GE F101  Introduction to Geological Engineering  
1 Credit  
Offered Fall  
Multiple aspects of geological engineering as a profession; the area and scope of the field.  
Lecture + Lab + Other: 1 + 0 + 0  

GE F261  General Geology for Engineers  
3 Credits  
Offered Spring  
Study of common rocks and minerals, landforms and erosion. Geologic materials and engineering application of geology.  
Prerequisites: MATH F151X; MATH F152X; Geology, science or engineering majors.  
Lecture + Lab + Other: 2 + 3 + 0  

GE F322  Erosion Mechanics and Conservation  
3 Credits  
Offered Spring or As Demand Warrants  
Engineering mechanics of water and wind erosion processes, types of geologic or anthropogenic induced erosion, application of engineering principles for design, management and control of erosion and engineering analysis of conservation structures.  
Prerequisites: ES F341.  
Lecture + Lab + Other: 3 + 0 + 0  

GE F365  Geological Materials Engineering  
3 Credits  
Offered Fall  
Identification and classification of soils, physical and mechanical properties of soil, interaction of soils with subsurface water, subsurface exploration and case studies with an emphasis on permafrost.  
Prerequisites: ES F208; GE F261.  
Lecture + Lab + Other: 2 + 3 + 0  

GE F371  Remote Sensing for Engineering  
3 Credits  
Offered Spring  
Applications of remote sensing to geological engineering problems. Introduction to digital satellite image processing with hands-on practice.  
Prerequisites: PHYS F212X.  
Lecture + Lab + Other: 2 + 3 + 0  

GE F376  GIS Applications in Geological and Environmental Engineering  
3 Credits  
Offered As Demand Warrants  
Fundamentals, concepts and components of geographic information systems (GIS) in engineering design. Introduction to acquiring, manipulating and analyzing digital terrain data for geological engineering and environmental applications, and the assessment of mineral resources. NRM F338 Recommended.  
Prerequisites: GE F261; GE F375.  
Lecture + Lab + Other: 2 + 3 + 0  

GE F371  Field Methods and Applied Design I  (W)  
2 Credits  
Offered Summer  
Techniques and geologic mapping and geotechnical instrumentation applied to engineering design and resource evaluation.  
Prerequisites: WRTG F111X; WRTG F211X; WRTG F212X; WRTG F213X or WRTG F214X; GE F261; GEOS F213; GEOS F214; GEOS F320; GEOS F314.  
Lecture + Lab + Other: 0 + 9 + 3  

GE F382  Field Methods and Applied Design II  (W)  
4 Credits  
Offered Summer  
Techniques and geologic mapping and geotechnical instrumentation applied to engineering design and resource evaluation.  
Prerequisites: WRTG F111X; WRTG F211X; WRTG F212X; WRTG F213X or WRTG F214X; GE F261; GEOS F213; GEOS F214; GEOS F320; GEOS F314.  
Lecture + Lab + Other: 0 + 9 + 0  

GE F384  Engineering Geology of Alaska  (a)  
4 Credits  
Offered Summer or As Demand Warrants  
A survey of the geology of Alaska relevant to the definition of natural and human-induced geological engineering hazards, the evaluation of sources of and specifications for engineering materials, and the evaluation of engineering construction sites.  
Prerequisites: Upper-division standing.  
Lecture + Lab + Other: 3 + 1 + 2  

GE F400  Geological Engineering Internship  
1-3 Credits  
Offered As Demand Warrants  
Supervised work experience in engineering organizations. Assignments will be individually arranged with cooperating organizations from the private and public sectors. A report of activities must be completed and reviewed by the sponsoring organization. The report may be held in confidence at the request of the sponsoring organization.  
Prerequisites: Upper-division standing.  
Lecture + Lab + Other: 1-3 + 0 + 0  

GE F405  Exploration Geophysics  
3 Credits  
Offered Fall  
Theory and application of gravity, magnetic, electrical, electromagnetic, radioactive and seismic methods as used for geophysical exploration. Some field work.  
Prerequisites: GE F375; MATH F251X; PHYS F211X.  
Lecture + Lab + Other: 2 + 3 + 0
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>GE F420</td>
<td>Subsurface Hydrology</td>
<td>3</td>
<td>Fall</td>
<td>Hydrologic, geologic and other factors controlling groundwater flow, occurrence, development, chemistry and contamination. Elementary groundwater flow theory. Interactions between surface-subsurface hydrologic systems. Hydraulic characteristics of earth materials, engineering problems and models related to subsurface fluids, and properties of water.</td>
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<tr>
<td>GE F422</td>
<td>Soil Physics</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>Fundamentals of soil physics, including soil texture, structure, size distribution, and water retention characteristics; flow of water through saturated and unsaturated soil; soil temperature and heat flow; infiltration, runoff, and evaporation. Processes relevant to active layer dynamics and permafrost are given due consideration.</td>
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<tr>
<td>GE F430</td>
<td>Geomechanical Instrumentation</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>Measurement of groundwater pressure, ground deformation, stress and temperature as well as the planning of monitoring programs, instrument calibration, maintenance and installation, data collection, interpretation, and reporting. Case histories are used.</td>
</tr>
<tr>
<td>GE F435</td>
<td>Exploration Design</td>
<td>3</td>
<td>Spring</td>
<td>Geologic, engineering and economic considerations applied to the design and development of mineral exploration programs.</td>
</tr>
<tr>
<td>GE F440</td>
<td>Slope Stability</td>
<td>3</td>
<td>Fall</td>
<td>Slope design for open pit mining and other excavations. Stability analysis by various methods and on-site measuring and monitoring techniques.</td>
</tr>
<tr>
<td>GE F441</td>
<td>Geohazard Analysis</td>
<td>3</td>
<td>Fall</td>
<td>Procedures and techniques to evaluate geological factors for geohazards, such as landslides, earthquakes, volcanoes, flooding, coastal hazards and permafrost-related problems.</td>
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<tr>
<td>GE F445</td>
<td>Design of Earth Dams and Embankments</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>Preliminary planning for design and construction of dams, site selection, reservoir assessment, foundation and other building materials, procedure for design of earth dams, design of abutment and spillway, estimation of volume of earthworks and storage capacities, site preparation for construction, excavation, slope stability issues and other geological engineering assessments.</td>
</tr>
<tr>
<td>GE F480</td>
<td>Senior Design (W)</td>
<td>3</td>
<td>Fall Odd-numbered Years or As Demand Warrants</td>
<td>Design factors and procedures for the solution of geological engineering problems. A design project is the focus of the course.</td>
</tr>
<tr>
<td>GE F610</td>
<td>Subsurface Hydrology</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>Hydrologic, geologic and other factors controlling groundwater flow, occurrence, development, chemistry and contamination. Elementary groundwater flow theory. Interactions between surface-subsurface hydrologic systems. Hydraulic characteristics of earth materials, engineering problems and models related to subsurface fluids, and properties of water.</td>
</tr>
<tr>
<td>GE F620</td>
<td>Advanced Groundwater Hydrology</td>
<td>3</td>
<td>Fall Odd-numbered Years or As Demand Warrants</td>
<td>Study of groundwater hydrology with emphasis on solute and contaminant transport, chemical reaction and ion exchange, advection and diffusion and computer modeling.</td>
</tr>
<tr>
<td>GE F622</td>
<td>Advanced Soil Physics (a)</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>Fundamentals of soil physical processes, multiphase flow and transport in unsaturated porous media such as soils. Application of principles of unsaturated flow to geoenvironmental and geotechnical systems. Methods for characterization of hydraulic properties in relation to soil physical parameters in the context of geoengineering problems of flow and stability. Non-isothermal flow in unsaturated soils and its impact on subsurface environment. Biogeochemical processes affecting soil and groundwater contamination. Unsaturated flow and transport modeling including heat transfer relevant to active layer dynamics and permafrost underlain soils in Alaska and other similar cold regions.</td>
</tr>
</tbody>
</table>
GE F624  Stochastic Hydrology and Geohydrology
3 Credits
Offered As Demand Warrants
Overview of the stochastic methods used to study and analyze hydrologic
and geohydrologic processes. Emphasis on modeling hydrologic processes
using statistical methods and stochastic interplay of processes between
surface and subsurface hydrology.
Prerequisites: GE F620 and graduate standing in Engineering.
Lecture + Lab + Other: 3 + 0 + 0

GE F626  Thermal Geotechnics
3 Credits
Offered As Demand Warrants
Fundamentals of thermal regimes of soils and rocks. Thermal
impact of structures on soils. Thawing of permafrost beneath roads,
buildings and around pipelines. Natural and artificial freezing of soils.
Engineering means to maintain thermal regime of soils. Thermal design
considerations.
Prerequisites: CE F326; CE F422.
Cross-listed with CE F626.
Lecture + Lab + Other: 3 + 0 + 0

GE F635  Advanced Geostatistical Applications
3 Credits
Offered Spring
Introduction to the theory and application of geostatistics. Review of
classical statistics, continuous and discrete distributions, hypothesis
testing and global estimation. Presentation of fundamental geostatistical
concepts including: variogram, estimation variance, block variance,
kriging, geostatistical simulation. Emphasis on the practical application
of geostatistical techniques.
Prerequisites: MIN F408; graduate standing.
Cross-listed with MIN F635.
Lecture + Lab + Other: 2 + 3 + 0

GE F665  Advanced Geological Materials Engineering
3 Credits
Offered As Demand Warrants
In-depth study of geological materials (aggregates--sand, gravel and
crushed rock for construction purposes) exploration, evaluation, testing
and production. Emphasis placed on geological materials used for
construction in Arctic and sub-Arctic environments, economic analysis of
pit and quarry operations and availability of materials in Alaska.
Prerequisites: GE F365.
Recommended: MIN F408.
Lecture + Lab + Other: 3 + 0 + 0

GE F666  Advanced Engineering Geology
3 Credits
Offered Fall Odd-numbered Years
The interaction between geology and engineering case histories.
Prerequisites: GE F365; graduate standing.
Lecture + Lab + Other: 2 + 3 + 0

GE F668  Tunneling Geotechniques
3 Credits
Offered Fall Even-numbered Years
Tunnel design, case histories, student report.
Prerequisites: Graduate standing.
Lecture + Lab + Other: 3 + 0 + 0

GE F692  Graduate Seminar
1 Credit
Topics in geological engineering explored through talks, group
discussions and guest speakers with a high level of student participation.
Prerequisites: Graduate standing.
Lecture + Lab + Other: 1 + 0 + 0

GE F692P Graduate Seminar
1 Credit
Topics in geological engineering explored through talks, group
discussions and guest speakers with a high level of student participation.
Prerequisites: Graduate standing.
Lecture + Lab + Other: 1 + 0 + 0

GE F698  Non-thesis Research/Project
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0

GE F699  Thesis
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0