

GEOLOGY 306 - SOIL SCIENCE SPRING 2024

PREREQUISITE	GEOL 101 and CHEM 103, or CHEM 211, or similar
CLASS MEETS	<p>Tuesday 4:30 p.m. to 7:10 p.m.</p> <p>Exploratory Hall, 1005</p> <p>IN ADDITION: Mini lectures online.</p>
INSTRUCTOR	<p>Dr. Julia Nord, 3453 Exploratory Hall</p> <p>Email Address - jnord@gmu.edu</p>
OFFICE HOURS	Tuesday 4:00 p.m - 4:30 p.m. and 7:15 p.m. to 8:00 p.m. and by appointment
TEXT	<p>Soil Science Simplified (SSS). 5th edition preferred. by Donald P. Franzmeier, William W. McFee, John G. Graveel and Helmut Kohnke. ISBN-13: 978-1478629078 ISBN-10: 147862907X</p> <p style="text-align: center;">Selected Readings will be assigned.</p> <p style="text-align: center;">FOR FIELD WORK Field Book for Describing and Sampling Soils, Version 3.0 U.S. GOVERNMENT BOOKSTORE.</p> <p style="text-align: center;">For the USDA Pamunkey Soil https://soilseries.sc.egov.usda.gov/OSD_Docs/P/PAMUNKEY.html</p> <p style="text-align: center;">Web Soil Survey https://http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm</p>
EXAMS	<p>All exams must be taken as assigned</p> <p>Make-up exams will only be allowed in exceptional and documented circumstances.</p>
MULTITASKING	<p>Recent research shows that humans are not good at multitasking, in fact several peer reviewed journals state that multitasking results in poorer learning and poorer performance. Please refrain from using phones and computers for text messages, Facebook, internet searching, shopping, IM and other related activities. IF we do not know the answer to a question as a group we can look it up during the break and have a discussion.</p> <p style="text-align: center;">If you use a computer for note taking please do not use it for other purposes.</p> <p style="text-align: center;">IF you still want to multitask please sit on the back row, or where no-one else can see your screen.</p> <p>Does multitasking in the classroom affect learning outcomes? A naturalistic study. Computers in Human Behavior (2020)</p> <p>In-class multitasking and academic performance Computers in Human Behavior (2012)</p> <p>Multitasking in the University Classroom. International Journal for the Scholarship of Teaching and Learning (July 2012)</p> <p style="text-align: center;">Students are Better Off without a Laptop in the Classroom Scientific American. July 2017</p> <p style="text-align: center;">Computer Multitasking in the Classroom: Reduced Learning versus Modern Living ACM Interactions. 2020</p>
ACADEMIC INTEGRITY	<p>Mason is an Honor Code University; please see the Office for Academic Integrity for a full description of the code and the honor committee process. HONOR CODE.</p> <p style="text-align: center;">Some key parts paraphrased from Mason's Honor code and the Center for Teaching and Faculty Excellence</p> <p>The integrity of the University community is affected by the individual choices made by each of us. Mason's Honor Code has clear guidelines regarding academic integrity. There are three fundamental principles to follow at all times: (1) all work submitted must be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification.</p> <p>Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA, APA or discipline based format.</p> <p>A number of projects in this class are designed to be completed within your study group. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product.</p> <p>Some projects are designed to be undertaken independently. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.</p> <p style="text-align: center;">http://ctfe.gmu.edu/teaching/designing-your-syllabus/</p>

DISABILITY ACCOMMODATIONS	<p>If you have a documented learning disability or other condition that may affect academic performance you should:</p> <ol style="list-style-type: none"> 1) make sure this documentation is on file with Office of Disability Services (SUB I, Rm. 4205; 993-2474; http://ods.gmu.edu) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.
BASIC NEEDS ACCOMMODATIONS	<p>It can be challenging to do your best in class if you have trouble meeting basic needs like safe shelter, sleep, and nutrition. If you have difficulty affording groceries, accessing sufficient food to eat daily, or lack a safe and stable place to live, I urge you to contact Student Support and Advocacy Center at 703.993.3686 and https://ulife.gmu.edu/get-help/pop-up-pantry/</p>
RECORDING OF LECTURES	<p>PLEASE NOTE: The opinions I express in this class are not necessarily the ones I personally hold. I may make statements to elicit a response.</p> <p>If you are recording the class, the opinions of other class members must not be played back to anyone outside of the classroom</p>
OSCAR Students as Scholars Inquiry-level course	<p>"This class is identified as a Scholarship Level, Mason Impact (MI) Course. Students engage in "Synthesis of information from a variety of sources to form a new explanation or exploration of a concept or event"</p> <p>This course is designed to introduce you to academic-level scholarly inquiry, and give you some of the the skills to ask good research questions and find the resources to answer those questions. In this class our resources will be field work and peer reviewed literature.</p> <p>Scholarly Inquiry courses must address both of the following elements:</p> <ol style="list-style-type: none"> 1. Articulate and refine a scholarly question. 2. Follow ethical principles. <p style="text-align: center;">and</p> <ol style="list-style-type: none"> 3. Communicate this knowledge. <p>And, address at least one of the following elements:</p> <ol style="list-style-type: none"> 3a. Choose an appropriate discovery process for scholarly inquiry. 3b. Gather evidence appropriate to the question. 3c. Apply appropriate scholarly conventions during scholarly inquiry. 3d. Apply appropriate scholarly conventions when reporting or performing. <p>And, address at least one of the following elements:</p> <ol style="list-style-type: none"> 4a. Assess the validity of key assumptions and evidence. 4b. Situate the scholarly inquiry within a broader context. <p style="text-align: center;">https://provost.gmu.edu/academics/undergraduate-education/mason-impact/mason-impact-students</p>
Course Goals:	<p>Provide an introduction to the physical, chemical, and biotic properties of soils.</p> <p>Discuss issues relating to soil quality, soil stewardship, and the problems of providing food for our growing population. Soils are becoming a scarce resource.</p> <p>Understand how soils form and support life. Without soil, the earth's surface would be barren rock or sand, silt, clay and gravel. Soil is a biologically active zone where sunlight, water, the atmosphere, and living things mix and interact with the Earth's rocks and minerals.</p> <p>Understand the complexity of soils. Soil is constantly altering its composition in response to changing conditions. It supports a host of interdependent communities of living things which survive by endlessly exchanging energy and chemical resources (minerals, elements, nutrients etc).</p> <p>Work with the USDA soil classification scheme, including soil mapping, and how soil is used as a resource for agriculture, building sites, landfills, septic systems, and water (quality, availability and movement). Be able to read and understand USDA profile descriptions. A knowledge of soils is necessary for site assessment, urban and regional planning, and pollution mitigation.</p> <p>Describe a soil profile in the field using the correct protocols.</p> <p>Appreciate that poor soil stewardship resulted in the demise of many civilizations - and it is still uncertain how well soils will be able to support a growing, hungry population, now over 8 billion. The generation of dust from soil erosion is linked to increased cases of human disease, coral death, red tides, drought, and the end of the Ice Age. Dust is even implicated in the demise of the dinosaurs. Soil interactions are also very important in the investigation of long-term Global Climate change.</p>
Your Goals	<p>Take some time over the next week to write your goals here.</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p> <p style="text-align: center;">.</p>
My peers	<p>Write down contact information for 2 of your fellow students here.</p> <p style="text-align: center;">.</p>

COURSE SCHEDULE

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DATE & Assignments	TOPICS	READINGS
Jan. 16 Tuesday Week 1 Assignment #1 Rocks and their Minerals Use your physical geology / Intro text, or your notes. View the online lectures - geology review Complete forms. Due. Jan. 23rd, on the BB site, or a hard-copy in class	What is soil? Four constituents of soil - water, air, minerals (all non-organic) and life (organic) Soils and their uses. Syllabus Discussion. Pamunkey Soil 4 soil forming processes Soil Taxonomy #1 Online Lectures: Geology Review (rock cycle, igneous, sedimentary and metamorphic rocks).	SSS (text) Chapter 1 What is soil? https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054280 Soil Processes. https://processes.soilweb.ca/soil-processes/ To understand the range of disciplines intertwined with soil science look at these 2 sites http://en.wikipedia.org/wiki/Soil_science REMEMBER - Wiki is NOT peer reviewed. However this is a pretty good summary and I have checked it. Soil Taxonomy. Twelve orders. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054277 What makes Good Garden Soil by John Mertus. This is a very good summary. The PDF is on the BB site - week 1. This material will be complex now. You will be able to read more and more of this summary as you learn over this semester.
Jan 23. Tuesday Week 2 Assignment #2 Weathering Due. Jan. 30, on the BB site, or a hard-copy in class	Introduction to the 5 soil forming factors. CLORPT CL imate O rganics R elief (topography) P arental Material T ime Weathering	SSS (text) p. 61-63 and 5-13, 5 soil forming factors. Virginia Site and Soil Evaluation Curriculum : Chapter 1. Introduction. p. 1-4 to 1-14. Chapter 1 pages 1-14 to 1-16 for the 4 Soil Forming Processes. Click link to "Soil Formation and Classification"
Jan 30 Tuesday Week 3 Assignment #3 Texture, Color etc. Due. Feb 6, on the BB site, or a hard-copy in class	Soil formation. Soil profile. O, A, E, B, C, R Introduction to the physical properties of soils.	SSS (text) 63-69, Chapter 6. https://www.youtube.com/watch?v=mq7XSjcnZQM https://www.soils.org/about-soils/basics/ https://stormwater.pca.state.mn.us/index.php?title=Soil_physical_properties_and_processes
Feb. 6 Tuesday Week 4 Assignment #4 Cation Exchange Capacity Due. Feb 13, on the BB site, or a hard-copy in class	Cation Exchange Capacity (CEC) Products of Weathering. Clay minerals. Soil colloids.	SSS (text) p. 13-21. https://www.srs.fs.usda.gov/pubs/ja/ja_barton002.pdf http://www.soilquality.org.au/factsheets/cation-exchange-capacity Cation Exchange
Feb 13 Tuesday Week 5 No Assignment	Soils and Climate Soils aeration Soil temperature Soil drainage Soil Taxonomy #2 More detail of the 12 soil orders.	SSS (text) Chapter 4. Soils and Climate Climate - Soils USDA soil taxonomy 12 Soil Orders

<p>Feb 20. Tuesday Week 6</p> <p>Assignment #5 Taxonomy</p> <p>Due. Feb 27, on the BB site, or a hard-copy in class</p>	<p>TEST 1. 4:30 - 6:00</p> <p>6:15. Testing for Soil Color and Texture We will look at a soil profile in class and identify the color and the texture of each horizon. You will get your hands "soily".</p>	<p>Reading: What makes Good Garden Soil by John Mertus on BB site.</p>
<p>Feb 27. Tuesday Week 7</p> <p>Assignment #6. Water movement in soils</p> <p>Due Feb 27. We will complete this in class</p>	<p>Soil water Hydrological Cycle Soil solution and plants. Chemical processes - leaching, oxidation etc</p>	<p>SSS (text) Chapter 4 and 5 (revisited)</p> <p>Water movement in soils</p> <p>Soil and Water FAO (Food and Agriculture Organization of the United Nations)</p> <p>Cohesion and adhesion of water</p>
<p>March 5.</p>	<p>SPRING BREAK</p>	
<p>March 12 Tuesday Week 8</p> <p>Class assignment #7 Organic Material</p> <p>Due March 19.</p>	<p>Soil Morphology. Carbon Cycle. Soil organic matter (SOM) Soil organic matter (SOM) Organisms and their residues</p>	<p>SSS (text) chapter 3, 6 and 7 revisited. Chapter 8.</p> <p>Watch: Video with Ryan Reed, Professional Soil scientist. Describing soils in the field.</p> <p>Determining soil texture by Feel</p> <p>Soil sampling techniques</p> <p>Describing Soil Profiles</p> <p>How to collect a Soil Sample</p> <p>Describing a Soil</p>
<p>SATURDAY March 16th</p> <p>Algonkian Park field trip 9:00 a.m. - 2:00 p.m.</p> <p>OR</p> <p>SUNDAY March 17th Algonkian Park field trip 12:00 noon - 5:00 p.m.</p>	<p>Describing soils in the field. Algonkian Park by the Potomac River, Sterling, VA.</p>	<p>What to bring - will be added here.</p>
<p>March 19 Tuesday Week 9</p> <p>Class assignment #8 Detailed soil descriptions</p> <p>Due in class.</p>	<p>Discuss project</p> <p>Nitrogen Cycle Soil Taxonomy #3</p>	<p>SSS (text) Chapters 9 and 10.</p> <p>What is the nitrogen cycle?</p> <p>Why Soil Organic Matter Is So Important</p>
<p>SATURDAY March 23rd</p> <p>Project data collection Day Approximately 3-4 hours in the field</p> <p>OR</p> <p>SUNDAY March 24th Project data collection Day Approximately 3-4 hours in the field.Y</p>	<p>Group Project - Data Collection</p> <p>Describing soils in the field. What to bring etc. will be discussed in class.</p>	

March 26 Tuesday Week 10 Dr Nord in UK	Time to work on project. Summarize goals. Find a method - agreed by all in your team - to present the soil profile and data. I will be in the BB classroom for questions. I will schedule a meeting time with each team.	
April 2 Tuesday Week 11 Dr Nord in UK Class assignment #9 Hope in a Changing Climate	TEST 2 Movie: Hope in a Changing Climate Hope in a Changing Climate	
April 9 Tuesday Week 12	Nutrients Other Macro elements. Sulfur, Phosphorous and Potassium. Online lectures. Micronutrients Nutrient management.	SSS (text) Chapter 10. Sulfur and Zinc: The Unsung Heroes of Soil Fertility Nutrient management Soil phosphorous Soil Factors That Influence Micronutrients Availability
April 16 Tuesday Week 13	Presentations. Project paper due in class today	
April 23. Tuesday Week 14	USLE Soils and erosion	SSS (text) Chapter 12 Universal Soil Loss Equation (USLE)
April 30 Tuesday	Reading Day	
May 7 Tuesday	Final	

GRADING

Test 1	15%
Test 2	15%
Final Exam	22%
Group Project & Presentations	20%
8 best assignments	24%
Field Trips	4% You must attend the field trip as preparation for the final project You must participate in the final project Occasionally the final project has been done at a different time - if - all team members agree. Dr. Nord in UK April 3-15