430 Urban Geography
This course will focus on themes in the development of contemporary cities with special attention to patterns and trends within the Twin Cities metropolitan area e.g. ethnicity, housing, transportation, historical evolution, and urban growth. Usually offered alternate years.
Prerequisite: 111 or 113 or consent of instructor

475, 476 Experiential Learning **2 credits**
477, 478 Experiential Learning
See the description of these courses at the beginning of the "Curricula" section of this catalog.

480 Seminar in Geography
The seminar explores the nature of geography as a discipline. The areas to be covered: history of geographic thought, the position of geography relative to the arts and sciences, different ways of interpreting geographical phenomena, and geography as a vocational and academic career. Research projects will cover these themes and be tailored to the student's interests. Usually offered alternate years.
Prerequisites: four geography courses, including one methods course

481 Advanced Field Study in Geography
A geographic analysis through field experience. Designed for advanced students in geography. Includes study-abroad courses.
Prerequisite: consent of instructor

483, 484 Seminar **2 credits**
485, 486 Seminar
See the description of these courses at the beginning of the "Curricula" section of this catalog.

487, 488 Topics **2 credits**
489, 490 Topics
The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available at www.stthomas.edu/registrar/onlineschedule.html.

491, 492 Research **2 credits**
493, 494 Research
See the description of these courses at the beginning of the "Curricula" section of this catalog.

495, 496 Individual Study **2 credits**
497, 498 Individual Study
See the description of these courses at the beginning of the "Curricula" section of this catalog.

Geology (GEOL)

Hickson (chair), Lamb, Theissen

Geologists study the Earth, not as a static lump of rock, but as a dynamic, changing system with a long, deep, and rich history. The science of geology focuses on the processes that have sculpted and continue to shape the planet and its life. The Department of Geology seeks to provide a solid foundation in the Earth sciences for its majors, preparing them for a variety of career paths.

The geology curriculum has been designed to provide students with a solid core, but with sufficient flexibility to allow students with particular interests to pursue a more customized program. At the heart of this program is the field laboratory experience, a fundamental and basic component of a St. Thomas geoscience degree. Department faculty emphasize the fact that geology must be learned in the field and as a result offer field laboratory experiences in all courses that extend from a short afternoon trip to a multi-week field course on field methods and regional geology. Majors will visit many of the geologically significant localities throughout the upper Midwest as part of their program.

Major in Geology

One of:
110 Geology of the National Parks
111 Introductory Physical Geology
113 The Earth's Record of Climate
114 The Science of Natural Disasters
115 Environmental Geology

Plus:
211 Mineralogy
260 Regional Geology and Field Methods
320 Sedimentology and Stratigraphy
340 Fundamentals of the Lithosphere I (Petrology)
360 Fundamentals of the Lithosphere II (Structural Geology)
430 Advanced Earth History

Plus three of (one of which must be at the 400-level):
130 Earth History
220 Oceanography
252 Earth Surface Processes and Geomorphology
410 Hydrogeology
460 Advanced Field Methods
494 Research
Note: GEOG 321 Geographic Information Systems and geology courses offered at Macalester College may fulfill one of these courses with permission of chair

Allied requirements
MATH 113 Calculus I
or
MATH 108 and 109 Calculus with Review I and II

Plus one of the following sequences:
CHEM 111 and 112 General Chemistry I and II
PHYS 111 and 112 Introduction to Classical Physics I and II
CHEM 111 General Chemistry I and PHYS 111 Introduction to Classical Physics I

For students wishing to pursue careers in paleontology, geobiology, or geomicrobiology:
BIOL 201 Diversity and Adaptation and 202 Genetics and Population
Biology may be substituted for one of the CHEM/PHYS sequences with permission of chair

Strongly recommended for students considering graduate study:
additional courses in the allied sciences and mathematics

Teacher Licensure

Elementary Education with a Co-major in Science and Mathematics for Elementary Education
Elementary Education with a Specialty in Science (5-8)
Co-major in Science (5-8) – Earth and Space Science (9-12) and a Co-major in Secondary Education
See School of Education Department of Teacher Education.

Minor in Geology

One of:
110 Geology of the National Parks
111 Introductory Physical Geology
113 The Earth's Record of Climate
114 Natural Disasters
115 Environmental Geology

Plus one of:
211 Mineralogy
320 Sedimentology and Stratigraphy

Plus:
340 Fundamentals of the Lithosphere I (Petrology)

Plus two of:
130 Earth History
211 Mineralogy (if not chosen above)
220 Oceanography
252 Earth Surface Processes and Geomorphology
260 Regional Geology and Field Methods
320 Sedimentology and Stratigraphy (if not chosen above)
360 Fundamentals of the Lithosphere II (Structural Geology)
410 Hydrogeology

102 Origins and Methods (110, 111, 113, 114, 115)
A study of the basic concepts of geology that were first developed by James Hutton in the late 18th century and their application today. This is an introductory science course specifically designed to reduce the mystique that often is associated with the scientific method. Following Hutton's example, the student will focus on the materials which make up the Earth and on the geologic processes that operate on these materials. Offered in January term.

110 Geology of the National Parks (102, 111, 113, 114, 115)
This course introduces fundamental geologic concepts, processes and materials using examples from the national parks. Emphasis is placed on the specific geologic materials, natural processes, landforms and sequence of

events responsible for the outstanding scenery in selected U.S. national parks. Laboratories will include study of the rocks common to the national parks; analysis of geomorphic, topographic and geologic maps of the national parks; and field studies of local sites. Lecture and two laboratory hours per week.

111 Introductory Physical Geology (102, 110, 113, 114, 115)
A study of the Earth's properties; the formation and classification of minerals, rocks, ore deposits, and fuels; and the nature and origin of the Earth's surface and interior. Emphasis will be placed upon a changing Earth, and the geologic processes operating at the surface and in the interior. Lecture and two laboratory hours per week.

113 The Earth's Record of Climate (102, 110, 111, 114, 115)
Climate change is a pressing issue for all of humanity, yet we cannot understand modern climate change without an awareness of the Earth's natural climate variability over the billions of years of geological time. In this course we will first explore modern climate and the controls on it; then focus on the methods used to understand how climate has changed over recent and distant geological time; explore the factors and theories that explain changes in the Earth's climate system; and finally analyze human-induced climate changes in light of the past geological evidence. Labs will focus on the analysis of climate data and geological evidence for changes in climate.

114 The Science of Natural Disasters (102, 110, 111, 113, 115)
This introductory geology course focuses on how and why natural disasters occur, as well as on their effects and how scientists study them. The course will examine internal and external Earth processes and in particular how these processes impact humans. Course emphases will be upon the principles underlying natural disasters such as earthquakes, volcanic eruptions, landslides, floods, coastal processes, and extinctions. We will use case studies of recent and historic events to understand these natural processes.

115 Environmental Geology (102, 110, 111, 113, 114)
This course emphasizes the interactions between humans and their environment, focusing on those processes and issues that are fundamentally geological in nature. Early in the course, students will be introduced to basic geoscience concepts and principals, the scientific method, plate tectonics, and Earth materials (rocks and minerals). The remainder of the course will focus on specific topics at the interface between humans and their environment, including volcanic and earthquake hazards, human impacts on the hydrological cycle, surface and groundwater contamination, climate and the carbon cycle, nuclear waste storage, soil erosion, non-renewable resources, and slope stability.

130 Earth History
The course introduces fundamental geologic concepts while examining the major tectonic, chemical and biological events that shaped the Earth through time. It will include a study of fossils, sedimentary structures, depositional environments, radiometric dating techniques, and other tools geoscientists use to interpret the past. Throughout the course global events will be studied but focus will be on the North American continent.

211 Mineralogy
A systematic approach to mineral study involving crystallography, analysis of physical and chemical properties, mineral formation, and methods of identification and classification. The course includes fieldwork in northern Minnesota and an emphasis on understanding the development of local minerals in the context of the geologic history of Minnesota. Lecture and three laboratory hours per week.
Prerequisite: one of 102, 110, 111, 113, 114 or 115

220 Oceanography
The Earth's surface is dominated by vast oceans known for the beauty of their wildlife and waters. The oceans are also increasingly recognized for their critical importance to the functioning of the Earth's climate system and for their endangered natural resources. For example, the ocean-atmospheric climate phenomenon known as the El Niño Southern Oscillation has gained household name recognition for its global impact on the weather, economy, and public health. In this course we will explore the physical, chemical, and biological processes that characterize the oceans. Students will develop research and analytical skills by making observations and interpretations of oceanographic processes using data, demonstrations, and field experiences.
Prerequisite: one of 110, 111, 113, 114, 115, 130, or permission of the instructor

252 Earth Surface Processes and Geomorphology
This course emphasizes the physical processes that are responsible for shaping the Earth's surface. The qualitative description of landforms is pursued, in light of student's newly-gained analytical and quantitative understanding of processes. The labs focus on techniques used by geomorphologists to characterize landforms, soils, and the processes that shape, including: air photo interpretation, analysis of digital topographic data, experimental simulation of landforms evolution, and field techniques in geomorphology.
Prerequisite: one of 102, 110, 111, 113, 114 or 115

260 Regional Geology and Geological Field Methods
The field is geology's laboratory. this course is an introduction to the major concepts of geology, as well as the methods of field geology. Students will learn how to collect, synthesize, and analyze geological data in the field. Techniques will be taught in the context of the regional geology of an area so students will gain a critical appre-

ciation of a geological terrain outside of their usual experience. Students will spend 2-3 weeks in the field examining geological structures, modern-day faults, modern processes that shape the Earth's surface, and examining the ancient record of past climate and environments preserved in the rock record. Student teams will learn basic techniques and instruments of geological mapping and rock description, how to recognize geological structures like faults and folds, ways to interpret the evolution of the Earth from sedimentary, igneous, and metamorphic rocks, and to link surface processes with the rock record. Offered in January-term.
Prerequisite: one of 102, 110, 111, 113, 114, 115, or permission of instructor

295, 296 Topics **2 credits**
297, 298 Topics
The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available at www.stthomas.edu/registrar/onlineschedule.html.

320 Sedimentology and Stratigraphy
Sedimentology is the study of sediment, particularly focusing on how it is transported and deposited. Stratigraphy emphasizes the analysis of sedimentary strata, the layers of sedimentary (and some volcanic) rocks that cover about three-quarters of the Earth's surface. Sedimentary rocks illuminate many of the details of the Earth's history: effects of sea level change, global climate, tectonic processes, and geochemical cycles are all recorded in the sedimentary strata of the Earth. This course will cover basics of fluid flow and sediment transport, sedimentary structures and textures, and – forming the bridge between modern landforms and ancient rocks – depositional sedimentary environments.
Prerequisite: one of 110, 111, 113, 114, 115; 211 recommended

340 Fundamentals of the Lithosphere I (Petrology)
This is the first course in a year-long sequence that covers the fundamentals of petrology and structural geology in a global tectonic framework. The course begins with a discussion of plate tectonics and then examines each of the major plate settings and their boundaries. It will include the formation of igneous, sedimentary and metamorphic rocks. Labs will include hand specimen identification and the use of the petrographic microscope. The course will also examine the conditions of rock deformation and the typical structural features of each tectonic setting. Labs will cover structural geology techniques including recognition and analysis of features in the field and in hand samples. In the fall semester the focus will be on the petrology of the mantle and lithosphere as well as divergent margins. In the spring semester, the focus will be on convergent margins. There will be several field trips as part of this course, ranging from 1-4 days, in the early fall and late spring.
Prerequisites: one of 110, 111, 113, 114 or 115; 211 and 320 or permission of the instructor

360 Fundamentals of the Lithosphere II (Structural Geology)
Continuation of 340.
Prerequisite: 340

410 Hydrogeology
This course focuses on groundwater and how geology influences its recharge, movement, storage, and withdrawal. The course will cover basic concepts of surface- and subsurface water flow, aquifer properties, well testing, heterogeneity in aquifers, groundwater chemistry and contamination, the role of groundwater in geological processes, and regional groundwater systems. Examples, labs, and projects will focus on groundwater in Minnesota and its immediate surroundings.
Prerequisite: one of 110, 111, 113, 114 or 115; 360 recommended

421 Geophysics
Fundamental principles of geophysical methods commonly used for subsurface exploration, including: gravity, magnetic, seismic and electrical measurements. Emphasis on field procedures and interpretation techniques used for geologic investigations. Lecture and three laboratory hours per week.
Prerequisite: 360

430 Advanced Earth History
This course serves as a senior capstone experience in the geology major. Using the tools and concepts from previous coursework—including geochronology, plate tectonics, and other Earth processes—students will examine in-depth some aspect of Earth history. The specific subject matter and focus of this course will vary from year to year, and will be chosen based on input from the students in consultation with the instructor. Some examples of topics include: Precambrian tectonics of the Great Lakes region; Global Mesozoic tectonics; Sedimentary basins and basin analysis; or the Phanerozoic amalgamation of Asia.
Prerequisite: C- or better in 260, 320, and 340

460 Advanced Field Geology
In this course, students will use skills developed in the introductory field methods course, Geology 260, to tackle more complex geologic problems. We will spend 3 weeks in the field mapping in an area that is more structurally complicated and learning additional techniques not introduced in the first course. Students will have the option of starting a research project and collecting data to be analyzed and written up in the following semester. Students not choosing this option will complete a field project during the course.
Prerequisites: 260 and permission of the instructor

475, 476 Experiential Learning **2 credits**
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485, 486 Seminar
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Health and Human Performance

Parsley (chair), Carey, Derry, Duoos, Grochowski; Flood, Hodgson, Mathre, Ofstead, Oliphant, Pham, Roney, Skrypek, Stenzel, Sweeney, Tschida

The Department of Health and Human Performance offers the following undergraduate professional programs of study:

1. a major in physical education teaching which leads to licensure at the elementary, middle, and secondary levels. Students graduating with a major in physical education will be able to effectively make application of the skills required for conducting the teaching-learning process in an extended practicum setting. They will also demonstrate the skill and knowledge to evaluate the teaching-learning process, the analysis of motor performance, and an assessment of theory to interface it with practice.
2. a major in health education teaching, which leads to licensure at the middle and secondary school levels. Students graduating with a major in health education will be able to effectively apply the knowledge and skills required for conducting the teaching-learning process in health education.
3. a major in community health education, which prepares the student for work in community health. Students graduating with a major in community health education will be able to effectively apply the knowledge and skills required in community health education settings.
4. a major in health promotion which prepares the student for work as a fitness specialist outside the school setting. Students graduating with a major in health promotion will have had experience at a work site. They will demonstrate the skill and knowledge expected of the entry-level exercise science professional in the areas of fitness evaluation, exercise prescription, and delivery of exercise programs to normal and special populations. They will effectively assess theory and interface it with practice.
5. a major in health promotion science which prepares the student for entrance into a masters of physical therapy program or other related medical field. A student graduating with a major in health promotion science will be trained on highly sophisticated assessment equipment and gain real-world experience outside the classroom.
6. a non-teaching major in health education or physical education for students who have career objectives other than teaching.
7. a minor in community health education.

The department also offers a course to fulfill the Health and Fitness competency of the core curriculum.

Teacher Licensure

Major in Physical Education (K-12)
Major in Health Education (5-12)
See School of Education Department of Teacher Education

Major in Community Health Education

HLTH 345 Nutrition for Health and Fitness
HLTH 350 Personal Health and Wellness
HLTH 353 Consumer, Community and Environmental Health
HLTH 375 Lifelong Stress Management (2 credits)
HLTH 400 Epidemiology
HLTH 441 Community Health Education: Curriculum, Assessments, and Administration
HLTH 451 Community Health Education: Methods, Resources, and Partnerships
HLTH 462 Human Sexuality Education
HLTH 464 Critical Issues in Health Education