Iowa's Environmental Resources

Spring & Summer 2025

The aggregation of time on tasks, assignment, and interactions must reflect rigor and expectations equivalent to the federal definition of the credit hour—15 hours of direct faculty instruction and a minimum of 30 hours of out-of-class student work for each credit hour awarded." But it should be noted that to do well in any educational effort it is your concentration/dedication, inquisitive mind, and overall scholarship engagement that will lead to an appreciation and understanding of any subject.

On-line: Zoom to Panopto Sessions, encouraged real-time but sessions may be taken asynchronously with follow up homework, questions and answers
Sessions: Tuesday 4 to 6 pm – March 11, 25; April 8, 22
Credits: 2 credit hours – UNI Grad. Credit
Sponsor: Iowa Limestone Producers Association, https://limestone.org/
Professor: Dr. Chad Heinzel
Course website: https://www.exploreiowageology.org/UNI_IA_EnviroResourcesTeachers.php
Contact: chad.heinzel@uni.edu , (319)-273-6168

Learning objectives

A. Discover Iowa's bedrock resources and their applications towards the our civilization's sustainability
B. Investigate, learn and apply knowledge of Iowa's surficial sediments and soils as they pertain to agriculture and our daily lives
C. Explore and learn processes related to Iowa's air quality (outdoor and indoor).
D. Understand the origins, pathways and mitigation of lead and other contaminants in Iowa's water resources.

Course Description –
EarthSci6233 - Introduction to the interactions and relationships between humans and natural resources: air, stone, clay, soil and water in beautiful Iowa ☺

Session 1 Iowa's geology history
March 11 Foundation concepts

Session 2 Iowa's bedrock
March 25 Aggregate, Sand/gravel, Metals and Energy Mining

Session 3 Sediments and Soils
April 8 The past 2 million years, relating to Iowa's current agricultural successes and imposing environmental hazards.

Session 4 Air and Water Quality in Iowa: Contamination to Recreation
April 22

Summer workshop – June 23-26 (Monday to Thursday), *Subject to change*

June 23 – Aggregate, sediment and soil resources: field work and laboratory safety
June 24 – U of I – Environmental Engineering, Iowa Geological Survey and IIHR – Aggregate and Metals mining – Environmental hazards and solutions
June 25 – Aggregate laboratories (chemical and physical), Maquoketa Caves, Dunes, and Agriculture
June 26 – Applied geochemistry and laboratory work at UNI

Grading

Course work	points
Homework	
Session 1	20
Session 2	20
Session 3	20
Session 4	20
Field work	
4 days of participation	40
June 10 activity	20
June 11 activity	20
June 12 activity	20
June 13 activity	20
Reflection/Summary	40
	240 points

Approx. grade distribution

X>220 = A X>200 = B X>170 = C

Class Attendance and Participation

Course questions will reflect and cover class 1) discussions, 2) field and lab activities, 3) text/journal readings, and 4) small group activities. https://policies.uni.edu/306).

UNI – All Statements for Student Success

UNI Information and regulations regarding Free Speech, Equity, Accessibility, The Learning Center and should be accessed here… https://provost.uni.edu/syllabus-statements

Additional recommendations from UNI's Center for Excellence in Teaching & Learning

Course materials, accessibility and opportunities for enhanced success

a. Textbook – We will use journal articles and handouts.

b. Computers and data – For the online portion you will need access to a computer, a good internet connection and headphones with mic capabilities.

c. Field trips – Our summer course will be a series of field trips.

d. Course webpage – You will have access to some course materials and additional learning resources through the following webpage - https://www.exploreiowageology.org/UNI_IA_EnviroResourcesTeachers.php

Pro-Tips for doing well in this class

1. Engage the content material before coming to the weekly discussions.
2. Participate in activities and discussions, ask a lot of questions ☺
3. If you have to miss a class please let me know ahead of time.
4. You will need to work, read, research and plan approximately 60 hours on your own time to complete the course work and learning opportunities.

Summer course

Due to grant to the Iowa Limestone Producers Association, you are getting reduced tuition and free lodging, field trip transportation and most of your summer course food paid for…

Required Items that you need to bring

One pair of close-toed shoes, water bottle, a pair of pants, one long sleeved shirt notebook, about 15 pages of loose-leaf/lined paper, pencils, water gear e.g. sandals, shorts, change of clothes Suggested items Personal snacks, sun hat, sunscreen, bug/tick spray, portable coffee mug if you like to drink coffee during the day.

Geology's 'Big ideas'

BIG IDEA 1. Geologists use repeatable observations & testable ideas to understand & explain our planet.

1.1 **Earth scientists find solutions to society's needs.** Earth scientists work on challenging problems that face humanity on topics such as climate change and human impacts on Earth. Earth scientists successfully predict hazards to humans and locate and recover natural resources, making possible the flourishing of humans on Earth.

BIG IDEA 2. Earth is 4.6 billion years old.

2.1 Earth's rocks and other materials provide a record of its history. Earth scientists use the structure, sequence, and properties of rocks, sediments, and fossils to reconstruct events in Earth's history. Decay rates of radioactive elements are the primary means of obtaining numerical ages of rocks and organic remains. Understanding geologic processes active in the modern world is crucial to interpreting Earth's past.

BIG IDEA 3. Earth is a complex system of interacting rock, water, air, and life.

3.1 The four major systems of Earth are the geosphere, hydrosphere, atmosphere, and biosphere. The geosphere includes a metallic core, solid and molten rock, soil, and sediments. The atmosphere is the envelope of gas surrounding Earth. The hydrosphere includes the ice, water vapor, and liquid water in the atmosphere, the ocean, lakes, streams, soils, and groundwater. The biosphere includes Earth's life, which can be found in many parts of the geosphere, hydrosphere, and atmosphere. Humans are part of the biosphere, and human activities have important impacts on all four spheres.

BIG IDEA 4. Earth is continuously changing.

4.1 Earth's geosphere changes through geological, hydrological, physical, chemical, and biological processes that are explained by universal laws. These changes can be small or large, continuous or sporadic, and gradual or catastrophic.

BIG IDEA 5. Earth is the water planet.

5.1 Water is found everywhere on Earth, from the heights of the atmosphere to the depths of the mantle. Early in Earth's history, surface water accumulated through both out-gassing from its interior and the capture of some extraterrestrial ice. Water vapor in the atmosphere condensed and rained out as the planet cooled.

BIG IDEA 6. Life evolves on a dynamic Earth and continuously modifies Earth.

6.1 Fossils are the preserved evidence of ancient life. Fossils document the presence of life early in Earth's history and the subsequent evolution of life over billions of years.

BIG IDEA 7. Humans depend on Earth for resources.

7.1 Earth is our home; its resources mold civilizations, drive human exploration, and inspire human endeavors that include art, literature, and science. We depend upon Earth for sustenance, comfort, places to live and play, and spiritual inspiration.

BIG IDEA 8. Natural hazards pose risks to humans.

8.1 Natural hazards result from natural Earth processes.
These hazards include earthquakes, tsunamis, hurricanes, floods, droughts, landslides, volcanic eruptions, extreme weather, lightning-induced fires, sinkholes, coastal erosion, and comet and asteroid impacts.

BIG IDEA 9. Humans significantly alter the Earth.

9.1 Human activities significantly change the rates of many of Earth's surface processes. Humankind has become a geological agent that must be taken into account equally with natural processes in any attempt to understand the workings of Earth's systems. As human populations and per capita consumption of natural resources increase, so do our impacts on Earth's systems.

Climate Principles –

Principle #1 Humans can take actions to reduce climate change and its impacts.

Actions taken by individuals, communities, states, and countries all influence climate. Practices and policies followed in homes, schools, businesses, and governments can affect climate. Climate-related decisions made by one generation can provide opportunities as well as limit the range of possibilities open to the next generation. Steps toward reducing the impact of climate change may influence the present generation by providing other benefits such as improved public health infrastructure and sustainable built environments.

Principle #2 The Sun is the primary source of energy for Earth's climate system.

Sunlight reaching the Earth can heat the land, ocean, and atmosphere. Some of that sunlight is reflected back to space by the surface, clouds, or ice. Much of the sunlight that reaches Earth is absorbed and warms the planet.

Principle #3 Climate is regulated by complex interactions among components of the Earth system.

Earth's climate is influenced by interactions involving the Sun, ocean, atmosphere, clouds, ice, land, and life. Climate varies by region as a result of local differences in these interactions.

Principle #4 Life on Earth depends on, is shaped by, and affects climate.

Individual organisms survive within specific ranges of temperature, precipitation, humidity, and sunlight. Organisms exposed to climate conditions outside their normal range must adapt or migrate, or they will perish.

Principle #5 Climate varies over space and time through both natural and man-made processes.

Climate is determined by the long-term pattern of temperature and precipitation averages and extremes at a location. Climate descriptions can refer to areas that are local, regional, or global in extent. Climate can be described for different time intervals, such as decades, years, seasons, months, or specific dates of the year.

Principle #6 Our understanding of the climate system is improved through observations, theoretical studies, and modeling.

The components and processes of Earth's climate system are subject to the same physical laws as the rest of the Universe. Therefore, the behavior of the climate system can be understood and predicted through careful, systematic study.

Principle #7 Human activities are impacting the climate system.

The overwhelming consensus of scientific studies on climate indicates that most of the observed increase in global average temperatures since the latter part of the 20th century is very likely due to human activities, primarily from increases in greenhouse gas concentrations resulting from the burning of fossil fuels.

Principle #8 Climate change will have consequences for the Earth system and human lives.

Incidents of extreme weather are projected to increase as a result of climate change. Many locations will see a substantial increase in the number of heat waves they experience per year and a likely decrease in episodes of severe cold. Precipitation events are expected to become less frequent but more intense in many areas, and droughts will be more frequent and severe in areas where average precipitation is projected to decrease.

Source materials =
Geology – www.earthscienceliteracy.org
Climate – www.cleanet.org