

## 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

## COURSE STUDENT LEARNING OUTCOMES

According to the objectives envisioned for the course, students learning outcome will be assessed based on the level of understanding of the following parameters:

- Use of some terminology to classify and describe soils' physical, chemical, and biological properties
- Soils' properties and use of soil survey to determine wise land use.
- Factors that contribute and accelerate soil erosion.
- Human activities and impact on land degradation
- Importance of 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	<b>Grades</b>
Exam II	*	100	<b>A ≥ 540</b>

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

(\* **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.)

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## TOPICS

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**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**

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*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*

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**The final exam Friday April 25<sup>th</sup> 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

**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:** 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 provided 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		<b>Grades</b>
Lab-project and assignments	60		<b>A</b> ≥ 540
Lab Final	50		<b>B</b> 539 - 480
<b>Sub-Total Points (lab)</b>	<b>25%</b>	<b>150</b>	<b>C</b> 479 - 420
<b>Sub-Total Points (lecture)</b>	<b>75%</b>	<b>450</b>	<b>D</b> 419 – 360
<b>Total Points</b>	<b>100%</b>	<b>600</b>	<b>F</b> < 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