GEOLOGICAL ENGINEERING (GE)

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 F375  Principles of Engineering Geology and Terrain Analysis
3 Credits
Offered Fall
Evaluation of terrain characteristics using basic geomorphic and engineering principles. Alaskan applications are provided due consideration.
Prerequisites: GE F261.
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 F381  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
GE F420  Subsurface Hydrology
3 Credits
Offered Fall
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.
Prerequisites: GE F365; MATH F302; ES F341.
Stacked with GE F421.
Lecture + Lab + Other: 2 + 3 + 0

GE F445  Design of Earth Dams and Embankments
3 Credits
Offered As Demand Warrants
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.
Prerequisites: senior standing.
Lecture + Lab + Other: 3 + 0 + 0

GE F610  Subsurface Hydrology
3 Credits
Offered Fall
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.
Prerequisites: Graduate standing in Engineering.
Lecture + Lab + Other: 2 + 3 + 0

GE F620  Advanced Groundwater Hydrology
3 Credits
Offered Fall
Odd-numbered Years or As Demand Warrants
Study of groundwater hydrology with emphasis on solute and contaminant transport, chemical reaction and ion exchange, advection and diffusion and computer modeling.
Prerequisites: GE F610; graduate standing.
Lecture + Lab + Other: 2 + 3 + 0

GE F422  Soil Physics  (a)
3 Credits
Offered As Demand Warrants
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 permafrosts are given due consideration.
Prerequisites: CHEM F105X, CHEM F106X.
Lecture + Lab + Other: 2 + 3 + 0

GE F622  Advanced Soil Physics  (a)
3 Credits
Offered As Demand Warrants
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.
Prerequisites: GE F610 and Graduate standing in Engineering.
Lecture + Lab + Other: 3 + 0 + 0
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered</th>
<th>Prerequisites</th>
<th>Lecture + Lab + Other</th>
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<td>GE F624</td>
<td>Stochastic Hydrology and Geohydrology</td>
<td>3</td>
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<td>Thermal Geotechnics</td>
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<td>CE F326; CE F422.</td>
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<td>GE F635</td>
<td>Advanced Geostatistical Applications</td>
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<td>MIN F408; graduate standing.</td>
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<td>Advanced Geological Materials Engineering</td>
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<td>GE F365.</td>
<td>2 + 3 + 0</td>
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<td>GE F666</td>
<td>Advanced Engineering Geology</td>
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<td>GE F668</td>
<td>Tunneling Geotechniques</td>
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<td>Topics in geological engineering explored through</td>
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<td>GE F692P</td>
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<td>Non-thesis Research/Project</td>
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