Geography, B.A.

Degree Offered

• Bachelor of Arts

Nature of the Program

Geography teaches you how the world works. Geographers use spatial concepts and tools to examine problems that face communities around the world, such as protecting vulnerable landscapes and species, the local and global effects of climate change, and the connections between people across the globe.

Our students study aspects of the natural sciences, social sciences, and humanities while developing skills in spatial investigation and problem-solving that are valuable assets in a variety of careers. Geography graduates are qualified for many careers in both the private and public sectors. In industry, geographers are hired as geographic information system analysts, business location researchers, environmental impact consultants, market analysts, and cartographers. In government, geographers work as local urban planners, regional and state economic development specialists, environmental and resource development analysts, land-use planners, international development agency advisors, teachers and trainers, researchers, cartographers, as well as geographic information system analysts. Some graduates may also use their training to pursue careers as environmental or community activists in non-profit organizations. Finally, many geography students go on to graduate school to obtain further training, most commonly in geography or planning but also in fields as diverse as law, information science, and environmental studies.

Geography students receive specialized training in one of the program’s three areas of emphasis:

• Geographic Information Science (GISc)
• Globalization and Development
• Global Environmental Change

An individualized program of study is also available combining elements of the three options.

Students who earn a degree in the Eberly College of Arts and Sciences must complete the University requirements, the College requirements for their specific degree program, and their major requirements.

Internship

An internship is a field-based academic option that uses the workplace as an extended classroom/laboratory. As part of the internship, students usually spend summer months or a semester working at a public agency, private business, or non-profit organization where they are supervised by experts in such areas as GIS, planning, the physical environment, international affairs, or economic development. The professional learning experience is recommended for majors in geography with at least forty-five total credit hours and twelve credit hours in geography. See the geography internship advisor for additional information.

Honors Program

Qualified students in geography are encouraged to participate in the University’s honors program. Geography honors students in their senior year are encouraged to take Honors Thesis.

Minors

All students have the possibility of earning one or more minors; follow the link for a list of all available minors and their requirements (http://catalog.wvu.edu/undergraduate/minors/). Please note that students may not earn a minor in their major field.

Certificate of Global Engagement

Students in the Eberly College, regardless of their major, can earn a Certificate of Global Engagement. Completion of the Certificate demonstrates the student’s knowledge of diverse cultures, as well as the ability to communicate and interact effectively with people of different cultural backgrounds. Students will be required to apply their knowledge of contemporary issues and global social contexts to their coursework and their broader citizenship. For details regarding Certificate requirements, please visit the Eberly College page (http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/#otherdegreeexttext).

FACULTY

CHAIR

• Brent McCusker - Ph.D. (Michigan State University)
ASSOCIATE CHAIR FOR GEOGRAPHY
• Amy Hessl - Ph.D. (University of Arizona)
  Biogeography, Forest Ecosystems, Climate Variability

PROFESSORS
• Amy Hessl - Ph.D. (Arizona)
  Biogeography, Forest Ecosystems, Climate Variability
• Randy Jackson - Ph.D. (Illinois)
  Director Regional Research Institute, Economic geography
• Brent McCusker - Ph.D. (Michigan State)
  Land Use Change, Africa, Policy Making

ASSOCIATE PROFESSORS
• Jamison Conley - Ph.D. (Pennsylvania State University)
  Spatial Analysis, Geocomputation, Health Geography
• Karen Culcasi - Ph.D. (Syracuse)
  Geopolitics, Identity, Middle East
• Brenden McNeil - Ph.D. (Syracuse)
  GIScience, Environmental modeling, Forest Ecosystem Services
• Bradley Wilson - Ph.D. (Rutgers)
  Social Movements, Local/Global Food Systems, Food Justice

ASSISTANT PROFESSORS
• Cynthia Gorman - Ph.D. (Rutgers)
  Gender, Migration, Human Rights, Refugee Communities
• Jonathan Hall - Ph.D. (Ohio State)
  Biogeography, Conservation Ecology, Culture/Environment Interactions
• Aaron Maxwell - Ph.D. (West Virginia University)
  Geospatial Instruction, Remote Sensing, Image Analysis, Spatial Modeling
• Maria Alejandra Perez - Ph.D. (Michigan)
  Human Geography, Science & Society, Speleology, Latin America
• Jamie Shinn - Ph.D. (Pennsylvania State University)
  Political Ecology, Social Vulnerability, Climate Change Adaptation, Sub-Saharan Africa

PROFESSORS EMERITI
• Greg Elmes - Ph.D. (Penn State)
• Trevor Harris - Ph.D. (University of Hull)
• Steve Kite - Ph.D. (University of Wisconsin)
• Ken Martis - Ph.D. (Michigan)
• Timothy Warner - Ph.D. (Purdue University)

ASSOCIATE PROFESSORS EMERITI
• Robert Hanham - Ph.D. (Ohio State)

CLINICAL ASSISTANT PROFESSOR
• Megan Govindan - MA (WVU)
  Community development

CLINICAL ASSOCIATE PROFESSOR
• Rick Landenberger - Ph.D. (WVU)
  Forest Ecology, land management

Admissions
• First-Time Freshmen are admitted directly into the Geography major.
• Students transferring from within WVU to the Geography major must have a minimum overall GPA of 2.0.
• Students transferring from another institution must have a minimum GPA of a 2.0.
Due to Covid-19 – Admission requirements may differ from what is listed on this page. Please review the most up-to-date program admission requirements for the Bachelor of Arts in Geography (https://admissions.wvu.edu/academics/majors/geography/) major.

ADMISSION REQUIREMENTS 2023-2024
The Admission Requirements above will be the same for the 2023-2024 Academic Year.

Major Code: 1444

Click here to view the Suggested Plan of Study (p. 5)

General Education Foundations
Please use this link to view a list of courses that meet each GEF requirement. (http://registrar.wvu.edu/gef/)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

General Education Foundations
F1 - Composition & Rhetoric 3-6
  ENGL 101 Introduction to Composition and Rhetoric
  & ENGL 102 and Composition, Rhetoric, and Research
  or ENGL 103 Accelerated Academic Writing
F2A/F2B - Science & Technology 4-6
F3 - Math & Quantitative Reasoning 3-4
F4 - Society & Connections 3
F5 - Human Inquiry & the Past 3
F6 - The Arts & Creativity 3
F7 - Global Studies & Diversity 3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree) 9
Total Hours 31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Degree Requirements
Students must complete WVU General Education Foundations requirements, College B.A. requirements, major requirements, and electives to total a minimum of 120 hours. For complete details on these requirements, visit the B.A. Degrees tab on the Eberly College of Arts and Sciences (http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/#bachelorofartstext) page.

Departmental Requirements for the B.A. in Geography
• Capstone Requirement: The university requires the successful completion of a Capstone requirement. In GEOG, students will take GEOG 496 simultaneously with either GEOG 491 or any GEOG 400 level course.*
• Writing and Communication Requirement: Geography Bachelor of Arts students fulfill the Writing and Communication Skills requirement by completing ENGL 101 and ENGL 102 (or ENGL 103), and two additional SpeakWrite Certified Courses™, GEOG 496 and a 2nd course selected from GEOG 205, GEOG 243, GEOG 300, GEOG 302, GEOG 303, GEOG 307, GEOG 393, GEOG 412, GEOG 415, GEOG 443, GEOG 452, GEOG 454, GEOG 455, GEOG 462.
• Calculation of Major GPA: A minimum GPA of 2.0 is required across all GEOG courses counted toward meeting major requirements. If a course is repeated, all attempts will be included in the calculation of the GPA unless the course is eligible for a D/F repeat.
• Benchmark expectations: For details, go to the Geography Degree Progress tab.

Curriculum Requirements

University Requirements 76
ECAS B.A. Requirements 12
Geography Major Requirements 32
Total Hours 120
University Requirements

<table>
<thead>
<tr>
<th>University Requirements</th>
<th>Hours</th>
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<tr>
<td>General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)</td>
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<tr>
<td>Outstanding GEF Requirements 1, 3, 4, 5, 6, and 8</td>
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<td>GEOG 191 First-Year Seminar</td>
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ECAS Bachelor of Arts Requirements

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<tr>
<td>Fine Arts Requirement</td>
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<tr>
<td>Foreign Language</td>
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<tr>
<td>Global Studies and Diversity Requirement</td>
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<td>Total Hours</td>
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Geography Major Requirements

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<tr>
<td>CORE COURSES:</td>
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<tr>
<td>GEOG 102 World Regions</td>
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<tr>
<td>or GEOG 108 Human Geography</td>
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</tr>
<tr>
<td>GEOG 107 &amp; 107L Global Climate System and Global Climate System Laboratory</td>
<td>10</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>GEOG 150 &amp; 150L Digital Earth and Digital Earth Laboratory</td>
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<td>GEOG 205 Climate and Sustainability</td>
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<tr>
<td>GEOG 209 Global Justice</td>
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<td>GEOSPATIAL TECHNIQUES REQUIREMENT:</td>
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<td>Select one of the following:</td>
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<tr>
<td>GEOG 300 Geographical Data Analysis</td>
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<tr>
<td>GEOG 350 Geographic Information Systems and Science</td>
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<tr>
<td>GEOG 455 Introduction to Remote Sensing</td>
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<td>GEOG 457 Open-Source Spatial Analytics</td>
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<td>GEOG 462 Digital Cartography</td>
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<td>UPPER-DIVISION ELECTIVES:</td>
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<tr>
<td>Select 4 courses from the following list. A minimum of 6 credits must be in GEOG.</td>
<td>12</td>
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<tr>
<td>Any GEOG course at the 300 level or above*</td>
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<tr>
<td>ANTH 457 Social Movements</td>
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<td>ANTH 458 Environmental Anthropology</td>
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<td>BIOL 463 Global Ecology</td>
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<td>ENGL 338 Environmental Criticism</td>
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<td>RESM 440 Foundations of Applied Geographic Information Systems</td>
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<td>RESM 455 Practice of Land Use Planning</td>
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<td>WGST 345 Women in International Development</td>
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<td>GEOGRAPHY ELECTIVE:</td>
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<td>Any additional GEOG course</td>
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<td>CAPSTONE EXPERIENCE:</td>
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<tr>
<td>GEOG 496 Senior Thesis</td>
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<td>Select one of the following:</td>
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<td>GEOG 491 Professional Field Experience</td>
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<td>OR</td>
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<td>Any GEOG course at the 400 level*</td>
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<td>Total Hours</td>
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GEOG course(s) selected to fulfill this requirement should not already fulfill another GEOG requirement and also exclude 490, 492, 494, 495, 496, 497, 498, 499.

Suggested Plan of Study

First Year

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<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
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<tr>
<td>GEOG 191</td>
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<td>ENGL 101 (GEF 1)</td>
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<td>Foreign Language 101</td>
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<td>Foreign Language 102</td>
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<td>GEOG 102 or 108 (GEF 7)</td>
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<td>GEOG 107</td>
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<td>&amp; 107L (GEF 2)</td>
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<td>F8 Course 1</td>
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<td>F8 course 2</td>
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<td>General Elective</td>
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Second Year

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<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tr>
<td>ENGL 102 (GEF 1)</td>
<td>3</td>
<td>Foreign Language 204</td>
<td>3</td>
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<td>Foreign Language 203</td>
<td>3</td>
<td>GEF 5</td>
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<td>GEF 3</td>
<td>3</td>
<td>ECAS Fine Arts Requirement (GEF 6)</td>
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<td>GEF 4</td>
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<td>GEOG Elective</td>
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<td>Final GEOG Core Course</td>
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<td>General Elective</td>
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Third Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GEOG Geospatial Techniques Requirement</td>
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<td>GEOG Upper-Division Elective 2</td>
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<tr>
<td>GEOG Upper-Division Elective 1</td>
<td>3</td>
<td>GEOG Upper-Division Elective 3</td>
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<tr>
<td>GEF 8 course 3</td>
<td>3</td>
<td>General Elective</td>
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<td>General Elective</td>
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<td>General Elective</td>
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Fourth Year

<table>
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<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
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<tbody>
<tr>
<td>GEOG Capstone Requirement (1 credit in 496 + additional 400 level course)*</td>
<td>4</td>
<td>GEOG Upper-Division Elective 4</td>
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<td>General Elective</td>
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</table>

Total credit hours: 120

* GEOG course(s) selected to fulfill this requirement should not already fulfill another GEOG requirement and also exclude 490, 492, 494, 495, 496, 497, 498, 499.

Areas of Emphasis Offered:

- Geographic Information Science (GIsc) (p. 5)
- Globalization and Development (p. 6)
GEOGRAPHIC INFORMATION SCIENCE (GISC) AREA OF EMPHASIS REQUIREMENTS

A minimum GPA of 2.0 is required in all emphasis courses

**Required Courses:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>GEOG 350</td>
<td>Geographic Information Systems and Science</td>
</tr>
<tr>
<td>GEOG 455</td>
<td>Introduction to Remote Sensing</td>
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**Electives**

Select two courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>GEOG 300</td>
<td>Geographical Data Analysis</td>
</tr>
<tr>
<td>GEOG 452</td>
<td>Geographic Information Science: Applications</td>
</tr>
<tr>
<td>GEOG 453</td>
<td>Geographic Information Science: Design and Implementation</td>
</tr>
<tr>
<td>GEOG 454</td>
<td>Environmental Geographic Information Systems</td>
</tr>
<tr>
<td>GEOG 462</td>
<td>Digital Cartography</td>
</tr>
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</table>

Total Hours: 13

GLOBALIZATION AND DEVELOPMENT AREA OF EMPHASIS REQUIREMENTS

A minimum GPA of 2.0 is required in all emphasis courses

**200-Level Coursework:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>GEOG 209</td>
<td>Global Justice</td>
</tr>
<tr>
<td>GEOG 241</td>
<td>Geography of Europe</td>
</tr>
<tr>
<td>GEOG 243</td>
<td>Geography of Africa</td>
</tr>
<tr>
<td>GEOG 244</td>
<td>Geography of the Middle East</td>
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</table>

**Upper-Division Electives:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>GEOG 302</td>
<td>Political Geography</td>
</tr>
<tr>
<td>GEOG 411</td>
<td>Rural and Regional Development</td>
</tr>
<tr>
<td>GEOG 412</td>
<td>Geography of Gender</td>
</tr>
<tr>
<td>GEOG 443</td>
<td>African Environment and Development</td>
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</table>

Total Hours: 12

Degree Progress

- Geography majors are expected to maintain 2.0 GPA overall and in geography courses.
- All majors must meet with Geography adviser each semester.

Students who do not meet these benchmarks may be removed from their major.

Major Learning Outcomes

**GEOGRAPHY**

Upon successful completion of the B.A. degree, Geography majors will be able to use key geographic concepts to critically analyze diverse topics and processes. Specifically, geography graduates will be able to:

1. Define the range of issues and topics relevant to geographic inquiry and analysis.
2. Apply qualitative and quantitative geographic analytical methods.
3. Collect, organize, summarize, and synthesize geographic information.
4. Demonstrate an understanding of the geographic nature and complexity of human environment relationships, environmental systems, and the patterns of human activities.
5. Apply geospatial technologies, and critically explain their role in modern society.
6. Connect everyday issues to geographic concepts, and situate these issues within the local to global continuum of scales.
7. Present geographic ideas and concepts effectively in oral, written, cartographic and other visual forms.

**COURSES**

**GEOG 102. World Regions. 3 Hours.**

Comparison and relationships of world regions. Geographical perspectives of contemporary global problems. Developing regions contrasted with modernized regions and the consequences of their interactions.
GEOG 107. Global Climate System. 3 Hours.
Introduction to the global climate system, emphasizing change in climates across space and time, and how current climatic changes arise from interactions among the atmosphere, biosphere, hydrosphere, lithosphere, and human societies.

GEOG 107L. Global Climate System Laboratory. 1 Hour.
PR or CONC: GEOG 107. Introduction to global environmental systems operating on the earth's surface, emphasizing weather and climate, soils, natural vegetation, and geomorphology, and examination of human interaction with these natural processes.

GEOG 108. Human Geography. 3 Hours.
This course introduces students to geographic dimensions of important topics in today's world. Students will learn about multiple approaches within human geography, including: cultural, economic, political, and urban geography. Students will use these approaches to understand and think critically about current issues in the world around them, from local to global scales.

GEOG 150. Digital Earth. 3 Hours.
PR or CONC: GEOG 149 or GEOG 150L. Recent advances in technology and data availability have increased our knowledge about the world. This class surveys key concepts of geospatial technologies (GIS, remote sensing, spatial analysis) in the context of social and environmental change.

GEOG 150L. Digital Earth Laboratory. 1 Hour.
PR or CONC: GEOG 150. Introduction to geographic information systems software using basic principles of mapping and analysis of geographic information.

GEOG 191. First-Year Seminar. 1-3 Hours.
Engages students in active learning strategies that enable effective transition to college life at WVU. Students will explore school, college and university programs, policies and services relevant to academic success. Provides active learning activities that enable effective transition to the academic environment. Students examine school, college and university programs, policies and services.

GEOG 199. Orientation to Geography. 1,2 Hour.
For majors, pre-majors, and potential majors; discussion of the discipline, curriculum requirements, areas of specialization, internships and career opportunities. (1 hr. lec., pass/fail only.).

GEOG 205. Climate and Sustainability. 3 Hours.
Examines the sustainability of natural resources in the context of global climate change. Emphasis is on the sustainability of food, water, energy, and other resources in the United States within the context of the global environment.

GEOG 209. Economic Geography. 3 Hours.
PR: GEOG 108. Examination of the world economy particularly the spatial patterns of agriculture, manufacturing and services.

GEOG 241. Geography of Europe. 3 Hours.
PR: GEOG 108. Study of contemporary human and physical geography of Europe. Insight to political, economic and social dimensions of transition in this region.

GEOG 243. Geography of Africa. 3 Hours.
Systematic and regional characteristics and geographic problems of political, social, and economic development.

GEOG 244. Geography of the Middle East. 3 Hours.
This course is designed to provide students with a detailed understanding and ability to analyze the geography of the Middle East (including North Africa). Special topics on current geographical issues will also be covered.

GEOG 245. Geography of Latin America. 3 Hours.
This course introduced students to geographic approaches to studying the natural, historical, social, political, economic, and cultural issues of Latin America, analyzed from multiple perspectives of how place is created, experienced, and imagined. The course takes a focus on some of the ongoing current events that are dramatically changing the geopolitics of the region, in Cuba, Venezuela, and Puerto Rico.

GEOG 293. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

GEOG 298. Honors. 1-3 Hours.
PR: Students in Honors Program and consent from the honors director. Independent reading, study, or research.

GEOG 300. Geographical Data Analysis. 3 Hours.
Quantitative techniques for collection, classification, and spatial analysis of geographical data with emphasis on map analysis and application of spatial statistics.

GEOG 302. Political Geography. 3 Hours.
Examines the interrelationship between politics and the environment, human territoriality, the political organization of space, geopolitical aspects of the nation-state and international problems.

GEOG 303. Cultural Geography. 3 Hours.
This course engages students in current research in cultural geography. What does a geographic approach contribute to understandings of culture? These perspectives are relevant to analyzing the politics of race, gender, the environment, and our place in it. Cultural geographers critically and creatively explore the ways humans develop a sense of place and their struggles over place and culture.
GEOG 307. Biogeography: Theory and Method. 3 Hours.
PR: GEOG 107. An introduction to the field of biogeography including the study of the distribution and diversity of life, how species migrate, the importance of natural and human disturbances in ecosystems.

GEOG 309. Introduction to International Development. 3 Hours.
Introduction to key concepts of international development including theoretical overview, data visualization, and development planning. Students will participate in lectures, in-class discussions, and computer software training.

GEOG 312. Migration and Human Rights. 3 Hours.
Examines the characteristics and causes of contemporary migration, the geopolitical dimensions of migration control, and the role of human rights in shaping human mobility.

GEOG 333. Human Geography in Practice. 3 Hours.
PR: ENGL 102 and (GEOG 102 or GEOG 108). The theories of science at the ground of human geography and the qualitative methods used to carry out human geographical research.

GEOG 350. Geographic Information Systems and Science. 4 Hours.
PR: Corequisite of GEOG 350L. Explores concepts, principles and practice of acquiring, storing, analyzing, display and use of geographic information.

GEOG 350L. Geographic Information Systems and Science Laboratory. 0 Hours.

GEOG 393. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

GEOG 409. Applied International Development. 3 Hours.
PR: GEOG 309. This course will provide students with background and training in international development planning and implementation. It will utilize lessons from real-world development planning scenarios and require students to work in teams to write planning documents using the course lectures and materials.

GEOG 411. Rural and Regional Development. 3 Hours.
PR: GEOG 102 or GEOG 108. An investigation into rural and regional development in developed and underdeveloped regions. The relationship between development theory and policy is explored.

GEOG 412. Geography of Gender. 3 Hours.
PR: GEOG 108 or consent. An exploration of how gender affects spatial patterns and processes. Theoretical and empirical aspects of feminism are analyzed including women and employment, third world feminism, sexuality and space, and gender in academia.

GEOG 415. Global Environmental Change. 3 Hours.
PR: GEOG 107 or equivalent or consent. A geographic analysis of the Earth system emphasizing the interdependence and feedback mechanisms of the hydrologic cycle, ecosystems, climate, and human activities.

GEOG 443. African Environment and Development. 3 Hours.
Detailed examination of the intersection of environmental and development studies in sub-Saharan Africa with critical assessments of current practice.

GEOG 450. Political Ecology Seminar. 3 Hours.
PR: GEOG 300 or GEOG 333 or GEOG 350 or GEOG 455 or GEOG 462 and enrollment in the Geography major or minor. Examination of some of the world’s most pressing social-ecological challenges, including the impacts of and responses to climate change and issues of environmental justice. Exploration of foundational texts, core themes and debates, and future trajectories in political ecology through extensive reading, classroom discussion, and written assignments.

GEOG 451. Introduction to GIS Programming. 3 Hours.
PR: GEOG 350 with a minimum grade of C-. Introduction to the computational aspects of geographic information systems and science. Covers topics in programming fundamentals such as variables, control structures, functions, and objects, as well as GIS-specific principles such as spatial data structures, functions for cartography, and creation of tools for GIS software.

GEOG 452. Geographic Information Science: Applications. 3 Hours.
PR: GEOG 350. GIS uses, needs, analysis, design, and implementation. Operational institutional and management topics of GIS for planning, locational decision making in business, government, and research contexts. (2 hr. lec., 1 hr. lab.) (Also listed as GEOL 452.).

GEOG 453. Geographic Information Science: Design and Implementation. 3 Hours.
PR: GEOG 350 and consent. Geographic database design and implementation using contemporary GIS software.

GEOG 454. Environmental Geographic Information Systems. 3 Hours.
Provides background and hands-on experience needed to answer scientific questions about the environment within a raster-based GIS framework. Students should have introductory-level GIS background.

GEOG 455. Introduction to Remote Sensing. 3 Hours.
PR: Corequisite of GEOG 455L. Theory, technology and applications of photo-interpretation and digital image analysis of aerial photography and multispectral images.

GEOG 455L. Introduction to Remote Sensing Laboratory. 0 Hours.
PR: Corequisite of GEOG 455. Introduction to Remote Sensing - GEOG 455 Laboratory.
GEOG 456. Remote Sensing Applications. 3 Hours.
PR: GEOG 455 or consent. Survey of remote sensing applications, focusing on the type of information obtained and methods used.

GEOG 457. Open-Source Spatial Analytics. 3 Hours.
PR: GEOG 300 or GEOG 350. Introduction to the free statistical software tool R and investigation of the use of this software for working with data in general and geographic data in particular.

GEOG 461. Web GIS. 3 Hours.
PR: GEOG 350. The World Wide Web has become a valuable means to display, collect, and share geographic data and maps. This course will explore the use of web technologies for developing web map applications. Students will learn to produce audience appropriate maps in the web environment using a variety of technologies and methods.

GEOG 462. Digital Cartography. 3 Hours.
PR: GEOG 361 or consent. Computer-aided mapping emphasizing the appropriate uses of software in thematic and topographic map design, annotation, symbolization, color, design, display and reproduction.

GEOG 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

GEOG 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

GEOG 492. Directed Study. 1-3 Hours.
Directed study, reading, and/or research.

GEOG 493. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

GEOG 494. Seminar. 1-3 Hours.
PR: Consent. Presentation and discussion of topics of mutual concern to students and faculty.

GEOG 495. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

GEOG 496. Senior Thesis. 3 Hours.
PR: Consent.

GEOG 497. Research. 1-6 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

GEOG 498. Honors. 1-3 Hours.
PR: Students in Honors Program and consent by the honors director. Independent reading, study or research.

GEOG 499. Global Service Learning. 1-3 Hours.
PR: Consent. Theory and practice of global service learning. The main objective will be to pair the experiential aspects of meaningful and sustained service in the host community with work from the student’s anchor course by offering a methodological framework for cultural immersion and community service as well as adding to the content of the anchor course.