



MATH FOR SOIL SCIENTISTS

SWS 6932/SWS4932- 2 credits

Fall 2014

INSTRUCTOR: Dr. Kanika S Inglett (Kanika@ufl.edu)

Research Assistant Professor, 3161 McCarty Hall A

Soil and Water Science Department, University of Florida, Gainesville FL 32611

Phone: 352-294-3164

OFFICE HOURS: By email via Sakai and by appointment.

COURSE OVERVIEW: A “refresher” course for undergraduates and beginning graduate students who would benefit from a review of fundamental principles (of mathematics, chemistry, biology and physics) and calculations that are commonly encountered in graduate level courses in environmental sciences. Students entering this course should have successfully completed course work in mathematics, chemistry, and physics at least at the sophomore and junior level at some time in their past. This course is not intended to substitute for a sound academic background in these three areas.

COURSE OBJECTIVES: To bring students up to speed in mathematics, chemistry, and physics with emphasis on those skills that are most relevant to graduate courses in environmental science including Soil and Water Science; To better prepare students for entry into graduate level courses which assume knowledge and competency in these particular skills as indicated by the course prerequisites.

PREREQUISITES: Basic courses in mathematics, chemistry, and physics at the sophomore and junior level that are typically taken by soil and water science majors.

COURSE FORMAT: Web-based lectures and 1 hour discussion session every week. The course material will be released at a set schedule. You will have access to one unit at a time. At the beginning of each week, the instructor will assign the topic/slides to be studied over the period of that week. In order for you to remain on schedule, the study of this material must be completed during that week. Even though the entire module is released and available, I strongly recommend you limit yourself to the material assigned by the instructor so as to gain a reasonable understanding of the material. Associated to each module will be the reading material that may elucidate the material in the texts or slides.

The material for the course can be accessed at <https://lss.at.ufl.edu/sakai-training/index.shtml>. You will need a Gatorlink account and your password to login.

FREQUENCY TAUGHT: Fall Term

DISCUSSION SESSION ATTENDANCE: Required.(Location/ Time TBD).

TEXTBOOK: *Math for Soil Scientists* by M.S. Coyne and J.A. Thompson. 2006. Thomson Delmar Learning. (Required)

TOPICAL OUTLINE:

Unit 1 THE BASICS

1. Basic Math Scientific notation Exponents and Logarithms
2. Significant Figures
3. Metric and International Scientific units
4. Unit conversions

Unit 2: QUANTIFYING PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

5. Soil texture and surface area
6. Bulk density, particle density and porosity
7. Measurements of soil water
8. Water and gas transport
9. Soil temperature, heat capacity and conductivity

Unit 3 PROBLEM SOLVING IN SOIL BIOCHEMISTRY

10. pH buffers and buffering
11. Oxidation Reduction and Energetics
12. Kinetics
13. Stable and radioactive isotopes

Unit 4 PROBLEM SOLVING IN SOIL BIOLOGY

14. Microbial growth yield and mortality
15. Microbial enumeration
16. Microbial biomass
17. Mineralization and Immobilization rates
18. Respiration and gas fluxes

Unit 5 PROBLEM SOLVING IN SOIL CHEMISTRY, FERTILITY, and MANAGEMENT (optional)

19. pH, Liming and Lime requirements
20. Cation and Anion exchange
21. Calculating fertilizer Application rates and nutrient availability
22. Potential Erosion
23. Waste management and bioremediation

Unit 6 DATA ANALYSIS AND SAMPLING

24. Descriptive statistics
25. Error analysis

- 26. Hypothesis testing and Inferential statistics
- 27. Sampling

Unit 7 PROBLEM SOLVING IN BIOGEOCHEMICAL PROCESSES (optional)

Calculations related to other biogeochemical processes that we routinely use in research.

INSTRUCTIONS FOR ON DISTANCE EDUCATION STUDENTS: This course is offered in a web-based environment; the format of which involves self-guided learning by systematically following an image and an accompanying image narrative. The course consists of 6 modules, an outline can be found in the course syllabus. Taking a course via distance education requires self discipline and rigorous adherence to the lecture schedule set up by the instructor. The following instructions should help with organizing the distance education, please read the instructions before proceeding to the first lecture.

TECHNOLOGY CHECKLIST: The technology checklist provides recommendations for students enrolled in the Distance Education Graduate Track in Environmental Science. It is the responsibility of the student to have access to a personal computer (or laptop), the Internet, and maintain the functionality of peripherals (e.g. web cam and audio system) to successfully participate in distance education courses offered by the Soil and Water Science Department.

- Personal computer or laptop with sufficient hard drive space to store course materials and speakers
- Operating system: Windows XP, Vista
- Software: MS Office Suite (incl. Word, Excel, and Power Point); Adobe Acrobat (to view pdf files), and a web browser
- High-speed internet access (e.g. broadband, DSL, satellite modem, cable modem)
- Web camera (optional)
- External microphone (e.g. headset with build-in microphone, voice over IP device) is required.

GRADING SYSTEM:

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Points (%)	95-100	90-94.99	87-89.99	83-86.99	80-82.99	77-79.99	73-76.99	70-72.99	67-69.99	63-66.99	60-62.99	0-59.99

Associated to each module will be an assignment that must be completed. Assignments will include allotted readings/ short quizzes/ questions that are expected to be submitted in time. Timely submission (as indicated on the assignments) of the assignments is critical for proper grading and credit. Your understanding of the material will be tested with two exams during the

semester Exam – will be time limited and will include calculations of data sets (provided by the instructor) related to your study material. In order for us to achieve this, we will agree upon a specified time. The exam will be released and the completed exam will be expected back within a set timeframe. As indicated initially, the amount of interaction is also important. Attendance and participation during Discussion sessions is required. Special permission should be obtained in advance if the student is unable to attend the chat session.

ASSESSMENT

Assignments	55%
Exams 1	20%
Exam 2	20%
Attendance	5%

UNIVERSITY REQUIRED ANNOUNCEMENTS:

Academic Honesty: As a result of completing the registration form at the University of Florida, every student has signed the following statement: “I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University”.

UF Counseling Services: Resources are available on-campus for students having personal problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling;
2. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual assault counseling; and
4. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

Software Use: All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.