

GEOPHYSICS

College of Natural Science and Mathematics
Department of Geosciences
907-474-7565
www.uaf.edu/geology/

M.S., Ph.D. Degrees

Minimum Requirements for Degrees: M.S.: 30 credits;
Ph.D.: 18 thesis credits

The geophysics program at UAF is closely connected with the Geophysical Institute and is optimally positioned to investigate a wide array of geophysical phenomena. Students have the option to obtain a general geophysics degree or to choose of the of three concentrations to focus their studies.

Upon graduation, a student is expected to be able to:

1. address geophysical problems using the principles of conservation of energy, mass and momentum using both physical and mathematical concepts, particularly with respect to mathematical techniques such as linear algebra, vector calculus and partial differential equations;
2. explain physical processes underlying the Earth's global scale features, including plate tectonics and the gravitational and magnetic fields;
3. describe common geophysical problems and assess the advantages and disadvantages of various theoretical, modeling or observational approaches to solving them, including identifying key assumptions underlying each approach;
4. frame well-defined scientific research questions and apply modern computational methods and observational techniques necessary to conduct the research;
5. publish and present results in peer-reviewed articles, scientific reports, and at national and international scientific meetings using oral and written skills developed through regular faculty feedback.

M.S. Degree

Concentrations: Solid-Earth Geophysics; Snow, Ice and Permafrost Geophysics; Remote Sensing Geophysics

1. Complete the following admission requirements:
 - a. Submit GRE scores.
 - b. Complete a background at least to the level of a B.S. concentration in geology, geophysics or an appropriate physical science or engineering.
 - c. Complete MATH F302 (Differential Equations)
 - d. Recommended: MATH F314 (Linear Algebra), MATH F421 (Applied Analysis), PHYS F220 (Introduction to Computational Physics)
2. Complete the general university requirements (page 232).
3. Complete the master's degree requirements (page 232).
 - a. Complete 6-12 thesis credits.
 - b. Complete any deficiencies concurrently with this degree.
4. Submit a written thesis proposal and pass an oral comprehensive examination centered on this proposal.
5. Complete and submit a written thesis and pass an oral defense of thesis.
6. Complete the following geophysics core requirements:

GEOS F631—Foundations of Geophysics	4
GEOS F682—Geoscience Seminar (fall semester).....	1

7. Complete 6 credits from relevant graduate-level courses agreed by the advisory committee, or choose one of the following concentrations:

Solid-Earth Geophysics

Complete 6 credits from the following:

GEOS F604—Seismology	3
GEOS F605—Geochronology.....	3
GEOS F626—Applied Seismology	4
GEOS F613—Global Tectonics.....	3
GEOS F655—Tectonic Geodesy	3
GEOS F671—Volcano Seismology	3

Snow, Ice and Permafrost Geophysics

Complete 6 credits from the following:

GEOS F614—Ice Physics.....	3
GEOS F615—Sea Ice.....	3
GEOS F616—Permafrost.....	3
GEOS F617—Glaciers.....	3

Remote Sensing

Complete 6 credits from the following:

GEOS F654—Visible and Infrared Remote Sensing.....	3
GEOS F657—Microwave Remote Sensing	3
GEOS F622—Digital Image Processing in the Geosciences	3
GEOS F676—Remote Sensing of Volcanic Eruptions.....	3
GEOS F639—InSAR and its Applications	3
ATM F613—Atmospheric Radiation.....	3

8. Complete 7 credits of courses approved by the advisory committee
9. The minimum credits required is 30. The required M.S. course work above represents 18 credits. The minimum number of thesis credits (GEOS F699) required is 6. The remaining 6 credits can either be thesis credits or credits from courses that are F400-level or higher.

Ph.D. Degree

1. Complete the following admission requirement:
 - a. Submit GRE scores.
2. Complete a master's degree in geology, geophysics or an appropriate field of physical science or engineering.
3. Complete the general university requirements (page 232).
4. Complete the M.S. requirements 6 and 7 above (11 credits).
5. Complete 3 credits each in two of the following advanced skills categories (total 6 credits):
 - a. Digital signal analysis and remote sensing

GEOS F654—Visible and Infrared Remote Sensing.....	3
GEOS F657—Microwave Remote Sensing	3
GEOS F622—Digital Image Processing in the Geosciences	3
PHYS F628—Digital Time Series Analysis.....	3
 - b. Statistics and parameter estimation

GEOS F627—Inverse Problems and Parameter Estimation.....	3
STAT F401—Regression and Analysis of Variance.....	3
STAT F461—Applied Multivariate Statistics.....	3
ATM F610—Analysis Methods in Meteorology and Climate.....	3
 - c. Mathematical methods

MATH F421—Applied Analysis.....	4
MATH F614—Numerical Linear Algebra	3
MATH F615—Numerical Analysis of Differential Equations.....	3
MATH F661—Optimization	3
ME F601—Finite Element Analysis in Engineering.....	3
 - d. One graduate-level advanced skills course approved by the student's advisory committee
6. Complete the Ph.D. degree requirements (page 232).

7. As part of the Ph.D. degree requirements, complete the following:
 - a. Complete and pass a written and oral comprehensive examination.
 - b. Complete and submit a written thesis proposal for approval.
 - c. Complete a research program as arranged with the graduate advisory committee.
 - d. Complete 18 credits of thesis, write a thesis and pass an oral defense of thesis.
8. The minimum credits required is 35. This includes 18 thesis credits and 17 credits from course work (11 from M.S., 6 from Ph.D.).

Admission to Ph.D. geophysics program directly from a bachelor's program:

Entering graduate students whose highest earned degree is the baccalaureate are normally admitted as Master of Science candidates. However, exceptionally able and accomplished students in this category are eligible for direct admission to the Ph.D. program. For direct admission from the baccalaureate to the Ph.D. program, a student must receive approval from the graduate admission committee and also meet one of three criteria:

- a. At least one first-authored manuscript published, accepted or submitted for publication in a peer-reviewed scientific journal
- b. Receipt of an NSF, NIH or similar prestigious pre-doctoral fellowship.
- c. Demonstrated research proficiency AND either (1) attained a GPA of at least 3.5 in mathematics and science courses at the undergraduate level, or (2) scored at or above the 80th percentile in two of three categories in the GRE. The requirement of demonstrated research proficiency can be waived for exceptionally promising students. In this case the student is required to complete a research or review paper focusing on a thesis-related topic approved by the graduate advising committee. The paper should be roughly 4,000-5,000 words and must be submitted and approved by the advising committee within the first three semesters to maintain Ph.D. status. Failure will result in changing the student's status to M.S. candidate.

After admission, M.S. candidates may, in exceptional cases, petition for conversion to the Ph.D. program if they satisfy one of the above criteria. Such petitions must be approved both by the student's current (M.S.) and proposed (Ph.D.) advisory committee and the department director or designee.