GEOGRAPHY (GEOG)

GEOG 100 Physical Geography
3 credits
*Gen Ed: Natural and Applied Sciences*
Natural environment; nature, distribution, and relationships of climate, landforms, oceans, vegetation, hydrography, and soils. Three lec and one 2-hr lab a wk; may involve evening classes.

GEOG 100L Physical Geography Lab
1 credit
*Gen Ed: Natural and Applied Sciences*
Natural environment; nature, distribution, and relationships of climate, landforms, oceans, vegetation, hydrography, and soils. Three lec and one 2-hr lab a wk; may involve evening classes.

GEOG 165 Human Geography
3 credits
*Gen Ed: Social Science, International*
Intro to geographical dimension in human behavior and how this is evident in population distribution, rural and urban land use, and social, economic, and political attributes of societies.

GEOG 200 World Regional Geography
3 credits
*Gen Ed: Social Science, International*
Countries, regions, and peoples of the world; interrelationships between humans and their physical and cultural environments.

GEOG 203 (s) Workshop
Credit arranged.

GEOG 204 (s) Special Topics
Credit arranged.

GEOG 260 Introduction to Geopolitics
3 credits
The course introduces students to contemporary approaches to geopolitics through the exploration of key geographic concepts and the ideas of structure and agency. Topics include terrorism, nationalism, militarism, borders, and environmental geopolitics. Current events are discussed to exemplify the concepts.

GEOG 299 (s) Directed Study
Credit arranged.

GEOG 301 Meteorology
3 credits
Atmospheric processes that produce weather; temperature; moisture, clouds, and precipitation; synoptic-scale weather; severe storms; weather instrumentation, weather maps, and forecasting; influences of weather on humans and impacts of humans on weather. (Fall only)
*Prereq: MATH 143 or equivalent.*

GEOG 313 Global Climate Change
3 credits
Joint-listed with GEOG 513.
Scientific basis of the climate system and global climate changes; process-based understanding of past, present and future climate change; natural and anthropogenic influences; interactions between climate, society and ecosystems; scientific review and politicization; climate change solutions and opportunities. Students in GEOG 513 will be required to solve additional quantitative problem sets and synthesize journal articles. (Fall only)

GEOG 330 Urban Geography
3 credits
Joint-listed with GEOG 531.
Theory and models of the functions, origin, development, structure, and distribution of cities; land-use and housing, globalzation and cities, neighborhood transition, urban economic development, and geographic aspects of city planning. Also considers urban social differences, inequality, and conflicts over the uses and meanings of city space. Graduate students are required to synthesize journal articles and complete an additional independent research paper.

GEOG 340 Business Location Decisions
3 credits
Locational decision making in primary, secondary, and tertiary industries; resulting patterns of industrial location; importance of location and impact of industries on other characteristics of communities as demonstrated by examples from each sector. One 1-day field trip. Additional assignments and exams reqd for grad cr.

GEOG 345 Global Economic Geography
3 credits
Joint-listed with GEOG 545.
An overview of major developments and contemporary debates in the economic geography literature; economic globalization, the spatial dimensions of resource use, agriculture, industry, and post-industry landscapes, economic aspects of land-use change, location theory and case studies. Additional projects required for graduate credit.

GEOG 350 Geography of Development
3-4 credits
*Gen Ed: International*
Joint-listed with GEOG 550.
Geographic appraisal of resource problems and development potentials of the Third World. One hour additional meeting per week or project for fourth credit. Additional assignments and exams required for graduate credit.

GEOG 360 Population Dynamics and Distribution
3-4 credits
*Gen Ed: International*
Effects of fertility, mortality, and migration on population size and distribution; demographic trends in U.S. and other societies and how these relate to economic, political, environmental, and other factors. One hour additional meeting per week or project for fourth credit. Additional assignments and exams required for graduate credit.

GEOG 365 Political Geography
3 credits
*Gen Ed: Social Science, International*
Joint-listed with GEOG 565
Surveys the geographic distribution of political processes, actions, and outcomes at variety of spatial scales - international, national, and local. Topics include origins of the modern territorial state, conflicts over access to and use of space, access to natural resources, nationalism, elections, democratization, globalization, terrorism, and the politics of identity. Graduate students are required to complete an additional independent research paper.

GEOG 385 GIS Primer
3 credits
Intro to basic concepts and applications of geographic information systems (GIS), lab exercises on PC-based GIS packages. Two lec and 2 hrs of lab a wk. *Prereq: basic knowledge of PC-based operating system.*
GEOG 390 Cartographic Design & Geovisualization
3 credits
Map projections, map generalization, cartographic design, map symbology, and typography; statistical, isarithmic and multivariate mapping; static versus dynamic mapping; interactive and internet mapping; cartographic animation; 2 hrs of lab/wk. (Spring only)
Prereq: GEOG 385.

GEOG 400 (s) Seminar
Credit arranged.

GEOG 401 Climatology
3 credits
Joint-listed with GEOG 512.
Physical basis for climatic processes and patterns; mechanics of global atmospheric circulation; radiation balance and heat budget of the earth; models of weather patterns and climate. Additional assignments and quantitative exercises required for graduate credit. (Spring, alt/ys)

GEOG 402 GIS Skills Development
1 credit, max 6
Hands-on skills development in GIS and related technologies. Primary topics vary by semester, but may include topics such as GPS/GIS integration, server GIS and cartographic design. May be taken for credit multiple times.

GEOG 403 (s) Workshop
Credit arranged.

GEOG 404 (s) Special Topics
Credit arranged.

GEOG 405 Climate and Water Resources Change
3 credits
Joint-listed with GEOG 505.
Physical processes that determine the climate of Earth and its past and future changes: greenhouse effect, radiative and heat feedback processes, orbital parameter theory. Climate and Environmental Periods. Atmospheric and water resources change within the instrumental period of records. Future climate and water resources: Paleo-perspectives on "greenhouse warming". Review of paleoclimatic techniques: dendroclimatology, marine and lake sediments, polar and mountain ice core paleo-climatic records, paleo-climatic and historic data analysis. Additional assignments and exams reqd for grad cr.
Prereq: GEOG 401 and STAT 251, or Permission.

GEOG 407 Spatial Statistics and Modeling
3 credits
Joint-listed with GEOG 507.
Introduces the basic theories and methods of spatial analysis used for statistical modeling and problem solving in human and physical geography. The special nature of spatial data (point, continuous, and lattice) in the social and physical sciences is emphasized. Topics include point pattern analysis, spatial autocorrelation analysis, spatial multivariate regression, local indicators of spatial association, and geographically weighted regression. Extra oral and/or written assignments required for grad credit. Cooperative: open to WSU degree-seeking students.
Prereq: STAT 431 or permission.

GEOG 409 Rural Development
3 credits
Joint-listed with GEOG 508.
Readings and discussion seminar course on rural societies in various countries. Rural trends and development prospects. Reading and discussion of literature in rural development. Extra projects and literature required for graduate credit. (Fall only)

GEOG 410 Biogeography
3 credits
Geographic distributions of plant and animal species, and causes of patterns, including climate, geology, speciation, extinction, and migration.
Prereq: GEOG 100/GEOG 100L or FOR 221/REM 221.

GEOG 411 Natural Hazards and Society
3 credits
Overview of the geophysical conditions associated with the development of natural hazards including social science principles and methodologies for addressing critical questions relating to managing the vulnerability and risks associated with various natural hazards.

GEOG 420 Land, Resources, and Environment
3 credits
Social, legal, cultural, political, and economic aspects of land-use control both in the United States and worldwide. Contrasts are made between indigenous and contemporary cultures within a sustainable geography-of-limits and political ecology framework. (Spring only)

GEOG 424 Hydrologic Applications of GIS and Remote Sensing
3 credits
Joint-listed with GEOG 524.
Concepts of area-based hydrologic modeling and assessment and the various types of spatially distributed information commonly used in these activities, such as topographic data, vegetation cover, soils and meteorologic data. Hands-on experience in manipulating these types of data sets for hydrologic applications. Recommended Preparation: FOR 462, BE 355, or CE 325; or Equivalent.
Prereq: GEOG 385 or equivalent work experience.

GEOG 430 Climate Change Ecology
3 credits
Climate change impacts on ecosystems, plants, and animals; feedbacks to climate change, climate change mitigation related to ecosystems and species.
Prereq: BIOL 114 or ENVS 101 or GEOG 100 or FOR 221 or REM 221 or Permission of Instructor.

GEOG 435 Climate Change Mitigation
3 credits
Joint-listed with GEOG 535.
Overview of the sources and magnitude of greenhouse gas (GHG) emissions at various scales from international to local; barriers to and options for reducing GHG emissions via new energy sources, increased efficiency, capture of wasted energy and land management practices. For graduate credit, a major independent project is required as well as additional assignments.
GEOG 453 Water and Energy Systems  
3 credits  
The class covers the basic science of water and energy and the applied interrelationships of those two resources in today's society. The broad spectrum coverage of the topic includes the energy linkage to both the supply and demand of water and also the water linkage to the supply of and demand for energy. The class includes development of systems dynamics models for describing the resource interactions. Recommended Preparation: Basic Physical Sciences.  
Prereq: MATH 143.  

GEOG 455 Societal Resilience and Adaptation to Climate Change  
3 credits  
Consequences of human causes, mitigation and adaptations, community resilience strategies, and policy implications to human impacts of global climate change. Concentration on social science issues including opportunities and constraints for resilience and adaptation to global climate change. Recommended Preparation: GEOG 411.  

GEOG 475 Intermediate GIS  
3 credits  
Course covers in-depth geographic information systems models and applications. Topics include network analysis, watershed analysis, spatial interpolation, terrain mapping and analysis, 3D visualization, and GIS modeling. Students develop spatial analysis and modeling skills to solve real-world problems.  
Prereq: GEOG 385  
Coreq: STAT 251.  

GEOG 479 GIS Programming  
3 credits  
An introduction to the use of programming languages, such as Python with standard ArcGIS concepts.  
Prereq: GEOG 475 or GEOG 390.  

GEOG 483 Remote Sensing/GIS Integration  
3 credits  
Joint-listed with GEOG 583. Concepts and tools for the processing, analysis, and interpretation of digital images from satellite and aircraft-based sensors. The integration of remotely sensed date and the other spatial data types within Geographic Information Systems. Additional assignments and exams reqd for grad cr. Two lecture and 2 hours of lab a week.  
Coreq: GEOG 385 or Equivalent.  

GEOG 486 Transportation, GIS & Planning  
G3 credits  
Interdisciplinary study of transportation and planning from a geographical perspective. Principles and methods of analysis in transportation geography, including accessibility and mobility, spatial interaction, network analysis, and GIS applications for sustainable transportation and land use planning; study of the cutting-edge approach to travel behavior analysis and modeling at various geographic scales (i.e., individual/household/community); activity-based field data collection and related survey design issues are discussed. Graduate students will have additional requirements. Two lec and one lab a wk. (Fall only)  
Prereq: GEOG 385 or Permission.  

GEOG 489 Capstone Preparation  
1 credit  
Planning and preparation for senior project to be carried out in subsequent semester. Students learn expectations for the senior project, plan their project, gather data and other resources and develop an agreement with their faculty mentor.  

GEOG 491 (s) Field Techniques  
3 credits, 6 max  
Acquisition of data in the field, analysis, interpretation, and presentation of results of field investigations. May also be taken in conjunction with other geography courses.  
Prereq: Permission.  

GEOG 493 Senior Capstone in Geography  
3 credits  
Gen Ed: Senior Experience  
A capstone course in which students integrate their knowledge of human and physical geography, as well as geographic techniques, to propose solutions to real-world problems. Students gain experience in working in small groups and in written and oral presentation of project results, and will be evaluated with respect to the skills acquired in their degree program. Topics may include, but are not limited to, issues such as sustainable development in rural communities, global and regional food and energy distribution, quantifying and analyzing global or regional indicators of environmental and/or societal trends. Open to senior geography majors or to non-majors with instructor's permission.  
Prereq: GEOG 489, Department of Geography Majors or Permission.  

GEOG 498 (s) Internship  
Credit arranged  
Graded pass/fail.  

GEOG 499 (s) Directed Study  
Credit arranged.  

GEOG 500 Master's Research and Thesis  
Credit arranged.  

GEOG 501 (s) Seminar  
Credit arranged.  

GEOG 502 (s) Directed Study  
Credit arranged.  

GEOG 503 (s) Workshop  
Credit arranged.  

GEOG 504 (s) Special Topics  
Credit arranged.  

GEOG 505 Climate and Water Resources Change  
3 credits  
Joint-listed with GEOG 405.  
Physical processes that determine the climate of Earth and its past and future changes: greenhouse effect, radiative and heat feedback processes, orbital parameter theory. Climate and Environmental Periods. Atmospheric and water resources change within the instrumental period of records. Future climate and water resources: Paleo-perspectives on "greenhouse warming". Review of paleoclimate techniques: dendroclimatology, marine and lake sediments, polar and mountain ice core paleo-climatic records, paleo-climatic and historic data analysis. Additional assignments and exams reqd for grad cr.  
Prereq: GEOG 401 and STAT 251, or Permission.
GEOG 507 Spatial Statistics and Modeling  
3 credits 
Joint-listed with GEOG 407.  
Introduces the basic theories and methods of spatial analysis used for statistical modeling and problem solving in human and physical geography. The special nature of spatial data (point, continuous, and lattice) in the social and physical sciences is emphasized. Topics include point pattern analysis, spatial autocorrelation analysis, spatial multivariate regression, local indicators of spatial association, and geographically weighted regression. Extra oral and/or written assignments required for grad credit. Cooperative: open to WSU degree-seeking students. 
Prereq: STAT 431 or permission.

GEOG 508 Rural Development  
3 credits 
Joint-listed with GEOG 409.  
Readings and discussion seminar course on rural societies in various countries. Rural trends and development prospects. Reading and discussion of literature in rural development. Extra projects and literature required for graduate credit. (Fall only)

GEOG 512 Climatology  
3 credits 
Joint-listed with GEOG 401.  
Physical basis for climatic processes and patterns; mechanics of global atmospheric circulation; radiation balance and heat budget of the earth; models of weather patterns and climate. Additional assignments and quantitative exercises required for graduate credit. (Spring, alt/yr)

GEOG 513 Global Climate Change  
3 credits 
Joint-listed with GEOG 313.  
Scientific basis of the climate system and global climate changes; process-based understanding of past, present and future climate change; natural and anthropogenic influences; interactions between climate, society and ecosystems; scientific review and politicization; climate change solutions and opportunities. Students in GEOG 513 will be required to solve additional quantitative problem sets and synthesize journal articles. (Fall only)

GEOG 524 Hydrologic Applications of GIS and Remote Sensing  
3 credits 
Joint-listed with GEOG 424.  
Concepts of area-based hydrologic modeling and assessment and the various types of spatially distributed information commonly used in these activities, such as topographic data, vegetation cover, soils and meteorologic data. Hands-on experience in manipulating these types of data sets for hydrologic applications. Recommended Preparation: FOR 462, BE 355, or CE 325; or Equivalent.  
Prereq: GEOG 385 or equivalent work experience.

GEOG 531 Urban Geography  
3 credits 
Joint-listed with GEOG 330.  
Theory and models of the functions, origin, development, structure, and distribution of cities; land-use and housing, globalization and cities, neighborhood transition, urban economic development, and geographic aspects of city planning. Also considers urban social differences, inequality, and conflicts over the uses and meanings of city space. Graduate students are required to synthesize journal articles and complete an additional independent research paper.

GEOG 535 Climate Change Mitigation  
3 credits 
Joint-listed with GEOG 435.  
Overview of the sources and magnitude of greenhouse gas (GHG) emissions at various scales from international to local; barriers to and options for reducing GHG emissions via new energy sources, increased efficiency, capture of wasted energy and land management practices. For graduate credit, a major independent project is required as well as additional assignments.

GEOG 540 Business Location Decisions  
3 credits 
Locational decision making in primary, secondary, and tertiary industries; resulting patterns of industrial location; importance of location and impact of industries on other characteristics of communities as demonstrated by examples from each sector. One 1-day field trip.  
Additional assignments and exams reqd for grad cr.

GEOG 542 Spatial Statistics  
3 credits 
The course extends the range of spatial analysis from GEOG 507. Topics include spatial covariance structures, methods of spatial model estimation, (e.g., iterated LS, GLS, MLE, penalized estimation), spatial interpolation and surface estimation, geostatistics/kriging and gravity model estimation and local parametric estimation procedures. Categorical spatial data analysis, Poisson and logistic regression, mixed models, contingency tables, models of discrete temporal and landscape change and graph-theoretic analogues, log-linear models. Additional topics, time permitting: introduction to hierarchical modeling and Bayesian spatial techniques and MCMC estimation, Markov random fields, stochastic space-time analysis and diffusion, time series of stationary series and vector autoregression with Granger causality, space-time covariance heterogeneity issues. Recommended: An additional course in multivariate statistics, probability theory or mathematical statistics.  
Prereq: GEOG 507 and STAT 431.

GEOG 544 Global Economic Geography  
3 credits 
Joint-listed with GEOG 345.  
An overview of major developments and contemporary debates in the economic geography literature; economic globalization, the spatial dimensions of resource use, agriculture, industry, and post-industry landscapes, economic aspects of land-use change, location theory and case studies. Additional projects required for graduate credit.

GEOG 550 Geography of Development  
3-4 credits 
Joint-listed with GEOG 350.  
Geographic appraisal of resource problems and development potentials of the Third World. One hour additional meeting per week or project for fourth credit. Additional assignments and exams required for graduate credit.

GEOG 560 Population Dynamics and Distribution  
3-4 credits 
Effects of fertility, mortality, and migration on population size and distribution; demographic trends in U.S. and other societies and how these relate to economic, political, environmental, and other factors. One hour additional meeting per week or project for fourth credit. Additional assignments and exams required for graduate credit. (Spring only)
**GEOG 565 Political Geography**  
3 credits  
Joint-listed with GEOG 365  
Surveys the geographic distribution of political processes, actions, and outcomes at a variety of spatial scales - international, national, and local. Topics include origins of the modern territorial state, conflicts over access to and use of space, access to natural resources, nationalism, elections, democratization, globalization, terrorism, and the politics of identity. Graduate students are required to complete an additional independent research paper.

**GEOG 583 Remote Sensing/GIS Integration**  
3 credits  
Joint-listed with GEOG 483.  
Concepts and tools for the processing, analysis, and interpretation of digital images from satellite and aircraft-based sensors. The integration of remotely sensed data and the other spatial data types within Geographic Information Systems. Additional assignments and exams reqd for grad cr. Two lecture and 2 hours of lab a week.  
Coreq: GEOG 385 or Equivalent.

**GEOG 586 Transportation, GIS & Planning**  
3 credits  
Interdisciplinary study of transportation and planning from a geographical perspective. Principles and methods of analysis in transportation geography, including accessibility and mobility, spatial interaction, network analysis, and GIS applications for sustainable transportation and land use planning; study of the cutting-edge approach to travel behavior analysis and modeling at various geographic scales (i.e., individual/household/community); activity-based field data collection and related survey design issues are discussed. Graduate students will have additional requirements. Two lec and one lab a wk.  
(Fall only)  
Prereq: GEOG 385 or Permission.

**GEOG 587 Advanced Topics in Remote Sensing**  
3 credit  
Current topics and applications in remote sensing literature including radar, thermal and hyperspectral remote sensing, sensor advances, airborne platforms, advanced classification and segregation techniques, large area pattern analysis, time series and trends, and advances in both terrestrial and non-terrestrial approaches, models and applications.

**GEOG 591 History and Philosophy of Geography**  
3 credits  
Evolution of geography as a discipline, focusing on post-scientific revolution developments and identification of major themes in contemporary geographic thought.

**GEOG 596 Geography Department Seminar**  
1 credit  
Weekly or bi-weekly department seminar with talks given by visiting and local speakers on topics relevant to geography.

**GEOG 598 (s) Internship**  
Credit arranged  
Practical, on-the-job experience with governmental agencies or commercial establishments; oral and written reports are presented in which the student reviews and constructively criticizes the experience gained; salary may be received for services performed. Graded pass/fail.  
Prereq: Permission.

**GEOG 599 (s) Research**  
Credit arranged  
Research not directly related to a thesis or dissertation.  
Prereq: Permission.

**GEOG 600 Doctoral Research and Dissertation**  
Credit arranged.