COURSE SYLLABUS • FALL 2026

Department of Biological and Environmental Sciences
East Texas A&M University

Instructor Information

Instructor	Dr. Huu-Tuan Tran
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Office Location	Room 215, Science Building
Office Hours	M-F; 10:00 AM – 4:00 PM
Course Number / Section	BSC 423-01W
Class Meetings	Online
Class Time / Location	
Preferred Communication	Email / D2L

Course Information

Recommended Textbook: Ronald Amundson. Introduction to the Biogeochemistry of Soils. Cambridge University Press, 2021.

Course Format: Face-to-face instruction supported by D2L, textbook readings, lectures, quantitative examples, soil data interpretation, case studies, discussions, and assessments.

Course Description

This course introduces the physical, chemical, biological, and geological processes that control soil formation and function. Students will examine soils as dynamic biogeochemical systems, with emphasis on mineral weathering, soil organisms, field properties, soil measurements and data, time-dependent soil processes, the soil carbon cycle, chemical and physical reactions, landscape processes, and human impacts on soils. The course integrates field observations with quantitative and conceptual approaches to understanding soil biogeochemistry and its role in environmental systems.

Student Learning Outcomes

1. Explain how climate, organisms, parent material, topography, and time interact to form and modify soils.
2. Describe the mineralogical and chemical foundations of soil biogeochemistry, including weathering and soil-forming reactions.
3. Explain the roles of microorganisms, plants, and other organisms in soil biogeochemical processes.
4. Identify major soil horizons and interpret field-based soil properties and soil-profile information.

5. Interpret common soil biogeochemical measurements, datasets, and graphical relationships.
6. Explain how soil processes evolve over time and across environmental gradients.
7. Describe the soil carbon cycle and evaluate controls on soil carbon storage, transformation, and loss.
8. Explain major chemical and physical processes in soils and their effects on nutrient and contaminant behavior.
9. Analyze how slope and landscape position influence soil redistribution and biogeochemical processes.
10. Evaluate how human activities alter soil biogeochemistry and discuss implications for sustainability and environmental change.

Learning Methods

Instruction will combine lectures, textbook readings, soil-profile and landscape examples, figures, quantitative exercises, data interpretation, and environmental case studies. Students will use D2L for announcements, lecture materials, assignments, assessments, and grades.

Course Requirements and Student Responsibilities

- Attend class regularly and participate in discussions and learning activities.
- Complete assigned textbook readings and review lecture materials before assessments.
- Monitor D2L and university email for announcements, assignments, and schedule updates.
- Complete exams, assignments, exercises, and other assessments by posted deadlines.
- Bring a calculator when quantitative soil or biogeochemical calculations are assigned.
- Communicate promptly with the instructor when academic or technical difficulties affect course participation.

Assessment and Grading

Assessment will emphasize understanding of soil-biogeochemical concepts, quantitative reasoning, interpretation of soil data, and application to environmental problems. Students will also complete a short topic presentation during the final third of the semester. Exact formats, presentation requirements, additional assignments, quizzes, and point values will be posted in D2L.

Grading:

Grading is based on the timely and correct submission of assignments, class participation as well as performance on the midterm examination and a comprehensive final. While the exams cover recent information, the final exam is cumulative and includes all information covered in class lectures, the text and the additional required readings. This also includes potential questions from student PowerPoint presentations.

- Weekly assignments: 20% of the final grade

- Class participation and attendance: 10% of final grade
- Student presentations: 20% of final grade
- Mid-semester exam: 20% of final grade
- Cumulative final exam: 30% of final grade

Guidelines for Assignments

- Weekly homework assignments must be prepared electronically and submitted as an MSWORD (.doc, .docx) or PDF document with a 12-point font, 1-inch margins (all around) and 1.25 line spacing.
- The assignment must be complete, correct, and submitted on time ("on time" means the assignment is turned in by the start of the class period when it is due). Weekly assignments won't be accepted late.

Examinations

- Examinations will be performed online. All scheduling conflicts must be discussed at least 1 week prior to the scheduled date of the exam. In the event of an emergency or illness on the day of an exam, you must notify me before the exam. If requested, students must provide verification of the absence in order to schedule a make-up exam. Students who do not make alternate arrangements prior to the exam will be given a grade of "0" for that exam.
- There will be two exams total (50% of the final grade). Mid-semester exam will cover the current content to-date. The final examination will be comprehensive and also includes potential questions from student PowerPoint presentations.

Letter Grade	Course Average
A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	Below 60%

Student Presentation Topics

Students will work individually or in small groups to prepare a short presentation connecting soil biogeochemistry concepts to an environmental or land-management problem. Suggested topics are:

1. **Soil Carbon Sequestration and Climate Change** - controls on soil organic carbon storage, stabilization, decomposition, and greenhouse-gas exchange.
2. **Nitrogen Cycling in Agricultural Soils** - mineralization, nitrification, denitrification, fertilizer inputs, nitrogen losses, and environmental impacts.
3. **Soil Microbiome and Biogeochemical Cycling** - roles of microorganisms in carbon, nitrogen, phosphorus, sulfur, and redox transformations.
4. **Soil Contamination and Biogeochemical Controls on Pollutant Fate** - how pH, organic matter, minerals, sorption, and redox conditions affect metals or organic contaminants.

5. **Land-Use Change, Soil Degradation, and Restoration** - effects of agriculture, erosion, urbanization, or disturbance on soil properties, nutrient cycling, and strategies for soil recovery.
6. **Soil Phosphorus cycling and nutrient availability**- forms and pools of phosphorus in soils, mineralization and immobilization, effects of soil pH on P availability, agricultural runoff and eutrophication.
7. **Biochar and Soil Biogeochemistry**- biochar production and properties, effects on soil pH, porosity, and water retention, nutrient retention and microbial activity, potential benefits and limitations of biochar application.
8. **Soil Salinity and Acidification and Their Effects on Soil Biogeochemistry**- effects on soil structure and water movement, impacts on plant growth and microbial activity, management and remediation of salt-affected soils

Suggested presentation structure: Background/Problem -> Key Soil Processes -> Biogeochemical Mechanisms -> Environmental Impacts -> Management or Restoration Strategies -> Key Takeaways.

Course Content

Chapter 1: Introduction to Soils

Chapter 2: An Overview of the Biogeochemistry of Soils

Chapter 3: The Biology in Soil Biogeochemistry

Chapter 4: Field-Based Properties of Soils

Chapter 5: Soil Biogeochemical Measurements and Data

Chapter 6: Time and Soil Processes

Chapter 7: The Soil Carbon Cycle

Chapter 8: Chemical and Physical Processes in Soils

Chapter 9: Soil Processes on Sloping Landscapes

Chapter 10: Humans and Soil Biogeochemistry

Fall 2026 Course Timetable

The timetable may be adjusted based on student progress and university needs.

Week	Chapter / Topic	Lecture / Activity
1	**Course Introduction**	Syllabus; what is soil biogeochemistry?; course framework
2	**Ch. 1 – Introduction to Soils**	Soils as natural bodies and environmental systems

	Ch. 1	Factors defining the soil system
	Ch. 1	Soil-forming factors; examples and review
3	**Ch. 2 – Overview of Soil Biogeochemistry**	Chemistry of Earth's crust
	Ch. 2	Mineralogical composition of crust and soils
	Ch. 2	Mineral weathering and chemistry of soil formation
4	**Ch. 3 – Biology in Soil Biogeochemistry**	Microbiology and soil processes
	Ch. 3	Biological imprint on biogeochemistry;
	Ch. 3	Plants, microbes, and biogeochemical models
5	Ch. 3	Biosequences and biological controls
	Ch. 3	Soil biodiversity
	Ch. 4 – Field-Based Properties	Soil profiles and horizons
6	Ch. 4	Field description and horizon nomenclature
	Ch. 4	Synthesis and interpretation of field data
	Ch. 5 – Measurements and Data	Soil sampling and biogeochemical measurements
7	Ch. 5	Quantitative soil data and calculations
	Ch. 5	Data interpretation and problem solving
	Ch. 6 – Time and Soil Processes	Time as a soil-forming factor
8	Ch. 6	Rates, chronosequences, and evolution of soils
	MIDTERM EXAM	Midterm Examination – Chapters 1–6
	Ch. 7 – Soil Carbon Cycle	Carbon inputs, pools, and transformations
9	Ch. 7	Soil organic carbon decomposition and stabilization
	Ch. 7	Carbon storage, fluxes, and environmental controls
	Ch. 7	Soil carbon and climate interactions
10	**Ch. 8 – Chemical & Physical Processes**	Soil solution, surfaces, and reactions

	Ch. 8	Sorption, exchange, acidity, and chemical equilibria
	Ch. 8	Physical processes, transport, and applications
11	Ch. 8	Biogeochemical controls on nutrients and contaminants
	Ch. 8	Quantitative examples and data interpretation
	Ch. 9 – Soil Processes on Sloping Landscapes	Topography and soil-forming processes
12	Ch. 9	Erosion, deposition, and soil redistribution
	Ch. 10 – Humans & Soil Biogeochemistry	Agriculture and land-use impacts
	Ch. 10	Human alteration of carbon and nutrient cycles
13	Ch. 10	Humans and soil biogeochemistry; connecting biological, chemical, physical, and landscape processes
	Student Presentations I	Topic 1: Soil Carbon Sequestration and Climate Change Topic 2: Nitrogen Cycling in Agricultural Soils
	Student Presentations II	Topic 3: Soil microbiome and biogeochemistry cycling Topic 4: Soil Contamination and Biogeochemical Controls on Pollutant Fate
14	Student Presentation III	Topic 5: Land-use change, soil degradation, and restoration Topic 6: Soil Phosphorus cycling and nutrient availability
	Student Presentation IV	Topic 7: Biochar and Soil Biogeochemistry Topic 8: Soil Salinity and Acidification and Their Effects on Soil Biogeochemistry
	Course Wrap-Up	Synthesis of Chapters 7-10; comprehensive review and problem solving. Key concepts, environmental applications, and final-exam preparation
Finals	FINAL EXAM	Comprehensive Final Examination

Attendance, Make-Up Work, and Late Work

Regular attendance and active participation are expected. Students are responsible for material covered in class and posted in D2L. If an absence affects an assessment or

assignment, contact the instructor as early as possible. Make-up work and deadline adjustments will be considered consistent with university policy and documented circumstances.

Academic Integrity and Use of Generative AI

Students are expected to maintain high standards of academic integrity. Generative AI tools may be used only when specifically permitted for an assignment or learning activity. When permitted, students remain responsible for accuracy, appropriate acknowledgment, and compliance with assignment instructions.

Technology, Accessibility, Student Conduct, and University Policies

Students should check D2L and ETAMU email regularly and maintain reliable access to required technology. Students are responsible for following current East Texas A&M University policies regarding attendance, academic integrity, student conduct, accessibility/accommodations, nondiscrimination, campus safety, and other university requirements. Current university policy language supersedes older policy text.

Syllabus Change Policy

This syllabus and timetable are intended as a guide. Adjustments may be necessary because of student progress, university closures, emerging environmental events, or other circumstances. Substantive changes will be announced in class and/or through D2L.