GEOLOGICAL ENGINEERING (GE)

College of Engineering and Mines
Department of Civil, Geological, and Environmental Engineering (http://cem.uaf.edu/cee.aspx)
907-474-7241

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
Grading System: Pass/Fail Grades

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
Grading System: Letter Grades with option of Plus/Minus

GE F322 Erosion Mechanics and Conservation
3 Credits
Offered 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
Grading System: Letter Grades with option of Plus/Minus

GE F326 Introduction to Geotechnical Engineering and Foundations
4 Credits
Offered Fall
Identification and classification of soils; physical and mechanical properties of soil; subsurface exploration; movement of water through soil; soil deformation. Bearing capacity of shallow foundations and piles, and stability of retaining walls. Laboratory testing techniques, and introduction to soil issues related to cold regions.
Prerequisites: ES F331 (may be taken concurrently); GE F261.
Crosslisted with CE F326.
Lecture + Lab + Other: 3 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

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
Grading System: Letter Grades with option of Plus/Minus

GE F375 Terrain Analysis and GIS
3 Credits
Offered Spring
Evaluation of terrain characteristics and their geomorphic processes, using GIS techniques in combination with remotely sensed data for engineering and environmental applications. Alaska applications are considered.
Prerequisites: GE F261.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F376 GIS Applications in Geological and Environmental Engineering
3 Credits
Offered Spring Odd-numbered Years
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
Grading System: Letter Grades with option of Plus/Minus

GE F381 Field Methods and Applied Design I
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 F322; GEOS F314.
Lecture + Lab + Other: 1 + 0 + 40
Grading System: Letter Grades with option of Plus/Minus

GE F382 Field Methods and Applied Design II
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 F322; GEOS F314.
Lecture + Lab + Other: 1 + 0 + 40
Grading System: Letter Grades with option of Plus/Minus

GE F400 Geological Engineering Internship
1-3 Credits
Offered Summer
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
Grading System: Pass/Fail Grades
Repeatable for Credit: May be taken 2 times for up to 6 credits

GE F405 Engineering and Environmental Geophysics
3 Credits
Offered Fall
Theory and application of seismic, electrical, gravity, magnetic, and electromagnetic methods for delineating near-surface features and structures as applied to engineering, environmental, and resource exploration problems. Overview of instrumentation, and the data acquisition, analysis, and interpretation process through hands-on practice.
Prerequisites: GE F375; PHYS F212X.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F420 Groundwater Engineering
3 Credits
Offered Fall
Fundamentals of groundwater occurrence, hydrology, resource development, water quality, monitoring and remediation. Field methods and modeling.
Prerequisites: CE F326, GE F326; ES F341.
Cross-listed with CE F420.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F430 Geomechanical Instrumentation
3 Credits
Offered As Demand Warrants
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.
Prerequisites: ES F331; GE F261 or GEOS F101X.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F440 Slope Stability
3 Credits
Offered Fall Odd-numbered Years
Slope design for open pit mining and other excavations. Stability analysis by various methods and on-site measuring and monitoring techniques.
Prerequisites: ES F331.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F441 Geohazard Analysis
3 Credits
Offered Fall Even-numbered Years
Procedures and techniques to evaluate geological factors for geohazards, such as landslides, earthquakes, volcanoes, flooding, coastal hazards and permafrost-related problems.
Prerequisites: GE F326.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F445 Design of Earth Dams and Embankments
3 Credits
Offered Fall Odd-numbered Years
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
Grading System: Letter Grades with option of Plus/Minus

GE F480 Senior Design
3 Credits
Offered Spring
Design factors and procedures for the solution of geological engineering problems. A design project is the focus of the course.
Prerequisites: Senior standing in the geological engineering program with completion of GE F381; GE F382; GE F405; GE F420.
Lecture + Lab + Other: 1 + 6 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F620 Advanced Groundwater Hydrology
3 Credits
Offered 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
Grading System: Letter Grades with option of Plus/Minus

GE F622 Advanced Soil Physics
3 Credits
Offered As Demand Warrants
Fundamentals of soil physical processes, multiphase flow, heat transfer and transport in unsaturated porous media such as soils. Application of principles of unsaturated flow to geo-environmental and geotechnical problems. Characterization of hydraulic properties in relation to soil physical parameters in the context of geoengineering problems of flow, transport and stability.
Prerequisites: GE F610 and Graduate standing in Engineering.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F624 Stochastic Hydrology and Geohydrology
3 Credits
Offered As Demand Warrants
Overview of the stochastic methods used to study and analyze hydrolic and geohydrolic processes. Emphasis on modeling hydrolic 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
Grading System: Letter Grades with option of Plus/Minus
Repeatable for Credit: May be taken 1 time for up to 3 credits

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
Grading System: Letter Grades with option of Plus/Minus

GE F635 Advanced Geostatistical Applications
3 Credits
Offered As Demand Warrants
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
Grading System: Letter Grades with option of Plus/Minus

GE F663 Groundwater Hydrology
3 Credits
Offered Fall Even-numbered Years
Fundamentals of groundwater aquifer formations, groundwater flow, resource development, management and protection.
Cross-listed with CE F663.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

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
Grading System: Letter Grades with option of Plus/Minus

GE F666 Advanced Engineering Geology
3 Credits
Offered As Demand Warrants
The interaction between geology and engineering case histories.
Prerequisites: GE F365; graduate standing.
Lecture + Lab + Other: 2 + 3 + 0
Grading System: Letter Grades with option of Plus/Minus

GE F668 Tunneling Geotechniques
3 Credits
Offered As Demand Warrants
Tunnel design, case histories, student report.
Prerequisites: Graduate standing.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

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
Grading System: Letter Grades with option of Plus/Minus
Repeatable for Credit: May be taken unlimited times for up to 99 credits

GE F692P Graduate Seminar
1 Credit
Offered As Demand Warrants
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
Grading System: Pass/Fail Grades
Repeatable for Credit: May be taken unlimited times for up to 99 credits

GE F698 Non-thesis Research/Project
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0
Grading System: Pass/Fail Grades
Repeatable for Credit: May be taken unlimited times for up to 99 credits

GE F699 Thesis
1-9 Credits
Lecture + Lab + Other: 0 + 0 + 0
Grading System: Pass/Fail Grades
Repeatable for Credit: May be taken unlimited times for up to 99 credits