Course Description and Purpose

Introduction to Minnesota's geological history focusing on such topics as: Minnesota's rock record and history, fossils, mining, soils, lakes, rivers, and ground water. Lecture; no laboratory.

Minnesota's Rocks and Waters is a three-credit large-section introductory level course that satisfies the university studies requirement in the natural sciences (non-lab component). Students in this course will explore the bedrock and landscapes of Minnesota in order to understand

1. The way external and internal geologic processes work
2. The way geologic processes have operated through time to create the bedrock and landscapes of Minnesota

Each student will gain an understanding and awareness of the complexity and interrelatedness of geologic processes, and how these processes have created the geology of Minnesota.

Warmups, Instructional plan and Course Policies

GEOS 100 meets in three discussion/lecture sessions per week. There is no laboratory. Discussion/lecture sessions will be supplemented with audio-visual materials in an effort to bring field examples into the classroom. In addition to formal lecture and lab meetings, there will be an optional discussion section meeting that will be directed by Nichole Schoolmeesters, the SI instructor for the course.

Assignments and warmups

It is very important that you thoroughly read the assigned material on the web and in the text before each meeting in order to better understand and participate in the discussions and lectures. I have also placed several books on
reserve in the main library for your reference. One in particular, "Minnesota's Geology" by Ojankangas and Matsch, will be especially useful.

For many class periods, students will be assigned a "warm-up" exercise, to be completed and submitted using D2L. Check D2L and the course web page often so that you don't miss one of these important assignments.

Most warmups include one essay and two multiple-choice or multiple answer questions, and occasionally, true false questions. Students will receive credit for completing the "warm-ups", which will count 15% of the course grade. Each warm-up must be submitted by 12 a.m. the day of the class meeting for which it is assigned, or no credit will be given.

We will use D2L to complete and submit each warmup. If you have difficulties with D2L, please do NOT contact me. Instead, email elearning@winona.edu.

Warmups will indicate the main concepts or ideas that I am trying to get across in the lecture sessions. Completing them diligently will make the lectures more understandable, and will familiarize you with the style of questions that I often ask on exams.

In addition, all warm-ups will be read prior to our class meeting and I will then address misconceptions that emerge from the warm-ups in class. Remember that the warm-ups are your opportunity to influence the course of each classroom meeting. Read the section on warmups on our course web page for more information.

Students receive credit for all honest attempts at completing warmups. An honest attempt means that all questions must be answered, and for the essay questions, you must address EACH part of the question to receive credit. So read and answer the essay questions carefully! The statement on academic honesty, reviewed below, will apply to these assignments.

Supplemental Instruction: We are very fortunate to have a supplemental instruction program as a part of this course. The "SI' this semester is Nicole Schoolmeesters (NAschool2068@Winona.edu). Nicole will hold two SI sessions each week, and the times and places of the meetings will be given in our announcements section of the course web page. In the past, we know that SI attendees average grades that are 11% higher than non attendees, and 8% higher than the overall class average. It is to your benefit to make use of these sessions on a regular basis.
Classroom policies:

I expect your full attention in our lecture sessions. Don't bother to come to class if you aren't ready to learn. Don't waste my time and the time of your peers.

And I also expect that you will be courteous to me and to your peers. Consequently, talking out of turn, reading the newspaper or other materials, using your laptops to IM or to surf the web, and using cell phones for ANY purpose are strictly prohibited. If you persist in violating this principle, you will be asked to leave the lecture hall.

**Cell Phones** shall be turned off and stowed when you enter the lecture hall or laboratory. They may NOT be used for ANY reason while you are in class or lab.

**Instant messaging and web surfing** shall NOT take place during class or lab time. If I discover that you have been using IM or web surfing in class or lab, I will ask you to stop attending.

Course requirements

**Prerequisites:** This course is designed to stimulate your thinking *(outcomes a, b, c, f, g of the university studies summary, given at the end of the syllabus)*, but there are no prerequisite courses. If you can balance your checkbook, you can do all the math that will be required *(outcome c)*. I will expect you to understand and apply fundamental concepts *(outcomes a, b, c, e, f, g)*, in addition to learning content for exams. You should strive to achieve as complete and sound a scientific interpretation as possible by trying to integrate information across discrete chapters of the text.

**Study Groups:** Because scientific understanding does not usually progress in a vacuum—it is through discussions and arguments with colleagues that most advances stem—I encourage you to work in groups and to discuss your ideas and to work through confusing concepts with your classmates. One of the best ways to study and understand and learn is to form a small study group-quiz one another. Make up questions that you think I’d ask on the , and be certain you can answer them. If you can accurately explain a concept to your peers, then you can feel comfortable that you understand it. If you’re confused in doing this, you’re likely to be confused about the material. *(outcome d)*

**Attendance:** Attendance at discussion/lecture sessions is essential for succeeding in the course. My exams emphasize material from our lecture sessions!. Therefore, pay close
Attention and take good notes!

**Assignments:** Completion of all lecture exams with an average passing grade is required in order to receive credit for this course. We will use the web extensively in this course, including completion and submission of warmups on D2L, as well as for important background reading assignments.

Any written assignments that you may be asked to complete will not be accepted on papers torn out of notebooks; all assignments must be neat, legible, and on paper with clean edges. I will not repeat a lecture during office hours simply because you chose not to attend class. Videos shown in class will not be made available outside of class. Attendance and participation will most definitely affect the outcome of your performance, because without careful listening and note-taking, you will have no basis for success.

**Testing and Grading**

Four examinations will be given. Each exam will be announced one week in advance. The format of the exams will be entirely multiple choice and true false. Bring a narrow scantron, pencil and good eraser to each exam. The fourth exam will be given during the final examination period, and will emphasize the last segment of the course. However, approximately 1/3 to 1/4 of this fourth exam will also include material from the earlier portions of the course.

Exams will emphasize material discussed in lecture sessions and will draw upon the readings as supplemental material. Your regular attendance is therefore essential, and careful note-taking is required for success in this course.

Exams are announced one week in advance and students are obliged to take exams at the scheduled times. The obvious reason for the exam policy is fairness to the entire class. If you cannot abide by this policy, you should drop the course as soon as possible.

If you miss an exam, you are expected to take a make-up. Note that a penalty of 10% of the maximum points attainable per late day will be deducted from the score of those who miss an exam because of an unexcused absence. Examples of unexcused absences include but are not limited to: attendance at weddings, convenient rides home, oversleeping, and unpreparedness. Examples of excusable absences include verifiable illness and family emergency. For excused absences, prior notice must be given by contacting the instructor before the scheduled time of the examination. And written documentation verifying the necessity for the absence must be presented to the instructor before taking the makeup exam. For excused absences, you must take the test the following...
weekday of the emergency day, or the deduction penalty goes into effect. If you are in doubt of the status of a pending absence, discuss the matter with the instructor prior to the examination date. In the event that a snow-day falls on the same date as a scheduled exam, the exam will be given during the next class meeting following the snow day, so come prepared.

Dishonesty on an exam constitutes forfeiture of the exam grade. You will also be reported to university officials. During testing times, students are expected to sit as far from neighbors as possible and to keep their answers secure. Different versions of each exam will be distributed throughout the class to provide greater assurance of honest assessment.

No student will pass the course without completing all exams and achieving a passing average.

**Grading:**

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<thead>
<tr>
<th>Exam</th>
<th>Percentage</th>
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<tr>
<td>Exam 1</td>
<td>16%</td>
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<td>Exam 2</td>
<td>19%</td>
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<tr>
<td>Exam 3</td>
<td>23%</td>
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<tr>
<td>Exam 4</td>
<td>27%</td>
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<tr>
<td>Warmups</td>
<td>15%</td>
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**Grading scale:**
- A 80%- 
- B 70-79%
- C 60-69%
- D 50-59%
- E <50%

**The Date of the final Examination is Wednesday, April 30, 10:30 in room SLC 120**

**Academic honesty policy:**

Students who plagiarize warmups or laboratory work from other students or other sources, and students who are discovered cheating on exams are subject to the Academic Integrity Policy and Due Process Rights on pages 9-11 of [www.winona.edu/studentaffairs/conduct.htm](http://www.winona.edu/studentaffairs/conduct.htm).
Use of **cell phones or IM** or any other electronic devices including computers during an exam, no matter what your reason, will be considered cheating.

Cheating of any kind will result in a score of zero for that exam or assignment (which cannot be dropped in the computation of your final grade), and you will be reported to university authorities. If you discuss an assignment with someone else, you are both expected to write up your answers individually and in your own words. This is also the policy for warmups. It is a violation of academic honesty (in other words, cheating) to turn in answers copied from another student’s paper, even if you worked together to achieve the answer!

**Consultation**

You are urged to consult with me concerning questions and/or problems dealing with the course. My office is PA 126 and hours are posted on the door and in our announcements section of the web page. If these hours are in conflict with your schedule, please see me for an appointment. Do not wait until the latter part of the course to get help!

*Only if you get assistance early in the semester will I be able to assist you in maximizing your learning potential.*

**Disabilities**

If you have a physical or cognitive disability, please come talk to me as soon as possible so that we can discuss how best to accommodate your needs.

**Guidelines for surviving a large lecture class at WSU**

*Arrive on time!* The first five minutes of class are often the most important part of the entire lecture. I usually use them to discuss how the day’s topics fit into the broader goals of the course, and where the course is headed in the next few lectures. Important logistical information like homework assignments and items that will and won’t be on exams, are often discussed here as well. Everyone is unavoidably late now and then, but my experience is that most students who consistently arrive a few minutes late for the lecture also receive a poor final grade in the course.

*Assignments* - The course outline summarizes readings in the textbook and on the web. Assignments should be read before coming to class, so that more effective listening, individual and group participation, and note-taking can take place. Following class, notes
should be reviewed together with careful re-reading of the assignments. If this is done on a regular basis, performance will be enhanced. Classroom sessions will be more meaningful and discussion will be possible. Assignments will not generally be announced. You are responsible for following the course outline.

Course Web Page - Consult the course web page daily. There you will find our warmups, class announcements, assignments, links to web sites that provide additional study materials related to all aspects of the course, links to self-testing, and daily lessons for you to complete that illustrate the kinds of reasoning you are expected to achieve. Remember that your textbook does not provide information on geologic processes and geologic materials (rocks and minerals). The course web page has links to readings on these topics that should be completed faithfully and in a regular fashion. The web page also has lecture outlines and an outline of material in an out-of-print text on Minnesota geology. It is important that you read and study all of these materials to ensure success in the course.

D2L - We will use D2L as a means of completing and submitting the warmups.

Use email often - I expect you to use your winona.edu email to communicate with me and I with you.

Electronic mail has become the basic means of communication among scientists. I will use e-mail to communicate important information to the class. Messages will be sent to your winona.edu account, so you must read it often. You'll find that I answer most email messages and queries within a short period of time unless they are sent at night. Don't hesitate to ask questions this way. My email address is: jmeyers@winona.edu

Study for the exams mainly from your lecture notes and your warmups. The lectures, course web page, and book all cover somewhat different topics, at different levels of detail. It would be silly if it were otherwise: why do the same thing three times? My lectures excerpt that portion of the book and web readings that I feel is most important for the course. The main purpose of the book and web readings is to allow you to hear things in a different voice, quietly, at your own pace, to help you figure out puzzling things from the classes. It is essential that you take thorough and well-organized notes in class. Suggestions for good note-taking in this course are up on our course web page.

Consultation - I will be available for consultation throughout the semester and you are urged to keep in touch, especially if you are having difficulty. Office hours are posted on my door (PA 126). If these hours are in conflict with your schedule, please make other arrangements with me. My telephone extension is 5266 and e-mail is jmeyers@vax2.winona.edu
Course Outline

I. Introduction
   - A. Course mechanics
   - B. Geologic cycles and introduction to Earth's dynamic systems
      - geologic
      - hydrologic
      - tectonic
   - C. Minnesota's place in geologic history
   - C. Physiographic regions and general geology of Minnesota

II. Geologic time with examples from Minnesota's geology
   - A. Relative time and the geologic column
   - B. Absolute time and the geologic time scale

III. Minnesota during Precambrian time
   - A. Archean - the building of Kenoraland
      1. Canadian shield
      2. Early crustal rocks and the Morton gneiss
      3. Sedimentary sequences, granite intrusions and Precambrian mountain ranges - prepare geologic map and use cross section
   - B. Early Proterozoic - the making of Laurentia and the Penokean mountain building episode
      1. Sandy beaches and iron formations - mineral resources of the north
      2. More ancient mountain ranges
   - C. Late Proterozoic - failed rifting of the continent
      1. Destruction of the Penokean Mountains and formation of Precambrian beaches - the Sioux Quartzite and Pipestone Nat'l Mon.
      2. Rifting of North America,
         a. the Duluth Gabbro and North Shore Volcanics - formation of ocean crust
         b. deposition of sediment - organic shales

IV. Minnesota during Phanerozoic time
   - A. Paleozoic stable continents, interior basins, and rising sea levels - the seas came in and the seas went out
      1. Cambro-Ordovician sandstones and limestones
      2. Cambro-Ordovician fossils
   - B. Mesozoic foreland basin, marine flooding, and marine life
   - C. Cenozoic
      1. The great Ice Age
         a. Glaciers and glaciation
b. Glacial chronology

c. Minnesota’s glacial lobes and physiography

d. Glacial Lake Warren and the Red River Valley

e. Torrents of the Minnesota and Mississippi Rivers, drainage changes and river terraces

f. Resources related to glacial deposition

2. Holocene

a. Weathering, mass wasting, streams and stream erosion

b. Stream erosion and the landscape

c. Drainage systems of Minnesota

d. Ground water in SE Minnesota and water resources

e. Great Lakes beaches and shorelines

f. Bogs and wetlands

Texts


Course Web Page, and other web resources, including a series of pamphlets from the Minnesota Geologic Survey dealing with various aspects of Minnesota Geology (available for download on our course web page in PDF format).

University Studies Program and GEOS 100

The purpose of the Natural Science requirement in the University Studies program is to provide students with the tools to understand and be able to apply the methods by which scientific inquiry increases our understanding of the natural world. GEOS 100 is an introductory 3-credit general-education course offered in mega-section lecture format. The course addresses the major themes and outcomes of the Natural Science category non-laboratory option.

These courses must include requirements and learning activities that promote students’ abilities to...

a. understand how scientists approach and solve problems in the natural sciences;

Students are given ample opportunity to understand how scientists approach and solve problems relevant to physical and historical geology, with a focus on Minnesota’s rocks and waters. Students are taught the scientific method, and are asked each day to apply that...
method to understanding problems at the introductory level in the geosciences. They are also taught the unique methods employed in interpreting and solving geologic problems. This is accomplished by studying how geologists have made and continue to make observations and collect data related to understanding the evolution of the geology of a particular area (Minnesota). We then use these observations to pose questions regarding Minnesota geology. These questions in turn suggest multiple-working hypotheses or explanations that are tested by continuing to gather more observations and data, and retaining those explanations that are most consistent with the observations.

b. apply those methods to solve problems that arise in the natural sciences;
Throughout the semester, students are presented with realistic problems in Minnesota's geology. Students are challenged to apply concepts learned in class to solve these problems and make predictions about the processes that have formed the rocks and the landscape of this region. Problem-solving activities range from short, in-class questions, to problem-sets assigned as homework, especially on the course web page. The problems are necessarily simplified when compared to those that face practicing geologists today, because this is an introductory general-education course with no prerequisites (particularly in mathematics and the allied sciences). However, given the level of the course, they are realistic problems that raise students' awareness of issues relevant to the discipline. Students are additionally asked to solve problems on exams.

c. use inductive reasoning, mathematics, or statistics to solve problems in natural science;
Students are given problems in this course that require them to work with simple mathematical relations. Such applications will be especially emphasized during our study of rates of weathering and erosion of Minnesota's bedrock, and equilibrium in river flow. In addition to mathematical reasoning, students are asked to make almost daily use of inductive reasoning to solve realistic geologic problems related to Minnesota geology. After learning about geologic concepts and the way the earth works, students are presented with real data and observations from Minnesota's bedrock and landscapes, often times from the web. They are then asked to think through solutions based on these observations and processes.

d. engage in independent and collaborative learning;
Students in Minnesota's Rocks and Waters will use both independent thinking and collaborative learning to understand how geologic processes affect Minnesota's bedrock and landscapes at the present time, and in turn, back through geologic time. Collaborative learning will take place in the, even though the lecture is delivered to a mega-section. Students will break out into small groups to address problem solving in all the major topical areas of the course. However, the ultimate responsibility for reaching scientific conclusions from observations and data analysis lies, however, with the individual student.
Independent learning is ensured by assigned activities and in-class exams. In addition, the course web page provides daily lessons for each student to complete prior to class. These lessons illustrate the sorts of thinking that students are expected to achieve related to the topic at hand.

e. identify, find, and use the tools of information science as it relates to natural science:
Students in Minnesota’s Rocks and Waters will identify, find, and use the tools of information science relating to our study of the geologic evolution of the state. Individual and group assignments are made that require students to use the web and library databases to research selected problems and to prepare short written reports on the results of their work. These reports will be submitted to the instructor via e-mail. The course web page provides students with tools to search the web for pertinent information on all aspects of the course.

f. critically evaluate both source and content of scientific information; and
Students in this course are presented large amount of information on Minnesota’s geology. Some of these data are potentially conflicting. Students must sort through the information, and by applying the scientific method, come to a reasonable interpretation of the data. One good example is conflicting views regarding interpretation of the oldest parts of Minnesota’s rock record in the Canadian Shield of the northern part of the state. Conflicting data are evaluated to give students a better sense of how scientific data are processed.

g. recognize and correct scientific misconceptions.
One of the main goals of this course is to help students recognize and correct the misconceptions they hold regarding geology and the evolution of Minnesota’s rocks and landscapes. Misconceptions addressed range from misunderstanding of the ways in which glaciers transport and deposit sediment, to the role of plate tectonics in the development of the Precambrian bedrock of Minnesota. Demonstrations or explanations are used whenever possible to force students to recognize and confront their misconceptions; these are followed by class activities designed to help students overcome and replace these misconceptions with accurate representations of scientific concepts.

University Studies Outcomes

The purpose of the Natural Science requirement in the University Studies program is to provide students with the tools to understand and be able to apply the methods by which scientific inquiry increases our understanding of the natural world. These courses must include requirements and learning activities that promote students' abilities to...
a. understand how scientists approach and solve problems in the natural sciences;
b. apply those methods to solve problems that arise in the natural sciences;
c. use inductive reasoning, mathematics, or statistics to solve problems in natural science;
d. engage in independent and collaborative learning;
e. identify, find, and use the tools of information science as it relates to natural science;
f. critically evaluate both source and content of scientific information; and

g. recognize and correct scientific misconceptions.

Course activities described throughout the remainder of this syllabus will be coded to the above list of outcomes by the corresponding letter. These outcomes will be integrated throughout course content each new topic will be presented in a manner in which the student will be able to understand and apply the methods by which scientists approach and solve problems in the natural sciences, using inductive reasoning or mathematics (outcomes a-c). Common scientific misconceptions will be identified at the start of each topic, and class material will be directed toward correcting those misconceptions (outcome g). You will be asked to work collaboratively on certain in-class activities and independently on homework and exams (outcome d). In-class and homework assignments will require that you work with the internet, course web site, and other sources to critically evaluate scientific information as it relates to Minnesota's geology (outcomes e, f).