113 Introduction to Economic Geography  
Fall, Spring. 3(3-0)  
Spatial distribution of resources, population, enterprise, trade, consumption, and production. Interaction of those distributions at local to global scales.

151 Introduction to Human Geography  
Fall, Spring. 3(3-0)  
Systematic study of spatial patterns and processes that have shaped human use and alteration of the world.

201 Introduction to Plant Geography  
Fall of odd years. 3(3-0) R: Not open to graduate students.  
Geographic distribution and characteristics of plants throughout the world; relationships between biomes and aspects of the physical environment (climate, soils, landforms, disturbance); plant ecology; human impacts on vegetation; optional field trip on campus.

203 Introduction to Meteorology  
Fall. 3(3-0)  

204 World Regional Geography  
Fall, Spring, Summer. 3(3-0)  
Economic, political, cultural, environmental, and technological processes and conditions that explain the diversity of world regions.

206 Physical Geography  
Fall, Spring. 3(3-0)  
Geographic and functional interrelationships within the physical environment: Earth-sun relationships, weather, climate, soils, vegetation and landforms (terrain characteristics).

206L Physical Geography Laboratory  
Fall, Spring. 1(0-2) P: GEO 113 or GEO 151 or GEO 203 or GEO 204 or (GEO 206 or concurrently) or GEO 208 or GEO 211 or GEO 215 or GEO 221  
Geographic aspects of weather, climate, soil, vegetation, and terrain. Interpretation and application of maps and remotely sensed imagery.

208 Physical Geography of the National Parks  
Fall. 3(3-0)  
Physical features such as geology, landforms, biota, and waters of United States and Canadian national parks, forests, seashores and lakeshores. Emphasis on formation and distribution.

211 Environmental Policy and Practice  
Fall. 3(3-0)  
Systems study of environmental policy and resource management practices in the United States and the broader global context, emphasizing geographical and other social sciences perspectives.

214 Geography of Drugs  
Fall of even years. 3(3-0)  
Physical, ecological, and human geographies of drugs, drug crops, pharmaceuticals, alcohol, and their diffusions. Cultural geographies and geopolitical implications of drugs' consumption, trade, and regulation and prohibition.

215 Sports Geography  
Fall of odd years. 3(3-0)  
Geographical variables that influence the location, character, and spread of sports at the national and global scale. Human cultures and diffusion. Themes associated with the geography of sports. Origin and spread of collegiate, professional, international, and Olympic sports.

221 Introduction to Geographic Information  
Fall, Spring. 3(3-0)  
Principles and methods of spatial data collection, handling, analysis, and display. Introduction to remote sensing, geographic information systems, and cartography.

221L Introduction to Geographic Information Laboratory  
Fall, Spring, Summer. 1(0-2) P: GEO 221 or concurrently RB: Basic computer and math skills  
Basic skills for working with Geographic Information Systems, remotely sensed imagery, design of maps, geospatial tools and technologies for data analysis and problem-solving.

225 Geographic Information Systems  
Spring. 3(3-0)  
Geographic patterns of global health and environmental inequalities; the built, physical and social environment; urban design; infectious and chronic diseases.

229 Geography of Recreation and Tourism  
Fall of even years. 3(3-0)  
Cultural, physical, and biotic factors affecting the distribution of recreation and tourism resources and participation. U.S. and international examples and case studies.

235 Geographic Patterns of Recreation and Tourism  
Spring. 3(3-0)  
Geographic patterns of global health and environmental inequalities; the built, physical and social environment; urban design; infectious and chronic diseases.

236 Undergraduate Research in Geography  
Fall of even years. 3(3-0)  
Supervised research on a topic or topics determined by the instructor. Applications of geographic tools and theory.

302 Climates of the World  
Fall of odd years. 3(3-0) RB: GEO 206 or GEO 203 R: Not open to freshmen  
Regional climates and underlying atmospheric circulation patterns. Climate classification, physical climatic processes, spatial and temporal aspects of climate, climate changes. Sources and use of climate data.

303 Severe and Hazardous Weather  
Spring of even years. 3(3-0) P: GEO 203 or approval of department  
Extratropical cyclones, freezing precipitation and ice storms, lake effect snowstorms, cold waves, blizzards, thunderstorms, tornadoes, downbursts, tropical cyclones, floods, drought, and heat waves.

306 Environmental Geomorphology  
Fall of even years. 3(3-0) Interdepartmental with Geological Sciences. Administered by Geography. P: CSS 210 or GEO 206 or GEO 333 or GLG 201 or GLG 304 or ISP 203A  
Relationships of running water, weathering, gravity, ice, waves, wind, and biota (including humans) to terrain and soils. Evolution of landscapes. Classical and modern interpretations.

314 Methods for Investigation of Urban Systems  
Spring. 4(3-2) Interdepartmental with Urban Planning. Administered by Urban Planning. P: UP 201 and CSE 101 and STT 201  
Models, approaches, and techniques for urban and regional problem analysis, research, program evaluation, and project management. Application of related computer software.

324 Remote Sensing of the Environment  
Fall. 4(2-4) P: GEO 221 SA: GEO 224  
Features and interpretation methods of remotely sensed imagery, especially black-and-white and color infrared airphotos. Basic features of radar, thermal, and multispectral imagery. Interpretation for agriculture, archaeology, fisheries, forestry, geography, landscape architecture, planning, and wildlife management.

325 Geographic Information Systems  
Fall. 3(2-2) P: GEO 221 and GEO 221L  
Technical and theoretical issues in the design, implementation, and use of geographic information systems for research and applications.

326 Cartographic Design and Production  
Fall. 4(2-4) P: GEO 221 and GEO 221L SA: GEO 423  
Map design, layout, and usability. Typography and color theory. Techniques of map production, print and digital display.

330 Geography of the United States and Canada  
Spring. Summer. 3(3-0) SA: GEO 230  
Regional analysis. Evolution and status of environmental, demographic, economic, and sociocultural patterns and processes.

333 Geography of Michigan and the Great Lakes Region  
Spring. 3(3-0) SA: GEO 233  
Michigan's physical, historical, and economic geography. Interrelationships between the physical environment (rocks, landforms, soils, climate, vegetation, hydrology) and historical and contemporary land uses. Demographic and agricultural patterns. Human history and settlement patterns. Contemporary recreational opportunities.

335 Geography of Latin America  
Fall of odd years. 3(3-0)  
Physical and human geography of Latin America. Current development issues, especially people-environment interaction in urban and rural areas. Topics include migration, urbanization, and industrialization.

336 Geography of Europe  
Fall of even years. 3(3-0)  
Major regions and nations, including their physical resources, peoples, political structures, and economies.
337 Geography of Asia-Pacific
Spring of odd years. 3(3-0)
Spatial patterns and processes of economic, urban, human and physical geography in eastern Asia, including China, Korea, Japan, Australia, New Zealand, the Indian subcontinent and other Asian countries. Contemporary regional development.

338 Geography of Africa
Fall. 3(3-0)
Physical and human geography of Africa. Current development issues, especially people-environment interaction in urban and rural areas. Topics include drought, agricultural patterns, hunger, rural development, migration, and urbanization.

339 Geography of the Middle East and North Africa
Spring of odd years. 3(3-0)

340 Geography of Eurasia
Spring of even years. 3(3-0)
Physical, ecological, and human geographies of the lands and peoples of the former Russian and Soviet empires and of neighboring regions.

363 Introduction to Quantitative Methods for Geographers
Fall. 3(3-0) RB: Completion of University mathematics requirement. SA: GEO 463
Quantitative techniques in the analysis and classification of spatial data.

370 Introduction to Zoogeography
Fall. 3(3-0) Int: Fish, Wildlife and Integrative Biology. Administered by Integrative Biology. P: IBIO 355
SA: ZOL 370
Patterns of geographical distribution of animals and the ecological and historical processes leading to these patterns.

401 Global Plant Geography
Fall of odd years. 3(3-0) P: GEO 201 or FOR 101 or FOR 204 or PLB 218 or IBIO 355 or approval of department R: Not open to freshmen.
Patterns of global plant distributions. Plant-atmosphere interactions, ecological processes, biogeographic patterns and predictive models of plant distributions.

402 Agricultural Climatology
Fall of even years. 3(3-0) Int: Interdepartmental with Biosystems Engineering. Administered by Geography. P: MTH 110 or MTH 116 R: Not open to freshmen or sophomores.
Relationships between climate and agriculture in resource assessment, water budget analysis, meteorological hazards, pests, crop-yield modeling, and impacts of global climate change.

403 Dynamic Meteorology (W)
Spring. 3(3-0) P: (MTH 234 and GEO 203) and completion of Tier I writing requirement RB: GEO 405 R: Open to juniors or seniors or master's students or doctoral students.
Principles of fluid dynamics and their application to the atmosphere.

405 Weather Analysis and Forecasting
Spring of even years. 4(2-2) P: GEO 203 and (MTH 110 or MTH 116)
Dynamic and thermodynamic principles of atmospheric science applied to the development and evolution of extratropical cyclones. Laboratory sessions include analysis of current observations and satellite imagery.

407 Regional Geomorphology of the United States
Spring of odd years. 3(3-0) RB: GEO 306 or GLG 201 or GLG 412 or ISP 203A or ISP 203B
Geomorphometric characteristics of physiographic regions of the United States.

408 Soil Geomorphology Field Study
Fall of odd years. 4(2-4) P: CSS 210 or GEO 306 or GLG 201 or GLG 412 or GEO 206 R: Not open to freshmen or sophomores.

409 Global Climate Change and Variability
Fall of odd years. 3(3-0) P: GEO 203 or GEO 206
Analysis of climate change and variability at various time and space scales. Climate systems, paleoclimatology, global warming, climate models, and climate impact assessment.

410 Geography of Food and Agriculture
Fall of even years. 3(3-0) RB: GEO 113 or GEO 151 or GEO 204 or GEO 206 R: Not open to freshmen or sophomores.
Spatial patterns of contemporary global agriculture and food systems. Human-environment geography of select agricultural practices and food systems. Effects of agricultural practices on natural and human resources.

411 Stream Systems and Landforms
Spring of even years. 3(3-0) RB: GEO 206 or GEO 306 or GLG 201 or GLG 431 R: Not open to freshmen or sophomores.

412 Glacial Geology and the Record of Climate Change
Spring. 4(3-2) Int: Interdepartmental with Geologic Sciences. Administered by Geological Sciences. RB: GLG 201 or GEO 306 or GEO 408 or GLG 301 R: Not open to freshmen or sophomores.
In-depth analysis of glacial geology and the record of climate change, with emphasis on North America and Europe. Field trip required.

413 Urban Geography
Spring. 3(3-0) Int: Interdepartmental with Urban Planning. Administered by Geography. P: Not open to freshmen or sophomores.
Theories and models of urban spatial form. Underlying structures and processes. Socio-spatial dimensions of modern urbanism. Differentiation and local control in residential, commercial, and industrial space.

414 Geography of Transportation
Fall of odd years. 3(3-0) Interdepartmental with Urban Planning. Administered by Geography. P: GEO 113 R: Not open to freshmen.
Spatial principles of transportation. Theories of interaction, network structures, and location-allocation models. Role of transport and transport planning.

415 Location Theory and Land Use Analysis
Fall of even years. 3(3-0) Interdepartmental with Urban Planning. Administered by Geography. P: GEO 113 or UP 201 RB: EC 201 or EC 202 R: Not open to freshmen or sophomores.
Classical and neoclassical, static and dynamic models of industrial location and spatial organization. Land rent theory. Central place theory. Multi-localization organization. Growth transmission.

417 The Ghetto
Fall of odd years. 3(3-0) Int: Interdepartmental with Urban Planning. Administered by Geography. R: Not open to freshmen or sophomores.
Analysis of the ghetto including its spatial organization and structure. Distribution of racial and ethnic populations. Emphasis on U.S. cities.

418 Applications of Geographic Information Systems to Natural Resources Management
Spring. 4(2-4) Int: Interdepartmental with Biosystems Engineering and Forestry and Fisheries and Wildlife. Administered by Fisheries and Wildlife. RB: GEO 221
Application of geographic information systems, remote sensing, and global positioning systems to integrated planning and management for fish, wildlife, and related resources.

424 Advanced Remote Sensing
Spring. 4(3-2) P: GEO 324
Interaction of solar radiation with the atmosphere, lithosphere, hydrosphere, and biosphere. Introductory digital image processing. Earth-resources satellite sensors, data products, and applications. Radar and thermal remote sensing.

425 Problems in Geographic Information Science (W)
Spring. 3(2-2) Int: Interdepartmental with Urban Planning. Administered by Geography. P: (GEO 325 or GEO 802) and completion of Tier I writing requirement
Advanced theoretical and technical issues in geographic information science utilizing a problems oriented approach. Development and implementation of geographic information science solutions and formal documentation of work.

426 Thematic Cartography
Spring. 4(3-2) P: GEO 221 and GEO 221L and GEO 326 or approval of department
Principles, theories, decision making, and techniques in thematic map production. Graphic and Geographic Information Systems applications. Print and digital display.

428 Digital Terrain Analysis
Fall of even years. 4(3-2) P: GEO 325
Theoretical and technical issues of collection, management, analysis, and display of terrain data. Applications of photogrammetry, geographic information systems, and cartography.
432 Environmental Ethics (W)  
Fall of even years. 3(3-0) P: Completion of Tier I Writing requirement. R: Not open to freshmen or sophomores.  
Ethical dimensions of environmental and spatial issues and associated public policies.

435 Geography of Health and Disease  
Fall. 3(3-0) R: Not open to freshmen or sophomores.  
Spatio-environmental concepts and techniques applied to health problems. Disease transmission cycles, community nutrition, and health-care planning.

436 Spatial Analysis of Populations  
Spring of odd years. 3(3-0) R: Not open to freshmen or sophomores.  
Concepts and methods to measure and evaluate geo-spatial and temporal trends in populations and their components, such as natality, mortality, migration, and characteristics at different geographic scales. Sources of spatial population data. Visualization and analysis of data in a geographical information system.

440 Critical Geopolitics  
Spring of even years. 3(3-0) R: Not open to freshmen.  

441 Cultural Geography  
Spring of odd years. 3(3-0) RB: GEO 151 R: Not open to freshmen.  
Survey of the geographic study of world cultures, cultural ecologies, cultural landscapes, and cultural influences on societies’ patterns of spatial organization.

453 Metropolitan Environments: Urban Forms and Land Uses  
Spring. 3(2-2) P: GEO 221  
Land use change, the physical fabric of the city, and the growth of regional centers in the American urban landscape. Issues associated with urban developments, practices and patterns in the 20th century and the resulting metropolitan form and function. Extensive use of geographic information software in spatial analysis.

454 Geography of Environment and Development  
Spring of odd years. 3(3-0) RB: GEO 113 or GEO 151 or GEO 330 or GEO 333 or GEO 335 or GEO 336 or GEO 337 or GEO 338  
Spatial patterns and processes associated with regional development in selected world areas.

459 Tourism in Regional Development  
Fall of odd years. 3(3-0) RB: GEO 259  
The role of tourism in regional development. Examples from Michigan, the United States and other nations. Environmental considerations.

460 Green Roofs and Walls  
Fall. 2(2-0) Interdepartmental with Fisheries and Wildlife and Horticulture and Planning. Design and Construction. Administered by Horticulture. P: HRT 203 or FW 101 or GEO 208 or PDC 120 or EGR 100 R: Open to juniors or seniors or graduate students.  
Green roof and wall design and installation practices including plant species and substrates. Environmental impact, ecosystem services, integration with other environmental practices. Influence of economics, public policy, and industry organizations on the implementation of green roofs on a wide scale. Multidisciplinary nature of planning and implementation of successful green roof and wall projects.

472 Ecological Monitoring and Data Analysis  
Fall. 3(2-2) Interdepartmental with Forestry. Administered by Forestry. P: (MTH 124 or MTH 152) and completion of Tier I writing requirement and (STT 201 or STT 224 or STT 231 or STT 421)  
Design of ecological monitoring systems and analysis of resulting ecological data sets. Monitoring system design, model specification and implementation, and computational considerations from both a design- and model-based perspective. Hands-on introduction to statistical software.

478 Urban Transportation Planning  
Spring. 3(3-0) Interdepartmental with Urban Planning. Administered by Urban Planning. R: Open to juniors or seniors in the Geography Major or in the Urban and Regional Planning Major or approval of school.  
Principles of decision-making in urban transportation planning. Demand and supply analysis, social and environmental impacts, implementation programs. Use of computer models.

480 Senior Seminar (W)  
Fall. 3(3-0) P: Completion of Tier I Writing Requirement R: Open to seniors in the Geography Major or in the Geography Minor.  
History, philosophy, and methodology of the geographic discipline as it has evolved within academic and social contexts.

802 Geospatial Technology  
Fall. 3(3-0) RB: Familiarity with coordinate systems.  
Comprehensive introduction to geotechnologies. Concepts and theories of remote sensing to include image interpretation and processing, Global Positioning Systems, spatial data structures, and geographic information systems.

813 Seminar in Urban and Economic Geography  
Fall. 3(3-0) R: Open to graduate students.  
Modern global economic restructuring. Social, economic, and political impacts on world system of cities.

817 China and Globalization  
Fall of even years. 3(3-0) Interdepartmental with Global Urban Studies Program. Administered by Geography. R: Open to graduate students.  
Theoretical debates and empirical discussions on current social, economic, environmental, and spatial challenges facing contemporary urban China in an era of globalization. Comparative and thematic approach.

827 Digital Image Processing and Analysis  
Fall. 4(2-4) P: GEO 424  
Use of computer to classify and enhance satellite images and to extract information from them. Combining images from different sources. Accuracy assessment of resulting information.
Remote Sensing of the Biosphere
Fall of even years. 3(3-0) P: GEO 424 or approval of department
Remote sensing for environmental and global change research. Advanced image interpretation and applications with emphasis on independent research projects.

Gender, Justice and Environmental Change: Issues and Concepts
Fall. 3(3-0) Interdepartmental with Anthropology and Criminal Justice and Community Sustainability and Forestry and Fisheries and Wildlife and Sociology and Women's Studies. Administered by Community Sustainability. RB: Background in social science, environmental science, or natural resources. Issues and concepts related to gender, ecology, and environmental studies. Key debates and theoretical approaches to addressing environmental issues from a gender and social justice perspective. Gender and environment issues and processes from a global perspective.

Gender, Justice, and Environmental Change: Methods and Application
Spring of even years. 3(3-0) Interdepartmental with Anthropology and Forestry and Fisheries and Wildlife and Resource Development and Sociology. Administered by Anthropology. RB: Background in social science, environmental science, or natural resources. Methods and case studies related to gender, ecology, and environmental studies. Methodological and fieldwork issues from a feminist perspective in international and intercultural contexts. Qualitative and quantitative methods for integrating social and environmental data.

Advanced Quantitative Methods in Geography
Spring. 4(4-0) RB: GEO 363 Statistical and mathematical approaches. Multiple regression, principal components and factor analysis, discriminant analysis. Related taxonomic methods.

Spatial Data Analysis
Fall. 4(3-2) Interdepartmental with Statistics and Probability. Administered by Geography. RB: (GEO 363 or STT 421 or STT 430) or equivalent quantitative methods courses. SA: GEO 466 Theory and techniques for statistical analysis of point patterns, spatially continuous data, and data in spatial zones.

Hierarchical Modeling and Computing for Spatio-temporal Environmental Data
Spring of odd years. 3(3-0) Interdepartmental with Forestry. Administered by Forestry. RB: (FW 849 or concurrently) and (GEO 866 or concurrently) Specification and application of modeling frameworks for spatial and temporal data. Emphasis on point-referenced data analysis using Bayesian statistics, uncertainty assessment, forecasting, and computing. Applied focus on the analysis of environmental data sets.

Geosimulation
Spring. 3(3-0) Interdepartmental with Environmental Science and Policy. Administered by Geography. RB: Basic understanding of data structures and algorithms covered in an introductory course of any programming language. R: Approval of department. Theoretical concepts related to simulating dynamic geographic phenomena in the intersection between human and natural systems. Innovative agent-based methodology applied to complex social-environmental systems. Hands-on experience of agent-based modeling, with special emphasis on modeling human decision-making and its impact on the natural environment.

Seminar in Physical Geography
Fall. 3(3-0) A student may earn a maximum of 12 credits in all enrollments for this course. RB: at least one course in physical geography R: Approval of department. Research on topics in physical geography.

Seminar in Human Geography
Fall. 3(3-0) A student may earn a maximum of 12 credits in all enrollments for this course. RB: at least one course in human geography R: Approval of department. Research on topics in human geography.

Seminar in Human-Environment Geography
Spring. 3(3-0) A student may earn a maximum of 12 credits in all enrollments for this course. RB: at least one course in human geography and one course in physical geography R: Approval of department. Research on topics in human-environment geography.

Seminar in Geographic Information Science
Spring. 3(3-0) A student may earn a maximum of 12 credits in all enrollments for this course. RB: at least one course in geographic information science, cartography or remote sensing R: Approval of department. Geographic information science (GIS) applications to social and environmental problems. Theory and related issues.

Research Design in Geography
Spring. 3(3-0) R: Approval of department. Research and writing in geography. Identification of geographic problems and their relative importance. Structuring and stating hypotheses. Data acquisition and tests for validity.

Advanced Readings in Geography
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of department. Advanced independent readings.

Advanced Research in Geography
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. Advanced independent research.