GEOLOGY (GEOL)

GEOL 118 Physical Geology 4 Credit Hours
An introduction to the study of geologic processes at work in the earth's interior and on its surface. Rocks and minerals, the origin and evolution of the continents, and the gradual and catastrophic processes that shape surface and bedrock features. Three hours lecture, three hours laboratory. (W).
Corequisite(s): GEOL 118L

GEOL 218 Historical Geology 4 Credit Hours
A generalized study of the history of the earth, with emphasis on the fossil record of life development, the stratigraphic sequence of deposits and paleogeography. Laboratory work will include the study of geologic and topographic maps and fossils of prominent invertebrate phyla. (YR).
Corequisite(s): GEOL 218L

GEOL 303 Geodesy & Cartog. Principles 3 Credit Hours
Understanding the shape, texture, and structure of the Earth's surface and interior is of critical importance for studying and visualizing the physical world around us. This course focuses on the physical and geographical properties of the Earth's surface, how these properties are measured, and how they are effectively displayed as maps and other visual representations. Surveying, Global Postioning Systems (GPS), and cartographic design both microscales (e.g., meter) and macroscales (e.g., light year) are heavily emphasized. (F, YR)

GEOL 305 Intro to GIS 4 Credit Hours
An introductory course that examines the digital representation, manipulation, and analysis of geographic data, with the emphasis on the analytical capabilities that GIS brings solutions to geographic problems. Students will explore and learn GIS principles using ESRI's mapping software, as well as complete a major GIS project.
Corequisite(s): GEOL 305L

GEOL 305D Intro to GIS 0 Credit Hours
Required discussion session for GEOL 305.
Corequisite(s): GEOL 305

GEOL 313 Earth Materials 4 Credit Hours
This course provides an overview of Earth materials. It includes topics of mineralogy, optical crystallography, igneous and metamorphic petrology and petrography as well as sedimentology and sedimentary petrology and petrography and how these rock types relate to tectonics. (W, AY).
Prerequisite(s): CHEM 134 and (GEOL 118 or ESCI 118)

GEOL 332 Hazardous Waste Management 3 Credit Hours
Environmental problems associated with solid and hazardous waste. Regulations governing the generation, transport, and disposal of hazardous waste. Waste management techniques, including reduction, reuse, recycling, treatment, incineration, and land disposal. Three hours lecture.
Prerequisite(s): GEOL 118 or ESCI 275

GEOL 340 Remote Sensing 4 Credit Hours
This course introduces students to the basics of remote sensing, characteristics of remote sensors, and remote sensing applications in academic disciplines and professional industries. Students will explore the physical and mathematical principles underlying remote sensing techniques, and will practice the acquisition, processing, and visualization of remotely derived data. This course emphasizes hands-on learning through projects. (W, YR).
Restriction(s):
Can enroll if Class is Junior or Senior or Graduate

GEOL 342 Physical Oceanography 3 Credit Hours
An introduction to physical and chemical oceanography, fundamental marine processes and plate tectonics. Interactions between the oceans and atmosphere and the effect of greenhouse gases on the oceans and the role of physical processes in global climate change will be studied.

GEOL 350 Geomorphology 4 Credit Hours
This introductory course is designed to familiarize students with the fundamentals of river behavior and the general principles in fluvial morphology, sedimentation, and hydraulics and stream bank erosion. Applications of these principles are shown utilizing a stream classification system. Problem solving techniques for watershed management, stream restoration, non-point source pollution and integration of ecosystem concepts in watershed management are presented. A combination of both lecture and field applications are provided. (W, AY).
Prerequisite(s): GEOL 118 or ESCI 118
Restriction(s):
Can enroll if Class is Junior or Senior
Can enroll if Level is Undergraduate

GEOL 370 Environmental Hazards 4 Credit Hours
This course is designed in the context of geosystems sciences. It sheds light on hazardous interactions between people and the physical environment including all four spheres: lithosphere, atmosphere, hydrosphere and biosphere. It explains natural and environmental hazards such as earthquakes, volcanism, floods, mass movements, wildfires, climate change, and severe weather. Theoretical concepts are applied to case studies from around the world. (F, AY).
Prerequisite(s): ESCI 118 or GEOL 118 or ESCI 101 or ESCI 201

GEOL 372 Energy and the Environment 4 Credit Hours
This course examines renewable and non-renewable energy sources: crude oil, gas, coal, radioactive ores, hydro, solar, wind, biomass, geothermal, and others. The energy sources will be discussed in the context of their origin, energy generation and efficiency, environmental impacts, and socio-economic implications. (W, AY).
Prerequisite(s): ESCI 118 or ESCI 101 or ESCI 201 or ESCI 275 or ESCI 301

GEOL 375 Groundwater Hydrology 4 Credit Hours
Sources, occurrence, and movement of groundwater. Surface and subsurface investigations. Principles of hydrogeology. Groundwater pollution and management. (AY).
Prerequisite(s): GEOL 118

GEOL 377 Environmental Field Methods 1 Credit Hour
An intensive, off-campus field course that provides students an opportunity to observe and critically study different natural and human environments. Students learn how to collect data in a systematic way and formulate scientific inferences about environmental processes, products, and problems. Students also learn preparation techniques for conducting long days in the field under varying weather conditions and in challenging terrains. The course may be repeated for credit when destination varies. There is a mandatory pre-departure meeting and trip length is typically one to two weeks in length. (YR). (YR).
Prerequisite(s): GEOL 118 or ESCI 118

GEOL 390 Current Topics in Geology 1 to 3 Credit Hours
A course in special topics current to the field of geology. Topics and format for the course may vary. See current Schedule of Classes. (OC).
Prerequisite(s): GEOL 118

GEOL 440 Advanced GIS 4 Credit Hours
This course offers an opportunity for students with a background in the fundamentals of geographic information systems (GIS) to apply the analytical capabilities of geospatial technology to model real-world situations in support of decision making. Particular emphasis is given to data development and management, spatial and statistical analyses, customization, and effective visualization. (W, YR).
Prerequisite(s): GEOL 305 or ESCI 305 or GEOG 305

GEOL 460 Structural and Engineering Geology 4 Credit Hours
GEOL 460/560 is the application of structural geology and stratigraphy to the practice of geology and civil engineering. Emphasis is placed on the application of geologic analysis to facilitate the understanding of dynamic Earth processes such as faulting and folding as well as the successful completion of engineering projects. Case histories will be used to evaluate how geologic knowledge has been used in both successful and unsuccessful engineering projects. (AY, W).
Prerequisite(s): GEOL 118

GEOL 475 Contaminant Hydrogeology 3 Credit Hours
Advanced lecture treatment of selected topics in subsurface hydrology including contaminant transport and fate of organic and inorganic constituents, aquifer test analysis, and the use of modeling in the analysis of selected case histories. (AY).
Prerequisite(s): GEOL 375
Restriction(s):
Can enroll if Class is Junior or Senior

GEOL 478 Field Geology 4 Credit Hours
Introduction to geological field methods; detailed rock descriptions, how 3-dimensional structures are visualized, described, and how maps and cross sections are constructed from field data. (F, AY).
Prerequisite(s): GEOL 118 or ESCI 118
Restriction(s):
Can enroll if Class is Sophomore or Junior or Senior

GEOL 487 Groundwater Modeling 3 Credit Hours
Lecture and laboratory applications of two- and three- dimensional groundwater flow and contaminant transport problems. Visual Modflow, Modpath (-PLOT and SUTRA), MT3D and Surfer will be used to evaluate remedial alternatives (e.g. pump and treat, funnel and gate, or trench and drain systems). EPA's Basins software combined with ESRI's GIS software ArcView will be used to evaluate and compare the Rouge River watershed with other small-scale watersheds in Michigan. (AY)
Prerequisite(s): GEOL 375
Restriction(s):
Can enroll if Class is Junior or Senior

GEOL 490 Advanced Topics in Geology 3 Credit Hours
Current topics from various areas in pure and applied geosciences will be reported upon by students, faculty and guest speakers. May include extended field trips. (OC).

GEOL 498 Independent Study in Geology 1 to 3 Credit Hours
Library research and independent study performed under the guidance of a faculty member. Permission of instructor. (F,W,S).

GEOL 499 Laboratory and Field Research 1 to 3 Credit Hours
Directed laboratory or field research performed under the guidance of a faculty member. Four to twelve hours laboratory or field study. Permission of instructor. (F,W,S).

*An asterisk denotes that a course may be taken concurrently.

Frequency of Offering

The following abbreviations are used to denote the frequency of offering: (F) fall term; (W) winter term; (S) summer term; (F, W) fall and winter terms; (YR) once a year; (AY) alternating years; (OC) offered occasionally