MichiganTech

Graduate Course Descriptions Effective Fall 2007
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Geolog. & Mining Engrg & Sci.

GE 5001 - Intercultural Natural Hazards Communication in Latin America
Perception of risk and hazards in Latin American cultures. Available technology for mitigation and its practicality and perception. Working effectively with hazard agencies. How to measure mitigation effectiveness. Indigeous and European over prints in Latin American life.
Credits: 2.0
Lec-Rec-Lab: (0-2-0)
Semesters Offered: Fall
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

GE 5020 - Earth Systems Science I
Includes basic geologic content traditionally covered in university-level physical geology and historical geology. The courser contact is a stepping through geologic time from the present in to the past. The course will take a place-based approach, using the geologic record of Michigan.
Credits: 4.0
Lec-Rec-Lab: (0-4-0)
Semesters Offered: Fall
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5030 - Earth Systems Science II
Focuses on material traditionally covered in courses on astronomy, meteorology, and oceanography. This course will also address content from the field by focusing on the Earth's climate system.
Credits: 4.0
Lec-Rec-Lab: (0-4-0)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5040 - Evolution of Structures in Deformed Rock
How rocks deform on a microstructural to hand specimen scale. Topics include dislocations, work hardening and recovery processes, annealing and recrystallization, slipsystems, preferred orientation mechanisms, and foliation development, with independent project on selected topic.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5050 - Structural Analysis and Interpretation
Analysis of deformed rock structures from hand specimen to outcrop and map scales. Topics include mechanics of cleavage development and folding, shear zones and vorticity, strain measurement, style group analysis, overprinting relationships, mapping and hemispherical projection techniques.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5100 - Advanced Geomorphology and Glacial Geology
In-depth study of surficial processes that shape landforms and determine the composition and character of the Earth`s surface. Processes studied include glacial, flovial, wind, mass movement, and wave action. Emphasizes the role of past and present climate. In-depth report and presentation on two separate topics required.
Credits: 4.0
Lec-Rec-Lab: (3-0-3)
Semesters Offered: Fall - Offered alternate years beginning with the 2003-2004 academic year
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): GE 2000

GE 5110 - Sequence Stratigraphy
The study of sedimentary rocks interpreted as a series of packages separated by time-significant surfaces. Also examines the processes controlling generation of the time-significant surfaces (eustasy, tectonics, and sediment supply).
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5120 - Basin Analysis
The evolution of sedimentary basins is influenced by the tectonic mechanisms that initially form the basin, the sediments that are deposited in the basins (composition and environments), and post-depositional processes (thermal, hydrologic, chemical and tectonic) that modify the basin fill. Course examines sedimentary basins as a record of past events.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5130 - Geology of the National Parks: Field Experience
A two-week, field-based course taught in National Parks Course requires a project and special assignments. Lab fee costs dependent upon location.
Credits: 4.0
Lec-Rec-Lab: (0-4-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5140 - Paleoclimatology
This course will investigate the geologic evidence of global climate and the mechanisms that are interpreted to produce climate change.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand

GE 5150 - Advanced Natural Hazards
Exploration of how to develop comprehensive plans to mitigate the impact of natural hazards on humans. Requires a project and report.
Credits: 3.0
Lec-Rec-Lab: (2-0-3)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5180 - Volcanology
Volcanoes and how they work. Volcanic products, their recognition, and significance. Applies chemistry, physics, and fluid mechanics in a volcanological context.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5185 - Special Topics in Volcanology
A special offering class devoted to an advanced topic in volcanology of topical interest, such as Megaeruptions, Convergent Plate Boundary volcanism or Volcanic Landslides. The class will be built around lectures from 6 different universities, linked via videoconferencing.
Credits: 2.0; May be repeated
Lec-Rec-Lab: (1-1-0)
Semesters Offered: On Demand - Offered alternate years beginning with the 2005-2006 academic year
Restrictions: Must be enrolled in one of the following Major(s): Geological Engineering, Geology, Geophysics; May not be enrolled in one of the following Class(es): Freshman, Sophomore

GE 5187 - Volcanological Field Seminar
Field Seminars of 1-3 weeks to volcanological sites of interest. These are offered in association and following GE5185. The field seminars are complemented by the preceding semester's classes, which examine the broad context of the field events. The two classes may be taken together as 4 credits or separately.
Credits: 2.0; May be repeated
Lec-Rec-Lab: (0-0-6)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Major(s): Geological Engineering, Geology, Geophysics; May not be enrolled in one of the following Class(es): Freshman, Sophomore

GE 5250 - Advanced Computational Geosciences
Introduction to quantitative analysis and display of geologic data using Matlab and Excel, covering basic Matlab syntax and programming, and analysis of one-dimensional (e.g. time series) and two-dimensional datasets (e.g. spatial data). Techniques are applied to geological datasets.
Credits: 3.0
Lec-Rec-Lab: (2-0-1)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5270 - Volcanic Clouds
Synthesis of recent advancements in volcanic cloud research along with theoretical background and practical experience in the study, understanding and remote sensing of volcanic clouds. Techniques covered are also applicable to other atmospheric phenomena although volcanic ash, gas and aerosol remote sensing is the main focus.
Credits: 4.0; Repeatable to a Max of 8; Graded Pass/Fail Only
Lec-Rec-Lab: (2-0-6)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

GE 5400 - Global Geophysics and Geotectonics
Plate tectonics and the internal structure of the earth using information from seismology, geomagnetism gravity, and heat flow. A term project/report is required.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 3160 and PH 2200 and GE 2000

GE 5405 - Geophysics for Archaeology
Principles and practice of non-invasive archaeological geophysics (remote sensing) such as magnetometry, ground penetrating radar and resistivity. Data interpretation will involve basic computation, contouring, three-dimensional visualization programs, interpretation and archaeological significance. Activities include fieldwork, data analysis and presentation, and short reports. The mathematical content of the class will be minimal.
Credits: 3.0
Lec-Rec-Lab: (2-0-1)
Semesters Offered: Fall - Offered alternate years beginning with the 2003-2004 academic year

GE 5450 - Potential Field Theory in Gravity and Magnetic Applications
The fundamentals of potential theory and the application to gravity and magnetic studies of the crust and lithosphere. Topics include Newtonian & magnetic potential, magnetization, regional gravity fields, the geomagnetic field, forward & inverse modeling. Fourier-domain modeling and transformations.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): MA 3160 and PH 2200 and GE 3040

GE 5500 - Paleomagnetism and Environmental Magnetism
Origin and interpretation of the natural remanent magnetism in rocks and its use in deciphering the geologic past. Applications studied are plate tectonic movements, environmental change, stratigraphic correlation, and the earth's magnetic field.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): GE 2000

GE 5600 - Advanced Reflection Seismology
Principles and application of reflection seismic techniques. Includes acquisition, data processing, and 2D/3D data interpretation. Project and report required.
Credits: 3.0
Lec-Rec-Lab: (2-1-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5610 - Quantitative Reservoir Characterization
Develop and integrate several aspects of reservoir characterization using data from actual oil and gas fields. The various aspects include well logs, seismic data, production data, and geologic/outcrop inference. Geostatistical routines and integrated software suites.
Credits: 3.0
Lec-Rec-Lab: (1-2-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5650 - Special Topics in Petroleum Geology
The study of current topics in petroleum geology. Research papers and reports are required.
Credits: variable to 4.0; Repeatable to a Max of 8
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5760 - Advanced Engineering Evaluation of Mineral Deposits
Analysis and design of programs to explore and evaluate various types of mineral deposits. An integrated project includes factors such as geological characteristics, economics, regulations, and environmental impact. Requires an independent project on an approved topic.
Credits: 3.0
Lec-Rec-Lab: (2-0-3)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5770 - Mineral Deposit Exploration Models
Systematic study of the characteristics, distribution, and origin of economic metallic and nonmetallic mineral deposits, and the development of models for exploration with emphasis on selected deposits. Laboratory stresses the study of mining districts and development of exploration and genetic models.
Credits: 4.0
Lec-Rec-Lab: (3-0-3)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): GE 2300 and GE 2310

GE 5785 - Seismic Petrophysics
Seismic petrophysics describes the use of rock physics information and logging data in the interpretation of reflection seismic data. The theories and empirical models relating seismic properties to other properties of rocks will be reviewed, and the logging techniques responsible for identifying those properties discussed. Various approaches to the quantitative interpretation of seismic data are covered. For varying course credit, projects with real data will be conducted by students.
Credits: variable to 3.0
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5800 - Mathematical Modeling of Earth Systems
Introduction to numerical techniques for mathematical modeling of various earth-system phenomena, including groundwater flow, heat transfer, and atmospheric transport. Numerical techniques covered include finite-difference, finite-element, collocation, and characteristic methods. Students write their own mathematical models. Prerequisite: experience in programming computer languages such as FORTRAN.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5810 - Flow and Transport in Subsurface Systems
Analysis of fluid flow in geologic materials, including groundwater flow, solute and contaminant transport, heat flow, and petroleum movement. Develops fundamental transport equations and numerical methods for solving these equations.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5850 - Advanced Groundwater Engineering and Remediation
Computer modeling and other advanced topics in the analysis hydrological systems, contaminant transport and fate, and subsurface remediation systems.
Credits: 3.0
Lec-Rec-Lab: (0-2-3)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Class(es): Graduate

GE 5910 - Geology Seminar
Seminar course dealing with geology subjects of current interest.
Credits: 3.0; Repeatable to a Max of 9
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5920 - Geophysics Seminar
Seminar course dealing with geophysics subjects of current interest.
Credits: 3.0; Repeatable to a Max of 9
Lec-Rec-Lab: (3-0-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 5930 - Special Topics in Geological Engineering
Study and discussion of geological engineering topics.
Credits: variable to 9.0; Repeatable to a Max of 9
Semesters Offered: On Demand
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5940 - Special Topics in Geology
Study and discussion of geology topics.
Credits: variable to 9.0; Repeatable to a Max of 9
Semesters Offered: On Demand
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5941 - Special Topics in Mineralogy
The study of special topics in mineralogy using the Seaman Mineral Museum.
Credits: variable to 3.0; Repeatable to a Max of 6
Semesters Offered: On Demand
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5950 - Special Topics in Geophysics
Study and discussion of geophysics topics.
Credits: variable to 9.0; Repeatable to a Max of 9
Semesters Offered: On Demand
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5960 - Special Topics in Mining Engineering
Study and discussion of mining engineering topics.
Credits: variable to 9.0; Repeatable to a Max of 9
Semesters Offered: On Demand
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate

GE 5994 - International Geological Practicum
Geological field work outside of the U.S. used by Peace Corps Master International students during their field assignments. May be used repeatedly up to 12 credits.
Credits: 1.0; Repeatable to a Max of 12
Lec-Rec-Lab: (0-1-0)
Semesters Offered: Fall, Spring, Summer
Restrictions: Must be enrolled in one of the following Major(s): Geological Engineering, Geology, Geophysics

GE 5998 - International Geology Master's Research
An original investigation in theoretical or experimental natural geological hazard mitigation and submission of a thesis or report in partial fulfillment of the MS degree conducted while in the Peace Corps Program.
Credits: variable to 9.0
Semesters Offered: Fall, Spring, Summer
Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following College(s): College of Engineering

GE 5999 - Master's Graduate Research
Research of an acceptable geological engineering, mining engineering, geology, or geophysics problem and preparation of a thesis.
Credits: variable to 15.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer
Restrictions: Must be enrolled in one of the following Level(s): Graduate

GE 6999 - Doctoral Graduate Research
Original research of an acceptable geological engineering, mining engineering, geology, or geophysics problem and preparation of a PhD dissertation.
Credits: variable to 15.0; May be repeated; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer
Restrictions: Must be enrolled in one of the following Level(s): Graduate

For more information, contact
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