

# GEOLOGICAL ENGINEERING

College of Engineering and Mines  
 Department of Mining and Geological Engineering  
 907-474-7388  
<http://cem.uaf.edu/mingeo/>

## BS Degree

Minimum Requirements for Degree: 133 credits

The mission of the geological engineering program is to advance and disseminate knowledge related to mineral and energy exploration, evaluation, development and production; engineering site selection, construction and construction material production; and groundwater and geo-environmental engineering including geologic hazards assessment, through creative teaching, research and public service with an emphasis on Alaska, the North and its diverse peoples.

Geological engineering deals with the application of geology in the environment. Properties of earth materials exploration activities, geophysical and geochemical prospecting, site investigations and engineering geology are all phases of geological engineering.

The program prepares students for employment with industry, consulting companies and government agencies.

The educational objectives of the geological engineering program are to produce:

1. Graduates who are employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.
2. Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.
3. Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

For more information about the geological engineering program mission, goals and educational objectives, visit <http://cem.uaf.edu/mingeo/abet/>.

## Major — BS Degree

1. Complete the general university requirements (page 129). As part of the core curriculum requirements, complete: MATH F200X\*, CHEM F105X\* and CHEM F106X\*.
2. Complete the BS degree requirements (page 134). As part of the BS degree requirements, complete: MATH F201X\*, PHYS F211X\* and PHYS F212X\*.
3. Complete the following program (major) requirements:
 

ES F201—Computer Techniques.....	3
ES F208—Mechanics.....	4
ES F331—Mechanics of Materials.....	3
ES F341—Fluid Mechanics.....	4
GE F101—Introduction to Geological Engineering.....	1

GE F261—General Geology for Engineers .....	3
GE F365—Geological Materials Engineering.....	3
GE F371—Remote Sensing for Engineering.....	3
GE F375—Principles of Engineering Geology and Terrain Analysis.....	3
GE F381W—Field Methods and Applied Design I .....	2
GE F382W—Field Methods and Applied Design II .....	4
GE F405—Exploration Geophysics .....	3
GE F420—Subsurface Hydrology .....	3
GE F480W—Senior Design .....	3
GEOS F213—Mineralogy.....	4
GEOS F214—Petrology and Petrography .....	4
GEOS F322—Stratigraphy and Sedimentation.....	4
GEOS F332—Ore Deposits and Structure.....	3
MATH F202X—Calculus III .....	4
MATH F302—Differential Equations .....	3
MIN F202—Mine Surveying .....	3
MIN F225—Quantitative Methods in Mining Engineering.....	2
MIN F370—Rock Mechanics.....	3
MIN F408O—Mineral Valuation and Economics .....	3
Technical electives** .....	6

### Highly recommended technical electives:

CE F341—Environmental Engineering.....	4
CE F344—Water Resources Engineering.....	3
CE F422—Foundation Engineering .....	3
CE F424—Introduction to Permafrost Engineering.....	3
CE F442—Environmental Engineering Design.....	3
CE F603—Arctic Engineering.....	3
ESM F422—Engineering Design.....	3
GE F322—Erosion Mechanics and Conservation.....	3
GE F376—GIS Applications in Geological and Environmental Engineering .....	3
GE F384—Engineering Geology of Alaska.....	4
GE F400—Geological Engineering Internship.....	1-3
GE F422—Soil Physics.....	3
GE F430—Geomechanical Instrumentation.....	3
GE F435—Exploration Design .....	3
GE F440—Slope Stability .....	3
GE F441—Geohazard Analysis .....	3
GE F445—Design of Earth Dams and Embankments.....	3
MIN F443—Principles and Applications of Industrial Explosives...3	
MIN F482—Computer-Aided Mine Design — VULCAN.....	3
NRM F435—GIS Analysis .....	4
PETE F302—Well Logging.....	3
PETE F407—Petroleum Production Engineering.....	3
PETE F426—Drilling Engineering .....	3

4. Minimum credits required ..... 133

\* Students must earn a C- grade or better in each of these courses.

\*\* Technical elective credits must contain engineering design and be selected by the student from the list of approved technical electives from the geological engineering program in conference with his or her advisor and approved by the department.

Note: Candidates for the BS degree in geological engineering are required to take the State of Alaska Fundamentals of Engineering examination, which is a first step toward registration as professional engineers.



# Baccalaureate Core Requirements

## Communication . . . . . 9 Credits

- ENGL F111X—Introduction to Academic Writing.....(3)  
*ENGL F190H may be substituted.*

Complete one of the following:

- ENGL F211X—Academic Writing about Literature.....(3)
- ENGL F213X—Academic Writing about the Social and Natural Sciences.....(3)

Complete one of the following:

- COMM F131X—Fundamentals of Oral Communication: Group Context.....(3)
- COMM F141X—Fundamentals of Oral Communication: Public Context.....(3)

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## Perspectives on the Human Condition . . . . . 18 Credits

Complete all of the following four courses:

- ANTH F100X/SOC F100X—Individual, Society and Culture.....(3)
- ECON F100X or PS F100X—Political Economy.....(3)
- HIST F100X—Modern World History.....(3)
- ENGL/FL F200X—World Literature.....(3)

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Complete one of the following three courses:

- ART/MUS/THR F200X—Aesthetic Appreciation: Interrelationship of Art, Drama and Music.....(3)
- HUM F201X—Unity in the Arts.....(3)
- ANS F202X—Aesthetic Appreciation of Alaska Native Performance.....(3)

**3**

Complete one of the following six courses:

- BA F323X—Business Ethics.....(3)
- COMM F300X—Communicating Ethics.....(3)
- JUST F300X—Ethics and Justice.....(3)
- NRM F303X—Environmental Ethics and Actions.....(3)
- PS F300X—Ethics and Society.....(3)
- PHIL F322X—Ethics.....(3)

**3**

Or complete 12 credits from the above courses plus one of the following:

- Two semester-length courses in a single Alaska Native language or other non-English language
- Three semester-length courses (9 credits) in American Sign Language taken at the university level.

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## Mathematics . . . . . 3 Credits

Complete one of the following:

- MATH F103X—Concepts and Contemporary Applications of Mathematics.....(3)
  - MATH F107X—Functions for Calculus\*.....(4)
  - MATH F161X—Algebra for Business and Economics\*\*.....(3)
  - STAT F200X—Elementary Probability and Statistics.....(3)
- \* No credit may be earned for more than one of MATH F107X or F161X.

Or complete one of the following\*:

- MATH F200X—Calculus I\*\*.....(4)
- MATH F201X—Calculus II.....(4)
- MATH F202X—Calculus III.....(4)
- MATH F262X—Calculus for Business and Economics.....(4)
- MATH F272X—Calculus for Life Sciences.....(4)

\* Or any math course having one of these as a prerequisite

\*\* No credit may be earned for more than one of Math F200X, F262X or F272.

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## Natural Sciences . . . . . 8 Credits

Complete any two (4-credit) courses.

- ATM F101X—Weather and Climate of Alaska.....(4)
- BIOL F100X—Human Biology.....(4)
- BIOL F101X—Biology of Sex.....(4)
- BIOL F103X—Biology and Society.....(4)
- BIOL F104X—Natural History.....(4)
- BIOL F115X—Fundamentals of Biology I.....(4)
- BIOL F116X—Fundamentals of Biology II.....(4)
- BIOL F120X—Introduction to Human Nutrition.....(4)
- BIOL F213X—Human Anatomy and Physiology I.....(4)
- BIOL F214X—Human Anatomy and Physiology II.....(4)
- CHEM F100X—Chemistry in Complex Systems.....(4)
- CHEM F103X—Basic General Chemistry.....(4)
- CHEM F104X—Beginnings in Biochemistry.....(4)
- CHEM F105X—General Chemistry.....(4)
- CHEM F106X—General Chemistry.....(4)
- GEOG F111X—Earth and Environment: Elements of Physical Geography.....(4)
- GEOS F100X—Introduction to Earth Science.....(4)
- GEOS F101X—The Dynamic Earth.....(4)
- GEOS F106X—Life and the Age of Dinosaurs.....(4)
- GEOS F112X—History of Earth and Life.....(4)
- GEOS F120X—Glaciers, Earthquakes and Volcanoes.....(4)
- GEOS F125X—Humans, Earth and Environment.....(4)
- MSL F111X—The Oceans.....(4)
- PHYS F102X—Energy and Society.....(4)
- PHYS F103X—College Physics.....(4)
- PHYS F104X—College Physics.....(4)
- PHYS F115X—Physical Science I.....(4)
- PHYS F175X—Astronomy.....(4)
- PHYS F211X—General Physics.....(4)
- PHYS F212X—General Physics.....(4)
- PHYS F213X—Elementary Modern Physics.....(4)

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## Library and Information Research . . . . . 0–1 Credit

- Successful completion of library skills competency test or LS F100X or LS F101X prior to junior standing

**0–1**

## Upper-Division Writing and Oral Communication

Complete the following at the upper-division level:

- Two writing intensive courses designated (W) and one oral communication intensive course designated (O), or two oral communication intensive courses designated (O/2) (see degree and/or major requirements)

**Total credits required 38–39**

All degrees (e.g. B.A., B.S., etc.) require additional courses.

Refer to specific degree and program requirements.

Students must earn a C- grade or better in each course used toward the baccalaureate core.

