Geography

Degrees Offered

- Master of Arts
- Doctor of Philosophy

Nature of the Program

Geography is a diverse and innovative field of study that bridges humanities, social sciences and natural sciences. Geographers engage with the most pressing issues of our time, including global environmental change, social inequality and transformations of our economy, politics, ecology and culture in the shifting terrain of the 21st century. Our geographers are trained in cutting-edge approaches to understand and make a difference in our rapidly changing world.

West Virginia University offers master's and doctoral degrees in geography. Our graduate program has a large faculty with expertise in the subdisciplines of human geography, environmental geography and geographic information science. Using qualitative and quantitative research methods, our faculty research in south Asia, Latin America, sub-Saharan Africa, the Middle East, east Asia and the U.S., including Appalachia.

Our interdisciplinary learning environment featuring state-of-the-art computing and spatial analysis facilities offers students the chance to develop innovative research projects and learn valuable skills to help solve some of the major challenges facing our world today.

The Graduate Program in Geography was designated a program of excellence by the West Virginia University Board of Governors in 1998, 2003, and 2008. This award is given to superlative degree programs in recognition of their contribution to higher education in West Virginia and national recognition.

Research

Students who are interested in pursuing research in an area other than these may do so provided the research area matches the interest of a faculty member in the department who agrees to supervise the student’s program. Students who wish to focus their research on a particular region are encouraged to do so. The Graduate Program in Geography at WVU has strong links with the University’s Regional Research Institute, the State GIS Technical Center, the Geology Program, the Water Research Institute, the International Studies Program, the West Virginia Geological and Economic Survey, the Center for Women’s Studies, and the Center for Black Culture and Research.

Computing Facilities

The Geography program has extensive computing facilities housed in a new 98,000 square foot building dedicated exclusively to geography and geology. The new building has five computer laboratories dedicated to teaching and research. The department has ESRI ArcGIS, ERDAS Imagine, and ENVI site licenses. In addition, the department supports SAS, SAS-Graph, JMP, Surface III, Oracle, and extensive database and statistical packages. The department’s geovisualization research group operates an immersive four-wall 3-D display environment or CAVE. The remote sensing program operates an ASD full-range portable spectroradiometer.

FACULTY

CHAIR

- Tim Carr - Ph.D. (University of Wisconsin-Madison)

ASSOCIATE CHAIR FOR GEOGRAPHY

- Karen Culcasi - Ph.D. (Syracuse University)

PROFESSORS

- Trevor Harris - Ph.D. (University of Hull)  
  Geographic Information Science
- Amy Hessl - Ph.D. (University of Arizona)  
  Biogeography, Forest Ecosystems
- Randall Jackson - Ph.D. (University of Illinois)  
  Director Regional Research Institute, Economic Geography
- Brent McCusker - Ph.D. (Michigan State University)  
  Land Use Change, Africa
- Timothy Warner - Ph.D. (Purdue University)  
  Remote Sensing
PROFESSOR EMERITUS
- Greg Elmes - Ph.D. (Penn State University) 
  Geographic Information Science
- Ken Martis - Ph.D. (University of Michigan) 
  Political, Electoral and Historical Geography

ASSOCIATE PROFESSORS
- Jamison Conley - Ph.D. (Penn State University) 
  Spatial Analysis, Geocomputation
- Karen Culcasi - Ph.D. (Syracuse University) 
  Political Cartography, Middle East
- Eungul Lee - Ph.D. (University of Colorado) 
  Climatology, Land-Atmosphere Interactions
- Brenden McNeil - Ph.D. (Syracuse University) 
  GIScience, Environmental Modeling
- Bradley Wilson - Ph.D. (Rutgers University) 
  Food Justice, Solidarity Economies, Political Ecology

ASSOCIATE PROFESSOR EMERITUS
- Robert Hanham - Ph.D. (Ohio State University) 
  Regional Development

ASSISTANT PROFESSORS
- Martina Caretta - Ph.D (Stockholm University) 
  Feminist Geography, Human Dimensions of Water
- Cynthia Gorman - Ph.D. (Rutgers) 
  Gender, Migration, Human Rights, Refugee Communities
- Jonathan Hall - Ph.D. (Ohio State University) 
  Desert Ecology, Biogeography
- Insu Hong - Ph.D. (Arizona State University) 
  GIScience, Virtual Reality and Spatial Optimization
- Rick Landenberger - Ph.D. (West Virginia University) 
  Remote Sensing, Geosciences Education
- Aaron Maxwell - Ph.D. (West Virginia University) 
  Remote Sensing, GISc, Physical Geography
- Maria Alejandra Perez - Ph.D. (University of Michigan) 
  Human Geography, Science & Society, Speleology, Latin America
- Jamie Shinn - Ph.D. (Penn State University) 
  Environmental Governance, Political Ecology, Adaptation to Climate Change

Admissions

APPLICATION
M.A. applicants must submit GRE scores, a personal two-page statement defining the applicant’s interest in geography and career intentions, and two letters of recommendation from people who are familiar with the student’s undergraduate training.

Ph.D. applicants must send three letters of recommendation, GRE scores, and a two-page research statement. Applicants are strongly encouraged to contact potential doctoral advisors among the faculty prior to application.

To receive full consideration, including consideration for funding opportunities, all applications for Fall admission must be submitted by January 15. In exceptional circumstances, we will review applications received after the January 15 deadline.

Prospective M.A. students must have an overall cumulative undergraduate GPA of 3.0.

Prospective Ph.D. students must hold a M.A./M.S. degree and a cumulative GPA of at least 3.0 in their previous graduate work. Students with degrees in other non-geography disciplines are encouraged to apply although they may be asked to make up deficiencies in geography during the first year in the program.

International students are encouraged to submit their materials at least three months in advance of all deadlines.
TEACHING ASSISTANTSHIPS
A small number of graduate teaching assistantships are competitively awarded by the Geography program on an annual basis. Teaching assistants are employed to work in support of undergraduate courses. Applicants who wish to be considered for a teaching assistant position should make that request known in their application.

RESEARCH ASSISTANTSHIPS
Research assistantships must be applied for through the faculty member whose research is providing the funding. The geography faculty are engaged in numerous funded research projects, many of which provide graduate students with opportunities for obtaining research skills and experience as well as employment and tuition aid. Furthermore, the professional contacts made in the course of faculty research frequently provide graduate students with opportunities for career development.

Master of Arts
The Master’s Program in Geography at West Virginia University provides students with cutting edge training in the history and theory of geography, experience with advanced geographic research methodologies and specialized mentoring from faculty experts across three sub-disciplinary fields (Human Geography; Environmental Geography; Geographic Information Science). To earn a M.A. in Geography at WVU students must complete 30 credit hours of graduate courses (based upon the curriculum described below), form a committee of graduate faculty to supervise their study, write and defend a thesis or project proposal, and finally, write and defend a thesis or project.

Degree Requirements
The M.A. thesis option is designed to enable full-time students to satisfy all program requirements and complete an examinable thesis within two years. Students are required to be well grounded in one or more of the program’s three areas of specialization (Geographic Information Science; Human Geography; and Environmental Geography).

- **Credit Hours:** Students are required to complete a minimum of 30 graduate credit hours in Geography at the 400 level or above. WVU requires that no more than 40% of the graduate degree credits be at the 400-level.

- **Grade Point Average:** Students must earn a minimum GPA of 3.0 overall and in coursework applied to their graduate program.

- **Graduation Requirement:** Students have the option of pursuing a Professional Master's Project or completing a Master's Thesis. The M.A. thesis is an independent research project undertaken by the student. The thesis research should adhere to the following: 1) Demonstrate knowledge of the literature in the student's chosen field, 2) Use data and methods appropriate to the research, 3) Draw conclusions from the research endeavor. The Professional Master's Project is designed for students interested in a more focused project than the traditional research thesis option. It is not recommended for students considering entering a Ph.D. program. The project has strict deadlines and must be completed in one semester and after the completion of GEOG 601 GEOG 601 GEOG 601 GEOG 603 or GEOG 701 GEOG 701 GEOG 701.

- **Additional Requirements:** The academic progress of every master's student is reviewed each year. Students must submit a self-evaluation signed by their advisor by January 15. The Graduate Committee will conduct its annual review of students in February and communicate with students in March. Waivers to the M.A. deadlines, timing requirements, and other rules may be requested from the Graduate Coordinator. Waivers are only given under extraordinary circumstances.

- **Thesis Defense:** The thesis defense occurs when the advisor and the committee agree that a defendable copy of the thesis is complete. The defense date must be advertised to the department at least three weeks in advance. Thesis defenses are not normally scheduled between June 15 and August 15. In accordance with College requirements, original signatures are required on the shuttle sheet form specifying the outcome of the defense.

- **Required Deadlines:**
  - **Thesis option**
    - First year
      - Fall semester: File plan of study
      - Spring semester: Form committee
    - Second year
      - Fall semester: Written proposal by Oct. 1st and Oral proposal by Oct. 31st
      - Spring semester: Defend thesis by the end of semester
  - **Professional option**
    - First year
      - Fall semester: File plan of study
      - Spring semester: Form committee
    - Second year
• Fall semester: Choose professional option by Oct. 1st. Get approval of written plan from the thesis committee and request permission to graduate committee by the end of semester.
• Spring semester: Defend project by the end of semester

Curriculum Requirements

CORE COURSES:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 600</td>
<td>Geography Research Colloquium (repeated every semester)</td>
<td>10</td>
</tr>
<tr>
<td>GEOG 601</td>
<td>Geographic Traditions</td>
<td></td>
</tr>
<tr>
<td>GEOG 603</td>
<td>Qualitative Research in Geography</td>
<td></td>
</tr>
<tr>
<td>or GEOG 701</td>
<td>Quantitative Spatial Analysis</td>
<td></td>
</tr>
</tbody>
</table>

GEOGRAPHY ELECTIVES:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Geography Courses at the 400 level or above</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

GRADUATION TRACK:

Select the Thesis or the Professional Track:

1- Professional Track

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 780</td>
<td>Non-Thesis Project (Professional option)</td>
<td></td>
</tr>
<tr>
<td>Any GEOG course at the 400 level or above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2- Thesis Track

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 797</td>
<td>Research (Thesis option)</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 30

* Excluding GEOG 600, GEOG 601, GEOG 697, GEOG 698, GEOG 699, GEOG 780, GEOG 797, GEOG 930.

Doctor of Philosophy

The Doctoral Program in Geography at West Virginia University provides students with cutting edge training in the history and theory of geography, experience with advanced geographic research methodologies and specialized mentoring from faculty experts across three sub-disciplinary fields (Human Geography; Environmental Geography; Geographic Information Science). To earn a Ph.D. in Geography at WVU students must complete 28 credit hours of graduate courses (based upon the curriculum described below), form a committee of graduate faculty to supervise their study, pass a comprehensive exam, write and defend a dissertation research proposal, and finally, write and defend a dissertation.

Doctor of Philosophy

Degree Requirements

• **Credit Hours**: Students are required to complete a minimum of 28 graduate credit hours in Geography at the 400 level or above. No more than 6 credit hours of 400-level courses may be counted towards the degree. Students may petition their committee to transfer up to 9 credit hours from another program.

• **Grade Point Average**: Students must earn a minimum GPA of 3.0 overall, and 3.0 in coursework applied to their graduate program.

• **Comprehensive Examinations**: The student is required to pass an oral and three written comprehensive examinations no later than the fourth semester. The student will be examined in two specialty areas and a third area closely related to the proposed dissertation research topic.

• **Dissertation Proposal/Defense**: Upon successful completion of the comprehensive examination and no later than the end of the fifth semester, the student will be expected to defend a dissertation research proposal. The award of the Ph.D. is granted upon the successful defense of the dissertation itself.

• **Required Deadlines**:
  • First year
    • Course work
    • Fall semester: File plan of study
  • Second year
    • Course work
    • Fall semester: Form committee
    • Spring semester: Oral and Written comprehensive exams
  • Third year
    • Field work/Data collection
    • Fall semester: Defend dissertation proposal by the end of semester
  • Fourth year
• Dissertation writing
• Spring semester: Defend dissertation by the end of semester (suggested)

Curriculum Requirements

COURSES

CORE COURSES:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 600</td>
<td>Geography Research Colloquium (6 credits minimum)</td>
</tr>
<tr>
<td>GEOG 601</td>
<td>Geographic Traditions</td>
</tr>
<tr>
<td>GEOG 603</td>
<td>Qualitative Research in Geography</td>
</tr>
<tr>
<td>or GEOG 701</td>
<td>Quantitative Spatial Analysis</td>
</tr>
</tbody>
</table>

COURSEWORK REQUIREMENT:

Select two courses from the following list:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 525</td>
<td>Problems in Geomorphology</td>
</tr>
<tr>
<td>GEOG 550</td>
<td>Geographic Information Science</td>
</tr>
<tr>
<td>GEOG 553</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>GEOG 607</td>
<td>Geography of Fire</td>
</tr>
<tr>
<td>GEOG 612</td>
<td>Gender, Society and Space</td>
</tr>
<tr>
<td>GEOG 615</td>
<td>Development Geography</td>
</tr>
<tr>
<td>GEOG 640</td>
<td>Geopolitical Perspectives</td>
</tr>
<tr>
<td>GEOG 654</td>
<td>Environmental Geographic Information Systems Modeling</td>
</tr>
</tbody>
</table>

Select one course from the following list:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 412</td>
<td>Geography of Gender</td>
</tr>
<tr>
<td>GEOG 415</td>
<td>Global Environmental Change</td>
</tr>
<tr>
<td>GEOG 443</td>
<td>African Environment and Development</td>
</tr>
<tr>
<td>GEOG 454</td>
<td>Environmental Geographic Information Systems</td>
</tr>
<tr>
<td>GEOG 455</td>
<td>Introduction to Remote Sensing</td>
</tr>
<tr>
<td>GEOG 462</td>
<td>Digital Cartography</td>
</tr>
</tbody>
</table>

Select one course from the following list:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 407</td>
<td>Environmental Field Geography</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 456</td>
<td>Remote Sensing Applications</td>
</tr>
<tr>
<td>GEOG 517</td>
<td>Climatological Analysis</td>
</tr>
<tr>
<td>GEOG 651</td>
<td>Geographic Information Science: Technical Issues</td>
</tr>
<tr>
<td>GEOG 655</td>
<td>Remote Sensing Principles</td>
</tr>
</tbody>
</table>

GEOGRAPHY ELECTIVES: *

Any Geography course at the 500 level or above

Total Hours 28

* Excluding GEOG 600, GEOG 601, GEOG 697, GEOG 698, GEOG 699, GEOG 780, GEOG 797, GEOG 930.

Degree Progress

MASTERS DEGREE:

• Thesis/Project Defense: The thesis/project defense occurs when the advisor and the committee agree that a defendable copy of the thesis/project is completed. The defense date must be advertised to the department at least two weeks in advance. Thesis/Project defenses are not normally scheduled between June 15 and August 15. In accordance with College requirements, original signatures are required on the shuttle sheet form specifying the outcome of the defense. Students should work with closely with their advisors to establish expectations for length and structure of the thesis/project.

• Annual Evaluation: The academic progress of every master’s student is reviewed each year. Students must submit a self-evaluation signed by their advisor by January 15. The Graduate Committee will conduct its annual review of students in February and communicate with students in March.
Waivers to the M.A. deadlines, timing requirements, and other rules may be requested from the Graduate Coordinator. Waivers are only given under extraordinary circumstances.

- **Required Deadlines:**

  **Thesis option**

  First year
  - Fall semester: File plan of study
  - Spring semester: Form committee

  Second year
  - Fall semester: Written proposal given to committee by Oct. 1st and complete oral proposal by Oct. 31st
  - Spring semester: Defend thesis by the end of semester

  **Professional option**

  First year
  - Fall semester: File plan of study
  - Spring semester: Form committee

  Second year
  - Fall semester: Professional option must be chosen by Oct. 1st. Get approval of written plan from the thesis committee and request permission from the graduate committee by the end of semester.
  - Spring semester: Defend project by the end of semester

**DOCTORAL DEGREE:**

- **Comprehensive Examinations:** The student is required to pass an oral and three written comprehensive examinations no later than the fourth semester. The student will be examined in two specialty areas and a third area closely related to the proposed dissertation research topic.

- **Dissertation Proposal/Defense:** Upon successful completion of the comprehensive examination and no later than the end of the fifth semester, the student will be expected to defend a dissertation research proposal. Dissertation Proposal defenses are not normally scheduled between June 15 and August 15. The award of the Ph.D. is granted upon the successful defense of the dissertation itself.

- **Annual Evaluation:** The academic progress of every doctoral student is reviewed each year. Students must submit a self-evaluation signed by their advisor by January 15. The Graduate Committee will conduct its annual review of students in February and communicate with students in March. Waivers to the PhD deadlines, timing requirements, and other rules may be requested from the Graduate Coordinator. Waivers are only given under extraordinary circumstances. A limited number of the required courses may be waived up to 9 credit hours if the student has already completed an equivalent course and can demonstrate proficiency with the material. They should work with their advisor and the Graduate Committee to request a waiver. Students requesting course waivers must make their request prior to submitting their formal Plan of Study in their first semester.

- **Required Deadlines:**

  First year: Course work
  - Fall semester: File plan of study
  - Spring semester: Form committee

  Second year: Course work
  - Fall semester: Form committee, if not yet completed
  - Spring semester: Oral and Written comprehensive exams

  Third year: Defend proposal/Field work/Data collection
  - Fall semester: Defend dissertation proposal by the end of semester
  - Fall and Spring semesters: Collect data/conduct fieldwork as necessary

  Fourth year: Dissertation writing
Graduate Certificate in GIS and Spatial Analysis

CERTIFICATE CODE - CG37

Complete 4 of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ARE 729</td>
<td>Spatial Econometrics</td>
</tr>
<tr>
<td>or ECON 729</td>
<td>Spatial Econometrics</td>
</tr>
<tr>
<td>RESM 540</td>
<td>Geospatial Modeling</td>
</tr>
<tr>
<td>RESM 575</td>
<td>Spatial Analysis for Resource Management</td>
</tr>
<tr>
<td>RESM 545</td>
<td>Spatial Hydrology and Watershed Analysis</td>
</tr>
<tr>
<td>RESM 640</td>
<td>Geographic Information Systems for Aquatic Resource Management</td>
</tr>
<tr>
<td>GEOG 550</td>
<td>Geographic Information Science</td>
</tr>
<tr>
<td>GEOG 651</td>
<td>Geographic Information Science: Technical Issues</td>
</tr>
<tr>
<td>GEOG 654</td>
<td>Environmental Geographic Information Systems Modeling</td>
</tr>
<tr>
<td>GEOG 655</td>
<td>Remote Sensing Principles</td>
</tr>
<tr>
<td>GEOG 753</td>
<td>Exploratory Spatial Data Analysis</td>
</tr>
<tr>
<td>GEOG 755</td>
<td>Advanced Remote Sensing</td>
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</tbody>
</table>

Independent Study Requirement:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESM 585</td>
<td>GIS and Spatial Analysis Project</td>
</tr>
</tbody>
</table>

Total Hours 15

* Students must take at least one of the course offerings from RESM/ARE/ECON (not counting RESM 585) and one from the GEOG course list.*

Major Learning Outcomes

GEOGRAPHY

The Graduate Program in Geography at West Virginia University trains students at the highest level to assume leadership roles in research, teaching, and applied work in Human Geography, Environmental Geography, and Geographic Information Science.

M.A. Program

• Master the existing scholarship in the study of Geography with the goal of using this scholarship in the pursuit of their own professional and/or research field.
• Conduct research in their area of specialization or engage in an applied geography project oriented to their professional goals.
• Prepare to be professionals in careers that require training at a high level in Geography.

Ph.D. Program

• Master the existing scholarship in the study of Geography with the goal of using this scholarship in the pursuit of their own research.
• Engage in and conduct original research in their area of specialization.
• Prepare to be professionals in careers that require training at the highest level in Geography.

The Geography Graduate Committee regularly reviews the structure and content of the M.A. and Ph.D. programs to provide the best possible education to students in order to meet the needs for highly trained individuals in Human Geography, Environment Geography, and Geographic Information Science.

GEOGRAPHY COURSES

GEOG 517. Climatological Analysis. 3 Hours.
PR: GEOG 207 or Consent. Statistical analysis and interpretation of climatological data and application to physical and human problems across the globe using user-friendly and programmable tools. (Also listed as GEOG 317.).

GEOG 525. Problems in Geomorphology. 4 Hours.
(Also listed as GEOL 525.).

GEOG 550. Geographic Information Science. 4 Hours.
PR: Instructor's permission. Principles and practice of geographical information science. Geospatial data handling for research, planning and decision-making. Spatial analysis, information production, and display.

GEOG 553. Environmental Impact Assessment. 3 Hours.
Study of the process and methods, including GIS, by which the environmental consequences of development actions are assessed and evaluated in advance of their occurrence.
GEOG 591. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

GEOG 593. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

GEOG 594. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

GEOG 600. Geography Research Colloquium. 1 Hour.
PR: Consent. Lectures and presentation on recent and current research by resident and visiting scholars.

GEOG 601. Geographic Traditions. 3 Hours.
PR: Consent. Review of the major approaches in geographic scholarship.

GEOG 602. Geographic Research-Design. 3 Hours.
PR: GEOG 300 and GEOG 601. Choosing, preparing, and developing research problems of geographic interest. Emphasizes proposal writing and research design alternatives.

GEOG 603. Qualitative Research in Geography. 3 Hours.
PR: GEOG 602 or consent. Analysis of qualitative research in geography and related fields. Examine methodological approaches and techniques that explore and interpret issues in the development of geographical research projects.

GEOG 612. Gender, Society and Space. 3 Hours.
PR: GEOG 601 or Consent. Examines how gender and feminist perspectives are an integral part of how space is used, distributed, and perceived in society. Overviews of major developments in the field including diversity and difference, representation, identity, and nature.

GEOG 621. Advanced Fluvial Geomorphology. 4 Hours.
PR: GEOL 321 or GEOG 321 or Consent. Analysis of stream processes, landforms, deposits, including paleohydrology and Appalachian surficial geology. Required weekend field trips at student's expense. (Also listed as GEOL 621.).

GEOG 630. Seminar: Land Use and Cover Change. 3 Hours.
Review, discussion, and critique of major scientific approaches to the study of land use and cover change. All world regions and biomes covered. Includes theoretical and technical discussions of change, human dimensions, and policy issues.

GEOG 640. Geopolitical Perspectives. 3 Hours.
This course uses geopolitical perspectives to critically examine the linkages between power and places. Seminal literatures in the sub-field of geopolitics are read and critiqued, including critical geopolitics, feminist geopolitics and post-colonial theory.

GEOG 651. Geographic Information Science: Technical Issues. 3 Hours.
PR: GEOG 350. Current issues in GIS research. Technical aspects of GIS operations, algorithms, theory of geographical data structures, and error handling. Labs focus on tools, data structures, database languages and macros. (2 hr. lec., 1 hr. lab.).

GEOG 654. Environmental Geographic Information Systems Modeling. 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 655. Remote Sensing Principles. 3 Hours.
Mapping of earth features using aerial and satellite-borne sensors, image enhancement, geo-referencing, and classification. (Also listed as GEOL 655.).

GEOG 691. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

GEOG 692. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

GEOG 693. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

GEOG 694. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

GEOG 695. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

GEOG 696. Graduate Seminar. 1 Hour.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his her program.

GEOG 697. Research. 1-15 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 698. Thesis or Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.
GEOG 699. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use of the University's facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department's 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.

GEOG 701. Advanced Research Methods. 3 Hours.
PR: GEOG 601. Review of quantitative and qualitative methods used in geographic research.

GEOG 753. Exploratory Spatial Data Analysis. 3 Hours.
Develop expertise in spatial analytical techniques for use in geographical data analysis and GIS.

GEOG 755. Advanced Remote Sensing. 3 Hours.
PR: GEOG 655 or GEOL 655 or consent. Collection, processing, and classification of remotely sensed data, including optical, thermal, radar, and topographic information. (2 hour lecture, 1 hour laboratory.) (Also listed as GEOL 755.).

GEOG 780. Non-Thesis Project. 3 Hours.
Research activities leading to a non-thesis project report.

GEOG 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

GEOG 792. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

GEOG 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

GEOG 794. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

GEOG 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

GEOG 796. Graduate Seminar. 1 Hour.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

GEOG 797. Research. 1-15 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 P102 . . 3 Hours.
GEOG P106 . . 1 Hour.
GEOG P107 . . 3 Hours.
GEOG P108 . . 3 Hours.
GEOG P191 . . 1 Hour.
GEOG P205 . . 3 Hours.
GEOG T102 . . 3 Hours.
GEOG T240 . . 3 Hours.
GEOG T341 . . 3 Hours.
GEOG T342 . . 3 Hours.
GEOG T343 . . 3 Hours.

GEOLOGY COURSES

GEOL 510. Computer Aided Subsurface Interpretations. 3 Hours.
PR: GEOL 311 and GEOL 341. Develop subsurface interpretations from integrated geological, geophysical and engineering databases in a computer workstation environment. Construct maps and 3D visualizations of subsurface structure, seismic horizons, layer properties, etc., for prospect location and subsurface assessment.

GEOL 511A. Sedimentary Geology in Ireland - Travel. 1 Hour.
Travel portion of GEOL 511. See GEOL 511 for description.
GEOL 522. Surficial and Glacial Geology. 3 Hours.
PR: GEOL 321 or GEOG 321 or consent. Analysis of late Cenozoic landscapes, especially those caused by glaciers or otherwise influenced by global climate change. Required weekend field trips at student’s expense. (Also listed as GEOG 522.).

GEOL 525. Problems in Geomorphology. 4 Hours.

GEOL 543. Tectonics. 3 Hours.
PR: GEOL 341 and GEOL 311; undergraduates need Consent. Investigation of patterns and processes of large-scale deformation mechanisms that shape the earth. Focuses on the structural evolution and modeling process of various plate boundaries.

GEOL 556. 3-D Seismic Visualization. 3 Hours.
This course focuses on the application of 3-D seismic data visualization and interpretation technologies to the characterization of subsurface structure, facies, and reservoirs, with particular reference to hydrocarbon exploration and CO2 sequestration.

GEOL 558. Seismic Attribute. 3 Hours.
PR: GEOL 341 and GEOL 311 and MATH 155. The effective seismic attribute technologies and attribute interpretation workflows, their application to the characterization of subsurface structures, facies, and reservoir properties, with particular reference to hydrocarbon exploration and CO2 sequestration.

GEOL 562. Quantitative Hydrogeology. 3 Hours.
PR: MATH 156 or GEOL 351 and GEOL 463 or Consent. Mathematical and computer analysis of groundwater flow, aquifer systems, radial-flow solutions; well/aquifer test methods; superposition, boundaries; dispersive/advective transport.

GEOL 564. Environmental Hydrogeology. 4 Hours.
PR: GEOL 101 and GEOL 102 and GEOL 463 and (PR or CONC: GEOL 562). Seminar reviewing groundwater occurrence, flow, quality, and exploration in various geologic terrains; groundwater pollution and dewatering; and groundwater technology. Includes topical literature review.

GEOL 575. Imperial Barrel Competition. 3 Hours.
The students will participate in the Imperial Barrel Award competition sponsored by the American Association of Petroleum Geologists (AAPG). They will evaluate a real-world petroleum basin using industry seismic and well data and will make a presentation to a panel of professional judges recommending an exploration strategy. Travel to the regional and national AAPG meeting may be required.

GEOL 579. Applied Petroleum Geoscience. 3 Hours.
Students work in teams to conduct integrated characterization of a petroleum reservoir, develop numerical simulation, consider technical options, perform economic analyses and make a final report to the company/organization.

GEOL 580. Organic Contaminant Geochemistry. 3 Hours.
This course focuses on fundamental chemical properties and structures of organic contaminants that control their functionality, fate, and transport in the environment. Natural organic matter and inorganic phases are discussed relative to contaminant mobility.

GEOL 585. Optical Mineralogy and Petrology. 3 Hours.
PR: GEOL 285. Introduction to the optical properties of minerals and the use of the petrographic microscope. Interpretation of sedimentary, igneous, and metamorphic rocks based on microscopic examination of thin sections. (Offered alternate years.).

GEOL 586. Advanced Isotope Geochemistry. 3 Hours.
PR: GEOL 486. Advance the understanding of isotopic systems by comprehensive discussion of selected research publications. Laboratory exercises will provide hands-on training in stable isotope measurement techniques. Study topics will focus on use of isotopes to address research questions in variety of fields, including geology, biology, forensics, environmental sciences and energy.

GEOL 588. Aqueous Geochemistry. 3 Hours.
PR: GEOL 101 and CHEM 112 or CHEM 116, or Consent. Review of basic chemical principles as they apply to aqueous geochemical environments. Properties of water and the types, sources, and controls of the common and environmentally significant chemical species dissolved in water.

GEOL 591. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

GEOL 593. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

GEOL 594. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

GEOL 610. Advanced Stratigraphy. 3 Hours.

GEOL 615. Advanced Stratigraphic Methods. 3 Hours.
Advanced discussion of stratigraphic correlation techniques, including sequence stratigraphy, To analyze deposition of clastic and carbonate sediments, with emphasis on assessing porosity development in sandstones and limestones, organic matter deposition, and flow of fluids, such as water, gas and oil, through rock.

GEOL 616. Advanced Sedimentation. 4 Hours.
PR: GEOL 311 or Consent. (Required field trips at student’s expense.) Origin of sedimentary rocks; principles involved in interpretation of ancient geography, climates, animals, and plants. Emphasis on detrital sediments and rocks.
GEOL 621. Advanced Fluvial Geomorphology. 4 Hours.
PR: GEOL 321 or GEOG 321 or Consent. Analysis of stream processes, landforms, deposits, including paleohydrology and Appalachian surficial geology. (Required weekend field trips at student's expense; also listed as GEOG 521.).

GEOL 632. Paleocology. 3 Hours.
PR: GEOL 331 and GEOL 311 or Consent. Methods of paleoecologic analysis in sedimentary geology. Topics include trace fossil analysis, shell biogeochemistry, community paleoecology, biofacies analysis of basins, and Precambrian paleoecology.

GEOL 642. Advanced Structural Geology. 3 Hours.
PR: GEOL 341. Theoretical and observational aspects of the development of geological structures. Problems ranging from the microstructural to the orogenic scale will be addressed.

GEOL 645. Basin Analysis. 3 Hours.
PR: GEOL 341 and GEOL 311 or equivalent. The origin, development, and distribution of basins and the structure found within basins throughout the world are studied. The techniques used for investigating basin evolution are emphasized. The effects of basin processes on the occurrence of energy resources are addressed.

GEOL 655. Remote Sensing Principles. 3 Hours.
Mapping of earth features using aerial and satellite-borne sensors, image enhancement, geo-referencing, and classification. (Also listed as GEOG 655.).

GEOL 659. Quantitative Methods in Geoscience. 3 Hours.
PR: STAT 312 or STAT 511 or Consent. Brief review and introduction to multivariate quantitative techniques as applied to geology and geography.

GEOL 665. Groundwater Modeling. 4 Hours.
PR: GEOL 562 or Consent. Theory and application of groundwater flow modeling, focusing on MODFLOW; numerical methods; discretization and boundaries; parameterization and calibration; problems and case histories.

GEOL 666. Karst Geology. 3 Hours.
PR: Consent. Review of karst terrain hydrogeology and geomorphology, emphasizing origins and nature of caves, sinkholes and other karst landforms, environmental problems of karst, and its water and mineral/ petroleum resources.

GEOL 680. Masters Project Research. 1-5 Hours.
Planning and presentation of a professional project, including proposal, work plan execution, and project report. Status reports and timeline planning. Must be taken in two consecutive semesters, totaling to 6 credits.

GEOL 681. Grad Internship in Geology. 1-6 Hours.
PR: Be enrolled in the Geology MS with a Professional Studies AOE and consent. To obtain practical work experience in a professional setting while obtaining skills and knowledge as a geologist.

GEOL 682. Masters: Professional Studies Track Cohort Seminar. 1 Hour.
PR: Registered students in the Geology MS - Professional Studies Track. This seminar will provide graduate students with the information, tools and resources needed to succeed in the Masters of Geology Professional Studies Track.

GEOL 690. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of geology. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It also provides a mechanism for students not on assistantships to gain teaching experience. (Grading will be P/F.).

GEOL 691. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

GEOL 692. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

GEOL 693. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

GEOL 694. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

GEOL 695. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

GEOL 697. Research. 1-15 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

GEOL 698. Thesis or Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.
GEOL 699. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking course work credit, but who wish to meet residence requirements, use the University facilities and participate in its academic and cultural programs. NOTE: Graduate students not actively involved in course work or research or enrolled, through enrollment in his/her departments Graduate Colloquium, to consult with graduate faculty, participate in both formal and informal academic activities sponsored by his/her program and retain all of the rights and privileges of duly enrolled students. Grading is P/F: colloquium credit may not be counted against credit requirements for master's programs.

GEOL 755. Advanced Remote Sensing. 3 Hours.
PR: GEOG 655 or GEOL 655 or consent. Collection, processing and classification of remotely sensed data, including optical, thermal, radar, and topographic information. (2 hour lecture, 1 hour laboratory.) (Also listed as GEOG 755.)

GEOL 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of geology. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be P/F.)

GEOL 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

GEOL 794. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

GEOL 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

GEOL 796. Graduate Seminar. 1 Hour.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

GEOL 798. Thesis or Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.

GEOL 799. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use of the University's facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department's 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.

GEOL 930. Professional Development. 1-6 Hours.
Professional development courses provide skill renewal or enhancement in a professional field or content area (e.g., education, community health, geology). These tuition-waived continuing education courses are graded on a pass/fail grading scale and do not apply as graduate credit toward a degree program.

GEOL P101. . 3 Hours.
GEOL P102. . 1 Hour.
GEOL P103. . 3 Hours.
GEOL P104. . 1 Hour.
GEOL P105. . 3 Hours.