Welcome

Welcome to the Geology and Environmental Science program at Youngstown State University. Our programs in Environmental Science and Geology are distinguished by our applied approach to learning. Our dedicated faculty consists of five PhD degree professors and thirteen adjunct faculty members with strong backgrounds in academics and real world experience. Our courses and degree programs prepare graduates for immediate employment and graduate studies opportunities by going well beyond the traditional classroom experiences with a variety of field experiences, study abroad experiences, access to high-end analytical laboratories and instrumentation, internship opportunities and faculty-led undergraduate research experiences.

Our laboratory facility instruments include plasma spectrophotometry, ion chromatography, gas chromatography, laser particle size analysis and a wide variety of bench-top instrumentation. In addition, students have access to TEM, SEM, XRF, XRD and other high-end instrumentation through the Department of Chemical and Biological Sciences.

The program has a strong emphasis on remote sensing and geophysical investigations. Field instruments include a DJI Matrice 600 drone with infrared and optical imaging capability, ground penetrating radar, hand held x-ray fluorescence, 24 channel refraction seismograph, earth resistivity, proton magnetometer, high resolution GPS and total station surveying equipment.

Graduates of our programs find personally rewarding and high-paying careers in the fields of petroleum geology, environmental geology, public health, engineering geology, government regulations and compliance, mining, hydrogeology, environmental safety, geophysics and related fields. Many graduates choose to continue their education by pursuing master of science and doctoral degrees in geology and environmental science.

The Geological and Environmental Sciences program is the home of the Clarence R. Smith Mineral Museum, a world-class collection of rare and amazing minerals and fossils from around the world. The museum is free and open to the public.

For more information, visit the Department of Physics, Astronomy, Geology, and Environmental Sciences.

Program Directors / Coordinators

- Geology Undergraduate Program Coordinator: Dr. Jeff Dick (Email: jcdick@ysu.edu) (330) 941-1756
- Environmental Science Undergraduate Program Coordinator: Dr. Felicia Armstrong (Email: fparmstrong@ysu.edu) (330) 941-1385
- Environmental Science Graduate Program Director: Dr. Jeff Dick (Email: jcdick@ysu.edu) (330) 941-1756

Part-Time Faculty

- Diana M. Alexander, M.S.
- Rebecca Baxter, M.S.
- Susie L. Beiersdorfer, M.S.
- Breanna Beaver, M.S.
- Anna C. Woodard (Draa), M.S.
- Heidi L. Haug, M.S.
- Jessie Holland, M.S.
- Thomas E. Jordan, Ph.D.
- Tamara M. Kerr-Sahli, M.S.
- Daniel J. Kuzma, M.S.
- Jason Lee, M.S.
- Patrick Pruent, M.S.
- Debbie A. M. Smith, M.S.

Majors

- BS in Environmental Science (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-environmental-studies/)
- BA in Geology (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-geology/)
- BS in Geology (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-geology/)

Minors

- Minor in Engineering Geology (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-environmental-studies/)
- Minor in Environmental Geology (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-environmental-studies/)
- GeoScience Minor (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-environmental-studies/)
- Natural Gas and Water (http://catalog.ysu.edu/undergraduate/colleges-programs/college-science-technology-engineering-mathematics/department-geological-environmental-sciences/bs-environmental-studies/)

Professors

- Felicia P. Armstrong, Ph.D., Professor
- Colleen McLean, Ph.D., Associate Professor

Lecturer

- Billie Spieler, Ph.D., Lecturer
Geological and Environmental Science

Geology

GEOL 1500 Environmental Geology 4 s.h.
An introductory course that examines interactions between human society and our changing planet, the effects of natural/geologic hazards on humans, and anthropogenic (human-caused) impacts on nature, geology, and society. Three hours of lecture and two hours lab per week.
Gen Ed: Environmental Sustainability, Natural Science, Social and Personal Awareness.

GEOL 1503 Rock Studio: Understanding Geology Through Lapidary Experiences 4 s.h.
A discussion and studio-based course designed to develop an understanding and appreciation of earth history, earth physical processes and the formation of rocks and minerals through combined class discussions and creative studio-based discovery experiences. Students learn fundamentals of geology and reinforce their understanding by creating interesting objects and artistic pieces from rocks, minerals and earth materials using a variety of cutting, polishing and basic lapidary equipment. Approximately 3 hrs lecture and 2 hours lab weekly over the course of the term.
Gen Ed: Natural Science.

GEOL 1504 The Dynamic Earth 3 s.h.
An examination of earth as consisting of interrelated geologic systems which are dynamic and constantly changing. Includes study of surface, lithologic and tectonic systems.
Gen Ed: Natural Science.

GEOL 1505 Physical Geology 4 s.h.
A study of the various physical and chemical processes acting on and within the earth, and their products within the context of plate tectonics and their relevance to humans and modern society. The laboratory component includes identification of minerals and rocks, and the interpretation of topographic and geologic maps. Three hours of lecture, two hours of lab per week.
Gen Ed: Natural Science.

GEOL 1505H Honors Physical Geology 4 s.h.
Concepts of the earth as a dynamic planet, investigated through a variety of lectures, text and journal readings, and independent library-research assignments.
Prereq.: Eligibility for the Honors Program or consent of instructor.
Gen Ed: Natural Science.

GEOL 1505L Physical Geology Laboratory 0 s.h.
Physical Geology Laboratory.

GEOL 1508 Geology of Gemstones and Allied Minerals 3 s.h.
Formation, occurrence, and distribution of gem materials. Properties and identification of gem stones; factors affecting their value. Introduction to synthetic/artificial gem materials. Not applicable toward the geology major.

GEOL 2600 Geology in the Field 1 s.h.
An experiential field-based course designed to expose students to a variety of geological sites and development projects. Two full day field trips with class room preparation are required.
Prereq.: GEOL 1505 or GEOL 1505H.

GEOL 2602 Introduction to Oceanography 3 s.h.
Survey of geological, physical, chemical, and biological oceanography; description and distribution of properties and their relationship to circulation, shorelines, ocean features, sediments, organisms, and environments.
Gen Ed: Natural Science.

GEOL 2605 Historical Geology 4 s.h.
An in depth study of the origin and evolution of the Earth and its systems and life forms throughout geologic time. The course is designed to develop student critical thinking skills through analysis of concepts and issues, and the integration of maps, lithologic information, and fossil information. Three hours lecture and two hours lab per week. Field trips are an integral part of the course.
Prereq.: GEOL 1505 and GEOL 1505L.

GEOL 2611 Geology for Engineers 3 s.h.
Study of geologic principles, processes, and materials; focus on recognition of geologic factors as they apply to engineering operations and projects. Laboratory work includes examination of minerals, rocks, maps, and case histories. Two hours lecture, two hours laboratory per week.
Gen Ed: Natural Science.

GEOL 2620 Intro to Natural Gas and Water Resources 3 s.h.
A survey of the history, science and technology of oil and gas exploration and production and water resource related issues with an emphasis on non-conventional production in the Appalachian Basin.
Prereq.: MATH 1513, CHEM 1516 and CHEM 1516L.

GEOL 3700 Mineralogy 4 s.h.
The occurrence, composition, and crystallography of common and economically important minerals. Identification of minerals using physical, chemical, optical and x-ray properties. The theory and use of the polarizing microscope and its application to the study of crystalline material, including asbestos materials. Two hours lecture, four hours of lab per week.
Prereq.: CHEM 1515 (may be concurrent) and GEOL 2605.

GEOL 3701 Geomorphology 3 s.h.
A study of landforms and the processes which create them, using aerial photographs, geologic maps, and topographic maps. The laboratory work emphasizes recognition and interpretation of landforms. Two hours lecture, two hours laboratory per week.
Prereq.: GEOL 2605.

GEOL 3702 Glacial Geology 3 s.h.
A study of glacier types: their origin, movement, erosional/depositional contributions, and their relationship to various non-glacial features. Emphasis is on the Pleistocene glacial succession in North America. Field trips are an integral part of the course.
Prereq.: GEOL 2605.

GEOL 3703 Geological Field Methods 2 s.h.
An experiential lecture and field-based course designed to expose students to sites of geological significance and to learn basic field geology methods including data collection, field notebooks, geological feature measurements, and precision surveying methods. The course requires two different two-day field trips with scheduled class meetings to prepare students for the field experiences.
Prereq.: GEOL 2605.

GEOL 3704 Structural Geology 2 s.h.
Description and interpretation of geologic structures, mechanical properties; stress-strain relationships, regional structure of North America, and major tectonic theories. Geology majors must take GEOL 3704L concurrently with GEOL 3704.
Prereq.: GEOL 3701 and GEOL 3718.

GEOL 3704L Structural Geology Laboratory 1 s.h.
Structural geology techniques and analyses, including orthographic solutions, stereographic projections, and interpretation of maps. Two hours lab per week.
Prereq. or Coreq.: GEOL 3704.

GEOL 3705 Structures and Landscapes 4 s.h.
A study of earth surface features and their relationship to rock structure. One or more required field trips. Three hours lecture and three hours lab per week.
Prereq.: GEOL 3700.

GEOL 3706 Geology of Economic Mineral Deposits 3 s.h.
A study of the occurrence, origin, and distribution of mineral deposits, with special attention to their economic use. Field trips are mandatory.
Prereq.: GEOL 3700.

GEOL 3708 Geological Field Methods 2 s.h.
A course designed to develop skills and confidence in field-based sampling, data collection and analysis of results. Two one to two day field trips are required.
Prereq.: GEOL 2600 and 3718 or permission of instructor.
GEOL 3709  Subsurface Investigations  3 s.h.
An introduction to subsurface investigative methods that integrate principles of geophysics, geochemistry, interpretation of well logs and other bore hole data, outcrops and published information in the solution of actual geological problems. Two hours lecture, two hours lab per week. Students are expected to perform field work in addition to regularly scheduled class time.
Prereq.: GEOL 3701; MATH 1571 recommended.

GEOL 3710  Petroleum Geology of the Appalachian Basin  3 s.h.
A survey of the history, science and technology of oil and gas exploration and production within the Appalachian Basin of North America. Course content will focus on conventional and non-conventional exploration and production history, methods, technologies and production. Three hours lecture per week. Field trip mandatory.
Prereq.: GEOL 2605 or permission of instructor.

GEOL 3711  Mineralogy  3 s.h.
Advanced study of the occurrence, classification and processes that lead to the formation of minerals and the rocks and materials in which they occur. Emphasis is placed on the study of rock-forming minerals using physical, chemical and optical properties. Field trip required. Two hours lecture and two hours lab per week.
Prereq.: CHEM 1515 and CHEM 1515L (may be concurrent) and GEOL 2605.

GEOL 3714  Principles of Paleontology  3 s.h.
A detailed study of fossil invertebrates, including their origin, classification, paleoecology and stratigraphic utilization. Two hours lecture and two hours lab per week.
Prereq.: GEOL 2605.

GEOL 3717  Petrology  3 s.h.
A modern approach to understanding rocks within the context of plate tectonics and the use of rocks and minerals as natural resources in support of modern society. Emphasis is placed on investigating the formation, occurrence and classification of igneous, sedimentary and metamorphic rocks using physical, chemical and optical properties. Field Trip Required. Two hours lecture and two hours lab per week. Prereq. GEOL 3711 and CHEM 1516/1516L may be taken concurrently.

GEOL 3718  Igneous and Metamorphic Petrology  4 s.h.
An in-depth study of the petrogenesis of igneous and metamorphic rocks based on their chemical and petrographic characteristics. Three hours lecture, three hours lab per week.
Prereq.: GEOL 3700.

GEOL 3720  Field Investigations in Geology  1-4 s.h.
A field-based approach to the study of geologic concepts and problems. Class and travel supervised by the Geology faculty; location, duration of stay, hours, credit, and grading criteria depend on the site and nature of the geologic concepts and problems investigated. The course may be repeated. A maximum of 4 s.h. may be applied toward Geology major requirements.
Prereq.: By permit only.

GEOL 3750  Geoscience Seminar  1 s.h.
Guest lecture and student presentation forum course designed to provide students with exposure to a broad range of topics and current research relevant to the geosciences. Course may be repeated.
Prereq.: GEOL 1505.

GEOL 3755  Geological Research Methods and Data Analysis  3 s.h.
This course introduces students to the design and execution project phases applied in the solution of real world geological problems. Emphasis is placed on the recognition of geological problems, the design and execution of research plans and experience with solution-based software commonly used in research and professional practice. Students are required to complete a geological research problem, submit a formal write up and provide an oral and/ or poster presentation.
Prereq.: GEOL 3717.

GEOL 3775  Research Methods for Undergraduates  1 s.h.
This course introduces the student to the fundamental and practical aspects of conducting research. The course emphasizes the scientific method, research methodologies, literature review, writing research proposals, and how research results are presented. Learn the process of developing, funding and conducting research. This course must be taken prior to any undergraduate research.
Prereq.: junior or senior standing.

GEOL 4804  Ground Water  3 s.h.
A study of the geologic and hydrologic factors controlling the occurrence and behavior of water beneath the earth’s surface. Two hours lecture, two hours lab per week.
Prereq.: GEOL 2605; MATH 1571 recommended.

GEOL 4806  Engineering Geology  3 s.h.
An introduction to the concepts of engineering geology with an emphasis on the relationship between geologic materials, construction of infrastructure and environmental issues. Topics include case studies that involve rock mass classification, soil classification, and material properties including strength, soil phase relationships, soil consolidation. Required field trip. Three hours lecture.
Prereq.: GEOL 2605 and MATH 1510/1510C and MATH 1511/1511C or permission of instructor.

GEOL 4812  GIS Applications to Geology  3 s.h.
This course covers a variety of geologic applications of GIS software; topics covered include: flood mapping, landslide hazard mapping, modeling soil erosion, watershed delineation, etc. Although you will be exposed to the basic functions of ArcGIS, the course is designed primarily to provide experience in obtaining, managing, interpreting, displaying, and presenting geo-spatial data in a meaningful context.
Prereq.: GEOL 3701, GEOG 2611.

GEOL 4820  Water Pollution Control  3 s.h.
Sources and prevention methods of water pollution, human activities and natural conditions that influence water quality, protection methods and regulations of water quality, contamination and remediation of groundwater.
Prereq.: GEOL 1505 or ENST 2600.

GEOL 4824  Tectonics  3 s.h.
Geodynamics and the workings of plate tectonics. Kinetics and dynamics of plate motion, plate driving forces, thermal structure of the earth, and thermal convection in the earth. Tectonic and structural features on the earth. Geophysical, stratigraphic and structural signatures of extensional rifting, strike-slip faulting, subduction zones, plate collisions and mountain belts.
Prereq.: GEOL 3704.

GEOL 4825  Geophysical Well Log Analysis  3 s.h.
An introduction to geophysical well logging, analysis, and interpretation applications in the oil and gas industry. Topics include well construction, drilling mud properties, and interpretation of gamma ray, SP, resistivity, sonic, neutron density, and cement bond logs.
Prereq.: GEOL 2620 or permission of instructor, GEOL 3704, PHYS 1502 or PHYS 2611 recommended.

GEOL 4830  Senior Thesis  4 s.h.
Designed to be completed during the student’s senior year and is expected to be a significant research-based contribution to the geosciences. A typical senior thesis topic will support the research program of full-time GES faculty. Students may develop their own research topic provided they have the support of one or more full-time GES faculty.
Prereq.: Junior standing, minimum cumulative GPA of 3.0, submission of approved research proposal, permission of GES Chairperson.
Gen Ed: Capstone.

GEOL 4899  Special Topics  1-3 s.h.
Selected aspects of geology not covered in existing courses. Topics to be announced each time course is offered. May be repeated for different topics.
Prereq.: appropriate 3700- or 4800- geology course and permission of the chairperson.
ENST 1500  Introduction to Environmental Science  3 s.h.
Basic environmental science literacy for informed citizens as inhabitants and stewards of Earth. The use of science and the scientific method to understand, assess, and manage the environment to improve human health, conserve energy and resources, preserve nature, and sustain quality of life.
Gen Ed: Environmental Sustainability, Natural Science, Social and Personal Awareness.
ENST 1500L  Introduction to Environmental Science Lab  1 s.h.
The use of the scientific method to explore various fields in environmental science including water quality, risk assessment, biodiversity and mineral uses. This field and laboratory work supplements ENST 1500.
Prereq. or Coreq.: ENST 1500.
ENST 2600  Foundations of Environmental Science  3 s.h.
A survey of the principles and issues of environmental studies including basic ecology, biodiversity, hazardous and solid waste management, sustainable development, energy production and conservation, environmental ethics, air, water and soil pollution.
ENST 2600L  Foundations of Environmental Science Laboratory  1 s.h.
Laboratory and field investigations identified in ENST 2600. Emphasis on the scientific method, problem solving and critical thinking skills in environmental assessment techniques, active exploration of environmental concerns and their solutions. Three hours per week. Field trips may require additional time past the scheduled lab time.
Prereq. or Coreq.: ENST 2600.
ENST 2620  Freshman/Sophomore Seminar  1 s.h.
This one credit hour course will focus on various disciplines of environmental science. Invited speakers will present on various topics in environmental science and students will engage in scientific literature searching. Active portions of the course will include online database literature searches, scientific writing, citation methods, and basic instruction in using Microsoft Word, Excel and PowerPoint.
Prereq.: Freshman or sophomore standing.
ENST 2650  Independent Study  1-3 s.h.
The introductory study of problems or issues in Environmental Studies or a review of the literature relating to a specific environmental topic. May be repeated for different topics for a total of 6 s.h.
Prereq.: Permission of the director.
ENST 3700  Environmental Chemistry  4 s.h.
Study of the fundamental chemical principles underlying common environmental problems, including water pollution, toxicology, chemical biotransformation and degradation. Chemistry of pesticides, petroleum hydrocarbons and heavy metals are also investigated. Taken with ENST 3700L.
Prereq.: ENST 2600 and CHEM 1515.
ENST 3700L  Environmental Chemistry Lab  0 s.h.
Students will investigate various analytical and instrumental techniques used in the examination of chemicals in environmental media (soil, water, biota). Includes proper handling, storage and precautions in the laboratory and the environment. Taken with ENST 3700.
ENST 3730  Air Quality  3 s.h.
Sources, dispersions, consequences and abatement of air pollutants emanating from industry and transportation. Topics also include the history, legislation, standards and economics of air pollution.
Prereq.: CHEM 1515.
ENST 3750  Seminar  1 s.h.
Guest lecturers will examine current topics in environmental issues, including current research, application of technology, management strategies to reduce environmental impact, environmental ethics, policy, etc.
Prereq.: ENST 2600.
ENST 3751  Water Quality Analysis  3 s.h.
Introduction to physical, chemical, and biological measurements of water quality. Sample collection and laboratory analysis of natural waters, drinking water, and wastewater. Interpretation of environmental data. Two hours lecture and three hours laboratory per week. Identical to CEEN 3751.
Prereq.: Must be taken concurrently with ENST 3751. Identical to CEEN 3751.
ENST 3751L  Water Quality Analysis Lab  0 s.h.
Lectures and laboratory experiments in the analysis of natural waters, drinking water and wastewater. Emphasizes procedures for the collection and interpretation of data on current environmental problems. Three hours laboratory per week. Must be taken concurrently with ENST 3751. Identical to CEEN 3751.
Prereq.: Must be taken concurrently with ENST 3751 (Note: already in course description).
ENST 3752  Soil Quality and Analysis  3 s.h.
Soil is an important environmental medium that must be analyzed to assess quality standards. Students develop the ability to conduct laboratory experiments and to critically analyze and interpret soil data. Furthermore, this course contributes to the background knowledge students need to assess environmental impact and risk, sustainability, health and safety.
Prereq.: CHEM 1515 and CHEM 1515L or equivalent.
ENST 3775  Research Methods for Undergraduate  1 s.h.
This course introduces the student to the fundamental and practical aspects of conducting research. The course emphasizes the scientific method, research methodologies, literature review, writing research proposals and the presentation of research results. Students will gain valuable experience in identifying a problem, developing a research plan and summarizing results. This course must be taken prior to engaging in undergraduate research.
Prereq.: junior or senior standing.
ENST 3780  Environmental Research  1-4 s.h.
A research project that involves problem identification, hypothesis formation, experimentation, data analysis and interpretation. The research may be either basic or applied.
Prereq.: Junior standing in ENST and permission of the director.
ENST 3781  Environmental Sampling Methods  3 s.h.
Sampling design, including number and types of samples and procedures for
taking representative samples of air, water, soil and contents of storage and
shipping containers. Two hours of lecture, three hours of laboratory.
Prereq.: ENST 2600 and STAT 2601 or equivalent.

ENST 3784  Research Experience in Environmental Science  4 s.h.
This capstone course will give student the experience in the planning
and execution of a research project. Graduate schools and research
establishments consider an undergraduate student research experience
as extremely valuable. Research provides students with an opportunity to
work with faculty and graduate students on more advance research topics.
Research furthers our knowledge of basic environmental science and helps
us find solutions to environmental problems. The process improves student
skills in gathering data, brainstorming ideas, evaluating data, and discussing
the results to others through written and oral presentations. Environmental
research can be focused on fieldwork, computer simulation, or laboratory
analysis.
Prereq.: Senior standing, Environmental Science major, ENST 3751 or
ENST 3752.

ENST 3790  Internship/Cooperative  1-4 s.h.
Students work under the direction of a faculty supervisor in a governmental
agency or in the private sector as environmental specialists. An activities log
and summary report are required. The course may be repeated.
Prereq.: Junior standing in ENST and permission of the director.

ENST 4822  Water Pollution Control  3 s.h.
Sources and prevention methods of water pollution, human activities and
natural conditions that influence water quality, protection methods and
regulations of water quality, contamination and remediation of groundwater.
3 s.h.
Prereq.: GEOL 1505 or ENST 2600.

ENST 4840  Topics  1-3 s.h.
Students do extensive reading in, and write a formal report on, a specific area
of Environmental Studies.
Prereq.: Junior standing or consent of instructor.

ENST 5800  Environmental Impact Assessment  3 s.h.
Analysis of the potential environmental effects resulting from the construction
of buildings, highways, parking lots, mines, reservoirs, and waste disposal
facilities. Standard procedures are taught for evaluating and reporting the
environmental impact of these activities.
Prereq.: ENST 5860 and senior standing.

ENST 5810  Environmental Safety  3 s.h.
The proper use of environmental monitoring instruments and personal
protective gear. Participation in a series of realistic, hands-on simulation
exercises that address a variety of waste clean-up situations. Topics include
chemical and physical hazards of chemical compounds and toxicology and
adverse effects of chemical exposure. Class meets three hours per week.
Successful completion of the course earns OSHA Hazwoper 40 hour training
certificate.
Prereq.: ENST 2600, equivalent experience or permission of instructor.

ENST 5820  Sustainability, Climate Change, and Society  3 s.h.
This course explores environmental, economic, and social aspects of
sustainable development, with an emphasis on economy and society. Through
topics such as water, food, and climate change, we examine the role of
humans and institutions in sustainable development and possibilities for
reconfiguring relationships between our institutions and the natural world.
Prereq.: junior, senior or graduate level standing.

ENST 5830  Toxicology and Risk Assessment  3 s.h.
A study of environmental toxicology of chemicals, primarily anthropogenic
pollutants, and their effect on humans and ecosystems. Includes
transportation of pollutants in the environment, biochemical reactions,
toxicity testing methods, and dose-response assessment. Continues with an
introduction in the process of estimating risk and the perception of those risks
including how risk is used to set environmental standards.
Prereq.: ENST 1516 and 9 sh >3700 in ENST, CHEM, BIOL, GEOL or CEEN,
junior, senior or graduate standing.
Gen Ed: Capstone.

ENST 5860  Environmental Regulations  3 s.h.
An examination of federal and state regulations that relate to cleanup of
abandoned waste sites, management of waste from current waste generators,
development of new hazardous products and chemicals, safety and health
issues, and control of pollution into air and water.
Prereq.: ENST 2600 or equivalent.