

INTRODUCTION to SOIL RESOURCES

ESC4680.25292 / BIOL4680.25257

INSTRUCTOR: Dr. Jose Barbosa, Department of Biological & Environmental Sciences

OFFICE: 114 Holt Hall. Office hours: 11.00 – 12.00 AM (M, T, Th, F)
Ph. (425-4299) email: Jose-Barbosa@utc.edu

LECTURES: Lectures are from 10.00 – 10.50 AM (Mon, Wed, Fri.) Room 207 Holt Hall.
Laboratory sessions. 1.00 – 3.50 PM (Wed) Room Grote 110 & VAAP site

*Attendance is **mandatory**, non attendance may affect student evaluation.*

REQUIRED TEXT: Currently, no formal text is required. Instructor will provide diverse supporting materials (*slides, class notes, brochures from the USDA and other PDF's files posted online*)

COURSE DESCRIPTION:

Prerequisites: Environmental sciences ESC151 with a minimum grade of C, or instructor approval.

Introduction to the study of soils and exploration of fundamental principles of origin, nature and constitution of soils. The geological origin of soils and factors of soil formation. Study of soil's physical, chemical and biological properties in determining the suitability of land for various uses. The environmental impact of agricultural and non-agricultural soil and land use. Soil erosion, conservation and management. The conquest of land through 7000 years and the impact of human actions. *Spring semester. Lecture 3 hours, Laboratory 1 hour. Prerequisites: Environmental sciences ESC151 with a minimum grade of C, or instructor approval. Laboratory/studio course fee will be assessed.*

COURSE OBJECTIVES:

The objectives of the course are to help students to gain an appreciation for soil as one of the most valuable natural resources and understanding of the complexities related to soil formation. Be familiar with different factors that intervene in the process of soil formation. Understand how human activities impact soil quality, accelerate soil degradation, and the need for conservation. Understand how soil quality affects life. To achieve these objectives, students have to learn about:

- soil variability
- some terminology to classify and describe soils' physical, chemical, and biological properties
- soils' properties and use of soil survey to determine wise land use.
- the nature and significance of soil texture.
- how soil characteristics of color and structure are used to identify soil horizons.
- how soil forming factors influence the development of different soils
- nature and significance of weight, pore space, and air relationships
- factors that contribute and accelerate soil erosion.
- Human activities and land degradation
- Soil biota

GENERAL POLICY and PROCEDURES: You should retain this schedule of lecture topics, reading assignments, test days, and relevant instructions for reference throughout the semester. You are responsible for learning the material that will be covered in the examinations, for preparing for lectures by reading assignments beforehand, and for being present on test dates without further notice or additional reminders.

SPECIAL ACCOMMODATIONS: Students who need special accommodations are encouraged to see me after class or in my office so we can discuss each particular situation, **confidentially if necessary**. You can contact me, if these times conflict with your schedule. Please bring your memo from The **Disability Resource Center (DRC)** (<http://www.utc.edu/disability-resource-center>) to me as soon as possible; we can discuss it during your appointment. Exam accommodations should be arranged in advance according to the DRC. If at any time during the semester you feel that the accommodations we have put in place are not working, please consult with me and /or the professional staff in the DRC office. If you do not have a memo from the DRC office that alerts me about your accommodations, it is recommended that you make an appointment to see them in **102Frist Hall, Dept. 2953 (425-4006 ph, 425-2288 fax)**. Without this memo no accommodations can be granted.

Special Request: With the advance of technology, cell phones, digital cameras, tablets (IPAD) and pagers have become commonplace. As a courtesy measure, please turn off these devices for the duration of the lecture. Use of electronic devices or any other gadgets may be banned from being used in the classroom if the instructor understands that such use may disturb the normal functioning of the class. However, some of these electronic devices may be used if intended to taking class notes or recording. Using IPAD for playing games during classes will not be tolerated.

GRADING: Grades are assigned according to the points-earned system shown below. **NO** subjective grade adjustments will be made. If all students earn A's all students will receive A's. Note that the instructor realizes that this is a heterogeneous class in terms of background and /or interest. However, expectations are equal for all students enrolled in this course. Each student **MUST** earn his/her grade and it will not be a gift. You should keep track of your points in each exam. Exams are not returned but student are required and encouraged to review and discussed their exams which are left with the instructor.

Obs. *Lecture participations can earn you extra points*

Exam I	*	100	Grades
Exam II	*	100	A ≥ 540
Exam III	*	100	B 539 - 480
Quizzes & assignments (presentation)	*	100	C 479 - 420
Exam Final (comprehensive see date at the bottom)		150	D 419 – 360
Sub-Total Points (lecture)	75%	450	F < 360
Sub-Total Points (lab)	25%	150	
Total Points (ESC4680)	100%	600	

(*) one of the lowest grades among these 4 opportunities will be dropped

Missing exams, quizzes, homework assignments, should be avoided at all cost. Valid reasons for absences are: 1) **severe** illness, 2) documented personal or family emergencies, 3) official University excuses. Illness will necessitate a note from the doctor or infirmary (as well a family emergency). Official University excuses will likewise require documentation. Preferably, notify me beforehand as to absences on a test day. The notification request must be made in writing (on paper or electronically). The request should include the event/conference and the name of the faculty advisor/sponsor (when possible the faculty sponsor should probably contact instructors on behalf of students who will be absent for educational/scholarship reasons).

Additionally, if you wish to make up a missed exam the instructor must be contacted before the next class period following the exam, and your written excuse presented and a makeup scheduled, or else no make up exam can be granted. If that is not possible to contact the instructor by the next class meeting, but you have a valid excuse for your absence and an excuse for why contact with the instructor was not made, you may be allowed to make-up exam only under unusual extenuating circumstances, but contact with the instructor at the earliest possible time is **MANDATORY**.

Assignments policy: Beginning with week 2, homework will be assigned on different weeks. Assignments are to be turned in no later than 5 PM on the due date. **NO HOMEWORKS WILL BE ACCEPTED AFTER 5 PM ON THE DUE DATE.** Throughout the semester, **UNANNOUNCED** (pop) quizzes will be given. No make ups are allowed if you miss any of them unless you have a valid excuse for being absent (**remember attending classes is mandatory**).

CHEATING: VIOLATION OF THE UNIVERSITY ACADEMIC HONESTY CODE WILL BE DEALT WITH AS OUTLINED IN THE RULES AND REGULATIONS TO DEAL WITH ACADEMIC DISHONESTY MATTER. All forms of academic dishonesty will be reported to the appropriate organization. This may result in failing grade, suspension, and/or expulsion from the University. These are serious problems, and since you are all advanced undergraduate and graduate students, any discovered attempt at academic dishonesty will be treated as extremely grave. (Note this includes turning in an excuse for absence that cannot be verified as true.)

TOPICS

Section A: Introduction to soil

What is soil?

What role does soil have in our lives?

Soil, An Ecological System

Section B: Soil Formation and Geology, From Rocks and Minerals to Soils

Unit 1, The Materials for Making Soil

Minerals

Types of Rocks

Weathering of rocks and minerals

Unit 2, Soil Forming Factors

Parent Materials
Time
Topography
Climate
Biota

Section C: Soil Morphology and Physical Properties

Unit 3, Soil Texture

Unit 4, Soil Horizons, Soil Structure and Color

Unit 5, Soil Bulk Density

Surface Area
Particle density
Bulk density
Pore space, size and arrangement

Section D: Soil Water and Water Movement in the Soil

Unit 6, Soil Water

Structure and reactivity of water
Soil water potential-modes of water movement
Water retention and capacity
Hydraulic conductivity
Infiltration and percolation
Field and moisture equipment

Section E: Soil survey and special groups

Unit 7, Soil Survey

Soil Survey
Wetlands
Urban soils

Section F: Soil Biodiversity, Organic Matters, Chemical Characteristics and Soil Quality

Unit 8, Soil Organisms

The soil biota
The role of microbiology in the soil environment

Unit 9, Soil Organic Matter, The Carbon & Nitrogen Cycle

Soil organic matter – living and dead
What happens to the dead organic matter?
Carbon cycle
Nitrogen cycle

Unit 10 Clay Minerals and Soil Chemical Characteristics and Soil Quality

Clay minerals
Soil Macronutrients:
The role of nitrogen in the soil environment
The role of phosphorus in the soil environment
Soil quality

Section G: Soil Management

Unit 11, Soil Erosion, Conservation and Management

Unit 12, Land Use, and Degradation

The final exam Friday April 25th 8.00-10.00 AM. The final exam will be comprehensive. The date and time of the exam is established by the university and can not be changed at our own will!

INTRODUCTION to SOIL RESOURCES

ESC4680L.25303 / BIOL4680L.25287

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REQUIRED TEXT: Currently, no formal text is required. Instructor will provide diverse supporting materials (*slides, class notes, brochures from the USDA and other PDF's files posted online*)

COURSE DESCRIPTION:

Prerequisites: Environmental sciences ESC151 with a minimum grade of C, or instructor approval.

Course Description:

This laboratory/practical is intended for students who have had limited exposure to Soil Science. Topics discussed in the lab sessions will emphasize aspects of environmental concern related to soil erosion, conservation and management, in addition to basic soil science knowledge. Laboratory observations and experiments will emphasize the physical, chemical, and morphological characteristics of soils as well as common soil science laboratory techniques. These soil characteristics will always be related to the environment. Field trips will give students the opportunity to observe in locus many of the principles discussed in the associated lecture classes and will provide a landscape/environmental level context for the lab.

Objectives:

- Provide hands-on, practical experience on soil-resources management and its relation to the environment.
- Enhance student understanding of essential soil physical, chemical and morphological properties
- Encourage students' appreciation of soil as a crucial component to environmental systems.
- Expose students to the dangers of inadequate soil management practice and its consequences to the environment.

Special Request: Classes will be held in Grote hall and at the VAAP site. For the field trips students should be on time for departure to the sites. Otherwise class performance will be affected unless students that are late assure their own transportation. When necessary, students will be advised about by certain prophylactic protocols that need to be respected in order to have access to certain areas of the VAAP site to be visited.

Grading: Grades are assigned according to the points-earned system shown below. **NO** subjective grade adjustments will be made. If all students earn A's all students will receive A's. Note that the

instructor realizes that this is a heterogeneous class in terms of background and /or interest. However, expectations are equal for all students enrolled in this course. Each student **MUST** earn his/her grade and it will not be a gift. You should keep track of your points in each exam. Exams are not returned but student are required and encouraged to review and discussed their exams which are left with the instructor.

Obs. Lab correspond to 25% of the final grade

Although not explicit in the table, students will be given chances to earn extra-points

Lab midterm	40		Grades
Lab-project and assignments	60		A \geq 540
Lab Final	50		B 539 - 480
Sub-Total Points (lab)	25%	150	C 479 - 420
Sub-Total Points (lecture)	75%	450	D 419 – 360
Total Points	100%	600	F < 360

Laboratory Exercise Schedule:

Introduction to the lab. Soil basics.

Soil Profiles, Soil Sampling

Soil Texture and Particle Size Distribution

Soil Bulk Density and Porosity. Soil Color

Soil Water

Midterm Exam during regular lab session

Soil Organic Matter / Soil Microbiology

Soil quality (compaction, root development, biomass)

Field trips:

Urban Soil

Wetlands

Soil erosion and conservation

Examples of land use and management