GENERAL COURSE OBJECTIVES AND OUTCOMES
1. Understand “Soil” as a natural body and about the factors of soil formation that determine its properties.
2. Develop an understanding of the physical, chemical, and biological properties of soils.
3. Investigate relationships between physical, chemical, and biological properties of soils, particularly as they affect plant growth, environmental pollution, and other land uses.
4. Gain an awareness of the importance of soils in the world ecosystem.


SCHEDULE OF INSTRUCTORS

<table>
<thead>
<tr>
<th>TIME &amp; LOCATION</th>
<th>INSTRUCTOR</th>
<th>OFFICE</th>
<th>Email</th>
</tr>
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<tbody>
<tr>
<td>Mon 2:00-4:50, VSC 103</td>
<td>Dr. Tom Wilson</td>
<td>Saguaro Hall 313</td>
<td><a href="mailto:twilson@ag.arizona.edu">twilson@ag.arizona.edu</a></td>
</tr>
<tr>
<td>Tues 11:00-1:50, VSC 103</td>
<td>Cassandra Fausel</td>
<td>Shantz 429</td>
<td><a href="mailto:cfausel@email.arizona.edu">cfausel@email.arizona.edu</a></td>
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<tr>
<td>Tues 2:00-4:50 VSC 103</td>
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Office Hours: Available for conference by appointment.

DETERMINATION OF COURSE GRADE

There will be 610 total points possible in this class: a Problem Set worth 20 points, Prelabs worth 110 points, Laboratory Reports worth 330 points, and two Evaluations worth 150 points. Each 10 point prelab is due at the beginning of each lab period, while each 30 point lab report is due at the beginning of the next lab period. Data for some labs will be sent to students by email throughout the semester; it is the student’s responsibility to regularly check email for this information. Late Prelabs are not accepted. There will be a grade penalty for turning in late lab reports as follows: 10% off if turned in the same week the lab was due; 25% off if one week late; 50% off if two weeks late. No lab reports will be accepted if more than two weeks late.

Do not miss a lab unless it is an emergency! It is your responsibility to check with the instructor to make up the missed lab or exam as soon as possible. The final grade will be assigned using these guidelines: A = ≥90%; B = 80%-89%; C = 70%-79%; D = 60%-69%; F = <60%.

ASSIGNMENTS

PRELABS. (10 points each, due at BEGINNING of lab, no makeup possible)

The Prelabs are brief experimental summaries designed to give the student the opportunity to demonstrate that she/he has examined the introductory material for the lab experiment BEFORE the experiment is conducted. This allows the experiment to be conducted more efficiently, and ensures that the student is able to make detailed observations of the experimental results. Each Prelab should one double-spaced typed page, and consists of:

A) Introduction. One paragraph that explains why the experiment is important, and includes a statement of lab objectives and a prediction of the results.
B) Experimental Methods. A brief description of the methods used. This should not be a duplicate of the description in the Lab Manual, or of another student’s Prelab.

LABORATORY REPORTS (30 points each, due at beginning of following lab)

These reports include a printout of data associated with each lab (or an electronic version submitted to D2L), and answers to the questions about the lab exercise. Typed reports are strongly encouraged. While students will work in groups to collect data, all interpretations of the data displayed in your answers should be independently reached. Do not work together to answer the questions!
SPECIAL NEEDS AND ACCOMMODATIONS

Students who need special accommodation or services should contact the Disability Resources Center, 1224 East Lowell Street, Tucson, AZ 85721, (520) 621-3268, FAX (520) 621-9423, email: uadrc@email.arizona.edu, http://drc.arizona.edu/ You must register and request that the Center or DRC and send me official notification of your accommodations needs as soon as possible. Please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate. *The need for accommodations must be documented by the appropriate office.*

STUDENT CODE OF ACADEMIC INTEGRITY AND CONDUCT

Students are encouraged to share intellectual views and discuss principles and the application of the course material. However, graded laboratory and homework exercises must be completed independently, except as noted by the instructor. The rules of student conduct as outlined by the University of Arizona will be followed. http://w3.arizona.edu/~dos/standards/standardsindex.html

For the policy regarding use of cell phones/pagers, refer to the Arizona Board of Regents’ Student Code of Conduct: http://dos.web.arizona.edu/uapolicies/sec5308abcd.html#sccphilosophy.

ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one’s self. See: http://policy.web.arizona.edu/~policy/threaten.shtml.

Confidentiality of Student Records

For policies regarding privacy of student records, please see the following: http://www.registrar.arizona.edu/ferpa/ferpa.htm
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<tr>
<th>DATE</th>
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<th>TOPIC</th>
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<td>Feb 3, 4</td>
<td>2</td>
<td>Soil Formation and Morphology, Web Soil Survey</td>
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<td>Feb 10, 11</td>
<td>3</td>
<td>Soil Morphology, Describing Four Pedons</td>
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<td>Soil Field Studies, Collect Soil Samples for Laboratory Analysis (field trip)</td>
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<td>Feb 24, 25</td>
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<td>Particle Size Analysis and Soil Survey Reports</td>
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<td>March 3, 4</td>
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<td>Soil Density and Porosity &amp; Tour of SWES Research Labs</td>
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<td>March 10, 11</td>
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<td>Soil Moisture and Temperature (field trip)</td>
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<td>Soil Colloids: Soil Chemical and Physical Characteristics</td>
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<td>Mar 31, Apr 1</td>
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<td>Evaluation I</td>
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<td>April 14, 15</td>
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<td>Soil Organisms and Soil Organic Matter</td>
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<td>Evaluation II</td>
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INTRODUCTION TO SOIL SCIENCE LABORATORY

I. LAB SAFETY

1. Safety Goggles
   Because of potential harm to your eyes due to splashed chemicals, broken glass, and other agents, you are required to wear goggles when experimental work involving the use of chemicals is being done in the laboratory. Goggles are provided.

2. Use of Chemicals
   Most of the laboratory experiments do not require use of toxic chemicals. However, some will require careful use of chemical reagents. If any chemical should spill on your skin or clothing, immediately wash the affected area with water and consult your instructor.

3. Waste Disposal and Cleanup
   All soils and chemical waste must go in the special containers placed on the lab benches. NEVER PUT CHEMICALS OR SOILS DOWN THE DRAIN. Alert the lab instructor if any glassware is broken. Used paper towels may be placed in regular garbage containers.

4. Clothing
   Students should wear clothes appropriate for lab and field studies. This includes proper shoes.

II. SCIENTIFIC METHOD

In any area of science, the role of the scientist is to critically evaluate ideas and information. Ideas and information must be shown to be valid and reliable through repeatable experiments and studies. Most scientists evaluate ideas and information through the scientific method. The scientific method is composed of three essential steps: 1) the collection of information through observation and measurement, 2) the formulation of a hypothesis that attempts to answer a question or explain an observation, and 3) the testing of the hypothesis through additional observations or careful experimentation.

A hypothesis is not a fact; it is meant to be tested, challenged, and refined as a result of experience. A good hypothesis will have two characteristics: it must account for all of the available data, and it must be able to be tested for accuracy. Testing of a hypothesis may involve collection of additional data or the designing of an experiment. An experiment typically involves an artificial situation in which all variables are controlled except for the one variable of interest. Experimentation requires very accurate and precise observations, and should be repeatable. Once the hypothesis has been tested, it is either supported by the new data determined experimentally, or is found to be invalid.

In this lab, students conduct experiments related to the basic principles about soils and their uses. Soils are a fundamental resource and students should understand about their properties and behavior. In order to manage and use them wisely, we must understand their internal organization and processes that keep them dynamic and productive. This task encompasses all scientific disciplines, making use of the concepts of force and potential (physics); atoms, ions, molecules, and colloids (chemistry); and enzymes and organisms (biology). Our goal is to provide hands-on exposure to the concepts presented in the lecture counterpart of this class, SWES 200.
LAB EXERCISE #1 (10 points)

The information on the following pages will prove helpful in completing this assignment. This exercise consists of two parts. Each part emphasizes statistical and computational techniques we will be using throughout the semester. The first part is an Excel spreadsheet containing data that you will receive via email. Calculate the mean, standard deviation, and coefficient of variation. For the second part, listed below, complete the necessary computations, show your calculations, and answer the questions. Please turn in both parts at the start of next week’s lab.

1. A football field is 120 yards in length (including the end zones) and 160 feet in width. Calculate the surface area of a football field and express your answer in the units requested. SHOW YOUR WORK in the space provided. (2 points)

   A football field is: 
   _______ square yards
   _______ square feet
   _______ square meters

   A football field is ______________ acres in size or ______________ hectares.

2. One bushel of wheat has a mass of 60 pounds. A farmer reported that his yield was 60 bushels per acre. Calculate the mass of this crop yield in the following units. SHOW YOUR WORK in the space provided. (2 points)

   ___________ Kilograms per Acre (Kg/Ac)
   ___________ Kilograms per Hectare (Kg/Ha)

3. Define the following terms: (2 points)

   Mega __________________________
   Kilo __________________________
   Centi __________________________
   Mill __________________________
   Mic __________________________

4. A soil sample has a weight or mass of 7.58 pounds. Calculate the equivalent mass: SHOW YOUR WORK in the space provided. (2 points)

   ___________ grams (g)
   ___________ milligrams (mg)

5. Characterize the following chemical compounds. (2 points)

   CaCO$_3$ __________________________ mole mass (mol) __________________________ millimole (mmol)
   KCl __________________________ mole mass (mol) __________________________ millimole (mmol)