavior arr.

44:450 Thesis arr.

Geology

Department chair: Richard A. Hoppin
Faculty: *professors* Richard G. Baker, Lon D. Drake, Brian F. Glenister, Philip H. Heckel, Richard A. Hoppin, Gilbert Klapper, George R. McCormick, Holmes A. Semken, Keene Swett, Sherwood D. Tuttle
professor emeritus William M. Furnish
associate professors Robert L. Brenner, Robert S. Carmichael, C. Thomas Foster, Jr.
assistant professor Eric H. Christiansen
adjunct professors G. Brian Bailey, George Hallberg, Donald Koch
adjunct assistant professors Ann B. Foster, Brian Witzke
research associate Julie Golden
Degrees offered: B.A., B.S., M.S., Ph.D.

Geology is the basic study and practical application of all scientific disciplines as related to understanding the earth. Geological concerns include the earth's origin, its present appearance and character internally and at the surface, its alteration with time, the locating of economic and energy resources, and how man is changing the earth for future generations. The Department of Geology has the customary subfields—mineralogy, petrology, stratigraphy, structural geology, paleontology, sedimentology, economic geology, geomorphology, glacial geology, environmental geology—and also includes applied geophysics, geochemistry, paleobiology, and remote sensing.

Career opportunities are available to professional geologists in industry (especially as related to the search for petroleum and minerals), teaching, urban planning, state and federal geological surveys, and government, resource, and research organizations. The master's degree is regarded by most hiring agencies as the working degree in geology. However, an undergraduate degree is fully satisfactory in certain teaching, federal, and industrial situations.

Many of The University of Iowa's geology graduates find employment with the petroleum industry in exploration geology and geophysics. Others continue in graduate school or take jobs with government or conservation