APPLIED GEOSCIENCES, MSAG

This program provides both theoretical and technical expertise in geochemistry, geophysics, hydrogeology and engineering geology and includes essential project management skills, necessary for leadership in environmental remediation and pollution prevention. The program also facilitates preparation for professional licensure. This degree prepares students to take on a range of pressing environmental problems including approaches to mitigating soil and water contamination, solving waste disposal challenges and responding to human-induced natural disasters such as landslides and floods.

For more information: https://www.sas.upenn.edu/lps/graduate/msag/curriculum/https://www.sas.upenn.edu/lps/graduate/msag/curriculum/

Curriculum

The Master of Science in Applied Geosciences (MSAG) degree is structured to give students a well-rounded grounding in applied scientific knowledge, as well as project management and leadership skills necessary to effectively put that knowledge into action in the field. To that end, the curriculum is structured with a combination of foundation courses and concentration electives, which allow students to focus on topics best suited to their interests and goals.

The MSAG requires the completion of 12 course units (CU) as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Course Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DYNM 619</td>
<td>Organizational Project Management</td>
<td>1</td>
</tr>
<tr>
<td>GEOL 620</td>
<td>Applied and Environmental Geophysics</td>
<td>1.0</td>
</tr>
<tr>
<td>GEOL 653</td>
<td>Introduction to Hydrology</td>
<td>1</td>
</tr>
<tr>
<td>GEOL 699</td>
<td>Project Design</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Foundation Courses</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

Select five course units of foundation courses:

- Geochemistry Foundation Area
  - GEOL 418  Geochemistry
  - GEOL 421  Biogeochemistry
  - GEOL 528  Aqueous Geochemistry
  - GEOL 618  Fundamentals of Air Pollution

- Engineering Geology Foundation Area
  - GEOL 670  Engineering Geology: Rock Mechanics
  - GEOL 671  Engineering Geology: Surficial Materials & Processes
  - GEOL 680  Interpretation of Near-surface Geologic Structure for Engineering and Environment

- Ground Water Hydrology Foundation Area
  - GEOL 656  Fate and Transport of Pollutants
  - GEOL 661  Environmental Groundwater Hydrology

- Geocomputations Foundation Area
  - ENVS 541  Modeling Geographical Objects
  - ENVS 681  Modeling Geographical Space
  - GEOL 651  Geocomputations
  - GEOL 658  Environmental Statistical Analysis

Geomechanics Foundation Area
- GEOL 654  Geomechanics: Solids
- GEOL 668  Geomechanics: Fluids

Professional Concentration

Select three course units of electives in a professional concentration

Total Course Units

1 All students must complete one course from each of the five foundation areas.

Professional Concentration Courses (3 CU)

Students choose three elective courses within their area of professional concentration. These concentration courses allow students to acquire the skills and the critical perspective necessary to master an applied geosciences sub discipline, and will help prepare students to pursue the final Project Design.

Students choose from the following concentrations:

- Engineering Geology (https://www.sas.upenn.edu/lps/graduate/msag/curriculum/engineering-geology/)
- Hydrogeology (https://www.sas.upenn.edu/lps/graduate/msag/curriculum/hydrogeology/)
- Environmental Geology (https://www.sas.upenn.edu/lps/graduate/msag/curriculum/environmental-geology/)

Individualized Professional Concentration Option

Occasionally a student's interests do not fit within one of the three Master of Science in Applied Geosciences concentrations. In this case, they may develop an individualized concentration under the supervision of a faculty adviser. The proposed individualization must be approved by the Program Director and the Faculty Committee.

Project Design Seminar (1 CU)

The Project Design is the culmination of the Master of Science in Applied Geosciences program, blending academic and professional experiences and serving to emphasize the skills and knowledge developed in the program. Students design a project drawing from their learning in and outside the classroom to demonstrate mastery of their concentration area.

Certifications and Licensure

Coursework in the program provides the academic depth needed for licensure as a Professional Geologist (PG) in the Commonwealth of Pennsylvania. In addition, students who complete the degree may shorten their “professional geological work” requirement from five years to four.

The program subsidizes and streamlines certification programs like OSHA's Hazardous Waste Operations and Emergency Response Standard (HAZWOPER).

Field Opportunities

Experiences in the field, such as class trips and site visits, are critical components of the curriculum. Students will have the opportunity to participate in research projects being conducted by members of the Department of Earth & Environmental Science. These projects will provide experience working with geoscience professionals in the field, and will
involve training in the use of relevant instrumentation, as well as data collection and analysis techniques.

**Time Frame**

Master of Science in Applied Geosciences students may enroll on either a part-time or a full-time basis. Time to graduation will vary depending on how many classes are taken each semester and whether summer classes are taken. Full-time students can complete the program in two years, taking three or four classes per semester. Part-time students typically complete their work in three years, taking one or two classes per semester. Individuals working full time are advised to take no more than two courses per term.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2020 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.