Geology

Degrees Offered

• Master of Science
• Doctor of Philosophy

Nature of the Program

The graduate program in geology provides study opportunities in the following areas:

• Hydrogeology and environmental geology with strengths in ground water flow and modeling; aqueous, contaminant and isotope geochemistry; mine reclamation; and floods and debris flows
• Basin analysis and sedimentary geology with strengths in seismic modeling, basin structures, deposition analysis, sequence stratigraphy, biostratigraphy, diagenesis, and plate tectonics
• Energy geology and geophysics with strengths in the exploration and development of oil, gas, and coal; and environmental impacts of fossil fuel usages
• Paleobiology and paleontology with strengths in macroevolution, paleoecology, and phylogenetics, particularly in relation to arthropods and mass extinctions
• Igneous petrology and volcanology with strengths in arc magmatism and the emplacement of lava flows and pyroclastic currents
• Computational and geochemical analysis

Tracks within the Masters Degree

The Research Track requires student to complete independent scholarly research culminating in a thesis. This track is intended for students interested in a more-traditional research-based graduate degree.

The Professional Studies Track requires students to complete a Professional Development credits/tasks in place of thesis-based research. This track is intended for students looking to obtain additional knowledge and skills for their professional careers in Energy Geology or Environmental Geology.

FACULTY

CHAIR

• Timothy Carr - Ph.D. (Univ. of Wisconsin-Madison)

ASSOCIATE CHAIR FOR GEOLOGY

• Shikha Sharma - Ph.D. (Univ. of Lucknow, India)

PROFESSORS

• Timothy Carr - Ph.D. (Univ. of Wisconsin-Madison)
  Sedimentology, Petroleum Geology
• Joseph J. Donovan - Ph.D. (Pennsylvania State Univ.)
  Hydrogeology, Quaternary Paleochemistry
• Kathleen Benison - Ph.D. (Univ. of Kansas)
  Sedimentology, Stratigraphy, Evaporites
• Dengliang Gao - Ph.D. (Duke Univ.)
  Geophysics, Petroleum
• Jaime Toro - Ph.D. (Stanford Univ.)
  Structural Geology, Tectonics, Energy
• Timothy A. Warner - Ph.D. (Purdue Univ.)
  Remote Sensing

ASSOCIATE PROFESSORS

• J. Steven Kite - Ph.D. (Univ. of Wisconsin-Madison)
  Geomorphology, Quaternary Studies, Geoarchaeology
• Shikha Sharma - Ph.D. (Univ. of Lucknow, India)
  Isotope Geochemistry, Biogeochemistry, Energy
• Dorothy J. Vesper - Ph.D. (Pennsylvania State Univ.)
Aqueous Geochemistry, Hydrogeology, Karst
- Amy Weislogel - Ph.D. (Stanford Univ.)
  Stratigraphy, Sedimentology, Energy

PROFESSORS EMERITI
- Robert E Behling - Ph.D. (Ohio State Univ.)
- Alan C. Donaldson - Ph.D. (Pennsylvania State Univ.)
- Thomas W Kammer - Ph.D. (Indiana Univ.)
- Henry W Rauch - Ph.D. (Pennsylvania State Univ.)
- John J Renton - Ph.D. (West Virginia Univ.)
- Robert C. Shumaker - Ph.D. (Cornell Univ.)
- Richard A. Smosna - Ph.D. (Univ. of Illinois)
- Thomas Wilson - Ph.D. (West Virginia Univ.)

ASSISTANT PROFESSORS
- Graham Andrews - Ph.D. (Univ. of Leicester)
  Igneous Petrology
- James Lamsdell - Ph.D. (Univ. of Kansas)
  Paleoecology, Paleoecology, Macroevolution

TEACHING ASSOCIATE PROFESSOR
- Joseph Lebold - Ph.D. (West Virginia Univ.)
  Earth Science Education, Stratigraphy, Paleoecology

TEACHING ASSISTANT PROFESSOR
- Kenneth Brown - Ph.D. (Miami Univ. Ohio)
  Geoscience Education, Geochronology, Mineralogy, Petrology

Admission Procedures and Prerequisites
Applicants seeking admission and financial support for the fall semester should apply by February 1. For spring semester, apply by October 1.

GRADUATE ADMISSION REQUIREMENTS FOR ALL APPLICANTS
- Transcripts from all universities attended
- An undergraduate GPA of 3.0 or higher
- Scores of the Graduate Record Examination
- Three letters of reference
- Statement of goals. MS applicants must identify their intended Track (Research or Professional Studies)
- International students must fulfill the English Language Proficiency requirements of WVU (https://graduateadmissions.wvu.edu/information-for/international-students).

ADDITIONAL ADMISSION REQUIREMENTS FOR THE MASTERS PROGRAM WITH A RESEARCH TRACK
Students seeking admission to the M.S. program with a Research Track must complete the equivalents of the geology and allied science and mathematics courses required for the B.S. in Geology at WVU:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 284</td>
<td>Mineralogy</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 285</td>
<td>Introductory Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 311</td>
<td>Stratigraphy and Sedimentation</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 341</td>
<td>Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 404</td>
<td>Geology Field Camp</td>
<td>6</td>
</tr>
<tr>
<td>MATH 155</td>
<td>Calculus 1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 156</td>
<td>Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 115</td>
<td>Fundamentals of Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 116</td>
<td>Fundamentals of Chemistry</td>
<td></td>
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<tr>
<td>PHYS 101</td>
<td>Introductory Physics</td>
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At least 4 courses for the following 3 subject areas:
Similar courses from other universities or relevant experiences may be substituted if approved during admission review. A requirement may be waived by the committee if the student can demonstrate competence in that subject area.

**ADDITIONAL ADMISSION REQUIREMENTS FOR THE MASTERS PROGRAM WITH A PROFESSIONAL STUDIES TRACK**

- B.A. or B.S. degree in a STEM or relevant field that includes course work in general physics, chemistry, and calculus. Completed coursework in geology is preferred

**Degree Requirements**

- **Credit Hours:** Students are required to complete a minimum of 32 graduate credit hours

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

- **Degree Requirements:**
  - Complete a plan of study
  - Complete 24 formal course credit-hours
  - At least 60% of the course credits taken from GEOL and GEOG
  - Courses outside of GEOL and GEOG to be approved by the student's advisor unless they are on the approved list of outside courses

- **Completion Requirements:** students must select a completion track for a total of 8 credits. Available tracks are the
  - Research track: students must complete a Master's thesis
  - Professional studies track: students have the option of completing an internship, completing a project with a faculty member, taking the ASBOG Fundamental exam (first step in professional licensure) and additional coursework, or a combination of these options.

- **Progress toward completion:**
  - Students whose GPA falls below 3.0 will be put on probation for one semester. If they remain below 3.0 for a second semester, they are dismissed from the program.
  - Withdrawing from classes is only permitted with the permission of the student's advisor or the Geology Graduate Program Committee.
  - Students must complete annual progress reports (see graduate handbook for details).
  - For students completing the Research track, deadlines are below:
    a. Proposal defense: Target date: May 1st, Year 2 (August 1 Year 2); Probation date: August 1st, Year 1 (December 1, Year 1); Funding termination date May 1st, Year 2 (August 1, Year 2).
    b. Thesis defense: Target date: May 1, Year 2 (August 1st, Year 2); Probation date: May 1st, Year 2 (August 1, Year 2).

**RESEARCH TRACK CURRICULUM REQUIREMENTS**

<table>
<thead>
<tr>
<th>Core Requirements</th>
<th>15</th>
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<tbody>
<tr>
<td>Any GEOL courses at the 500 or 600 level</td>
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</table>

**Electives | 9**

Select three courses from the list below:

- Any additional GEOL courses at the 500 or 600 level

| AEM 401 | Environmental Microbiology |
| AGRN 417 | Soil Genesis and Classification |
| AGRN 455 | Reclamation of Disturbed Soils |
| AGRN 552 | Pedology |
| ENVP 460 | Environmental Impact Assessment |
| ENVP 515 | Hazardous Waste Training |
| ENVP 555 | Environmental Sampling and Analysis |
| FHYD 444 | Watershed Management |
| FHYD 644 | Watershed Hydrology |
| PNGE 632 | Reservoir Simulation and Modeling |
| PNGE 735 | Advanced Formation Evaluation |
RESM 444  Advanced GIS for Natural Resource Management
RESM 441  Introduction Geographic Information Systems Natural Science
RESM 480  Environmental Regulation
RESM 540  Geospatial Modeling
RESM 545  Spatial Hydrology and Watershed Analysis
STAT 511  Statistical Methods 1
STAT 512  Statistical Methods 2
WMAN 446  Freshwater Ecology
WMAN 547  Applied Wetlands Ecology and Management

**Research Track Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>GEOL 694</td>
<td>Seminar</td>
</tr>
<tr>
<td>GEOL 697</td>
<td>Research</td>
</tr>
</tbody>
</table>

Total Hours 32

* Except GEOL 594, 680, 681, 694, 697.

**RESEARCH TRACK NON-COURSE REQUIREMENTS**

- Research Proposal
- Research Proposal Defense
- Thesis
- Thesis Defense

**PROFESSIONAL STUDIES TRACK CURRICULUM REQUIREMENTS**

**Core Requirements** 15

Any GEOL courses at the 500 or 600 level *

**Electives** 9

Select three courses from the list below:

- Any additional GEOL courses at the 500 or 600 level *
- AEM 401  Environmental Microbiology
- AGRN 417  Soil Genesis and Classification
- AGRN 455  Reclamation of Disturbed Soils
- AGRN 552  Pedology
- ENVP 460  Environmental Impact Assessment
- ENVP 515  Hazardous Waste Training
- ENVP 555  Environmental Sampling and Analysis
- FHYD 444  Watershed Management
- FHYD 644  Watershed Hydrology
- PNGE 632  Reservoir Simulation and Modeling
- PNGE 735  Advanced Formation Evaluation
- RESM 444  Advanced GIS for Natural Resource Management
- RESM 441  Introduction Geographic Information Systems Natural Science
- RESM 480  Environmental Regulation
- RESM 540  Geospatial Modeling
- RESM 545  Spatial Hydrology and Watershed Analysis
- STAT 511  Statistical Methods 1
- STAT 512  Statistical Methods 2
- WMAN 446  Freshwater Ecology
- WMAN 547  Applied Wetlands Ecology and Management

**Professional Studies Track Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>GEOL 594</td>
<td>Seminar</td>
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<tr>
<td>GEOL 694</td>
<td>Seminar</td>
</tr>
</tbody>
</table>
Professional Experience

Select one option or a combination of two options:

<table>
<thead>
<tr>
<th>Internship:</th>
<th>Project:</th>
<th>Professional Licensure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 681 Grad Internship in Geology</td>
<td>GEOL 680 Masters Project Research</td>
<td>Select two Geology (GEOL) or other approved courses at the 500 or 600 level **</td>
</tr>
</tbody>
</table>

Total Hours: 32

* Except GEOL 594, 680, 681, 694, 697.
** Except GEOL 594 and GEOL 694.

Doctor of Philosophy

The candidate for the Ph.D. must complete a program of courses outlined by the candidate’s doctoral research committee. A candidacy preliminary examination must be successfully completed within one year after enrollment. The proposal defense and oral examination must also be successfully completed. Participation in two GEOL 796 Graduate Seminars is required. No other formal course requirements exist; these are chosen by the student in conjunction with his or her research committee.

MAJOR REQUIREMENTS

<table>
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<tr>
<th>Colloquium:</th>
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<tr>
<td>GEOL 699 Graduate Colloquium (repeated)</td>
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<table>
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<tr>
<th>Seminar:</th>
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<tbody>
<tr>
<td>GEOL 796 Graduate Seminar (repeated)</td>
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Comprehensive Examination

Dissertation Proposal

Dissertation

Dissertation Defense

Total Hours: 4

Major Learning Outcomes

GEOLOGY

Students obtaining a masters in Geology with a Research Track will be able to:

- Communicate geologic concepts orally and in writing
- Apply research skills to analyze geologic questions
- Propose, produce and defend original research in their field of study
- Explain geologic principles as they relate to their area of research

Students obtaining a masters in Geology with a Professional Studies Track will be able to:

- Communicate geologic concepts orally and in writing
- Demonstrate knowledge in either energy geology or environmental geology
- Apply geological knowledge and methods to (1) find, develop and produce energy resources particularly natural gas, natural gas liquids and oil; OR, (2) to assess environmental issues

Students obtaining a doctorate in geology degree will be able to:

- Communicate geologic concepts orally and in writing
- Apply research skills to analyze geologic questions
- Propose, produce and defend original research of publishable quality
- Explain geologic principles as they relate to their area of research
- Effectively communicate the state of knowledge in their research area
- Identify research questions in geology
- Critique and assess peer-reviewed literature