Department of Earth & Environmental Sciences
LEHIGH UNIVERSITY

CRN 43496 EES 80 Earth Systems 4 credits Fall 2021

Professor: Dave Anastasio, Office 226 STEPS Building (**dja2@lehigh.edu)**
Office Hours: Mondays 9:30-10:30AM and Wednesdays 1:30-2:30PM, or by Appointment. ST 226 or send me an email and we can pick a time to meet in a larger space than my office.

COVID-19
We will all have to have some agility as I expect course plans and this syllabus might change with evolving circumstances. Please exercise best safety practices and remind one another that we all have to adhere to safety guidelines. We will follow and when possible, exceed all Lehigh University protocols; these will include all state and CDC guidance to help keep everyone safe. If there is a positive test, expect adjustments on a case-by-case basis.

Teaching Assistant: Connor Downing, Office ST 140, email: **ccd220@lehigh.edu**.
Office Hours: Tuesdays 10:00-11:00AM and Thursdays 11:00AM-noon, or by appointment.

EES 80 is a 4-credit course that is required for minor, BS, and BA degrees in EES. It will serve as your Introduction to Earth Systems.

Lectures- Monday and Wednesday 10:45AM-12:00PM in room ST131. Panopto captured voice over Powerpoint slides are available on CourseSite for all registered students. Lecture ppts will be pre-posted on the CourseSite.

Laboratories: Mondays, 1:35-4:15 PM, ST 131, or outside for fieldtrips, dress for the weather.

Catalog Description
Study of the integrated earth system, including the atmosphere, biosphere, geosphere, and hydrosphere and interactions between these components (e.g., plate tectonics, biogeochemical cycling, climate, anthropogenic impacts). The course is designed to prepare students for a major in earth and environmental sciences and includes a lab that develops skills relevant to this broad field including data analysis, modeling, use of maps and geospatial data, and field work. Natural Sciences distribution.

Texts And Materials
The Blue Planet (Third Edition) by Skinner and Murck (ISBN: 978-0—471-23643-6), Wiley and Sons. Available at LU bookstore or on-line as an ebook, looseleaf pages, or bound in a cloth or hardbound book, to buy or rent, new or used. Costs vary between $57.00-

180.00 depending on the type of book you choose. This will be our main textbook. We will cover all chapters in order. It is an excellent support for the connection amongst course content but light on the Geosphere, luckily, this is what I know best. Other articles and links may be posted on our CourseSite. There is no laboratory manual to purchase; all laboratory materials will be provided.

COURSE OVERVIEW

Part of this course is about "earth systems science" and the ways that complex systems can function. This is actually a specific subfield within EES. Our world is much more than the sum of its parts, both in how it evolved and in how it operates today. Most of this course is about the components of the earth system, the rocks, water, air, and organisms, and the records Earth processes leave for the educated observer. There's too much to cover in one introductory course so we won't worry about omissions, but EES080 will get you ready for what is next: EES115 Surface Processes, EES131 Earth Materials, and EES152 Ecology. Two things are important as you enter our major: (1) that you have a big-picture view of the whole Earth, and (2) that you learn some fundamentals so you will be able to answer questions such as: What are the main components of Earth? What are they made of? How do they behave? How do they compare? What are the flows of matter and energy among them? How do they interact?

EES 80 lab: Because EES080 is trying to prepare you for our major, the lab will introduce fundamental concepts and skills important to the major. In lab we will address the nature of data, how to handle data, some interesting ways that the natural world organizes itself, and as examples, some interesting features of the natural world. Please be sure you understand that because in EES080 the lab delivers additional content and skills, not every lab will connect with what we're doing in the classroom. The lab sessions are an opportunity for you to build some skills, get some hands-on experience, and learn more about how systems interactions occur. We will have some data collection, some work with specimens, some field work, some modeling, and some data analysis, and many of the labs will involve scientific communication. Three of the labs will involve fieldwork. Because of the weather, the lab schedule might change (we tend to go rain or shine, but at some point we just have to throw in the towel).

During a typical lab period, labs will be introduced, then the experiential happens, and then each lab gets turned in, unless otherwise directed. In general, labs are due at the end of the laboratory period. In adhering to this pattern, you will finish one lab exercise before beginning another.

EES Student Learning Objectives:

Content

- Earth scientists use repeatable observations and testable ideas to understand and explain our planet.
- Understand the time and spatial scales of Earth and environmental processes, and differentiate between processes acting at local, regional, and global scales.

- ❖ Earth is continuously changing

Skills

- ❖ Communicate clearly in visual, verbal and written modes and use new media as appropriate to convey Earth and environmental content and information to public and professional science audiences.

Citizenship

- ❖ Value how earth science knowledge and skills can be used to address the grand challenges facing human society, including climate change, biodiversity, energy, water resources, and hazards.

Expectations for class and lab: In all ways, treat everyone connected with this class with respect and help one another be safe. Let's encourage a sense of collaboration among your new cohort of EES members. Let's be supportive and teach one another. We often learn best when we take the chance of being wrong, but that only works in a supportive environment

In-Class Assignments: There will be short assignments to begin 6 lectures. The lecture assignments are due as completed. Your four highest graded assignments will count towards your final course grade at 2% each.

Course Content Objectives: Earth scientists use repeatable observations and testable ideas to understand and explain our planet. The course will demonstrate basic core competency by supporting with evidence the following Earth science literacy principles (www.earthscienceliteracy.org/): Earth is 4.6 billion years old, Earth is a complex system of interacting rock, water, air, and life, Earth is continuously changing, Earth is the water planet, life evolves on a dynamic Earth and continuously modifies Earth and humans depend on Earth for resources, natural hazards pose risks to humans, humans significantly alter the Earth. And you will learn how to value how Earth science knowledge and skills can be used to address the grand challenges facing human society, including climate change, biodiversity, energy, water resources, and hazards.

CourseSite: CourseSite will be our hub for posting and submitting course materials. ASAP, you should login and make sure that you're registered for EES080 and can see this course and download course materials.

Peer Tutoring/Teaching Assistants: Regular class participation is the easiest way to do well in the course. You are encouraged to be proactive in getting academic assistance from me, the TA, or peer tutors (contact the Academic Support in Student Services where you will be paired with an EES tutor, or talk to me directly about help). Support will be provided to all who ask.

Lecture Supports: I will stick pretty closely to the assigned textbook in terms of topic organization. I expect to post lectures weekly as voice over slides so that lectures can be accessed asynchronously on CourseSite. Laboratory exercises will also be posted weekly.

Evaluation:

Two Lecture Exams	20% each	40%
In Class Assignments	best 4 of 6	8%
Laboratory Assignments	2% each	24%
City Resiliency Poster Assignment, Collaborative		8%
Final Exam		20%

All assignments due by 5PM last day of classes
All assignments must be completed or excused to pass the course.

Academic Honesty: It is the duty and obligation of students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping to ensure an environment of academic integrity. As such, each student is expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the University's Code of Conduct.

Accommodations for Students with Disabilities
Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at indss@lehigh.edu, or online at https://studentaffairs.lehigh.edu/disabilities.

Diversity and Inclusion: Lehigh University is committed to diversity, inclusion and engagement [http://www.lehigh.edu/diversity]. That commitment is captured in The Principles of Our Equitable Community [http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf].. The Principles have been endorsed across Lehigh and by the Board of Trustees. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

Field Safety: Please exercise care on the fieldtrips. On the geologic, forest ecology, and watershed labs, we will take Lehigh University vans. Load and unload carefully from bus

being cognizant any traffic. Dress for the weather and the fieldtrip. Always follow faculty and TA instructions.

Syllabus

Fall semester 2021 is expected to run from August 23-December 3, 2021.

	Reading
WEEK 1 Chap. 1	
August 23, 2020.	
Course intro. System science, Earth system reservoirs	Pgs. 1-15
Dynamic interactions, hypothesis and theory	Pgs. 16-30
Lab 1. Scientific Methods	
WEEK 2 Chap. 2 and Chap. 3	
August 30	
Energy	Pgs. 31-52
Matter	Pgs. 53-76
Lab 2. Minerals	
WEEK 3 Chap. 4	
September 6	
Sun and Solar System	Pgs. 81-100
Chronology and Numerical age	Pgs. 101-108
Lab 3. Rocks	
WEEK 4 Chap. 5 and Chap. 7	
September 13	
Geosphere-Plate tectonics, History and Processes	Pgs. 109-125
Earthquakes and the Earth's interior	Pgs. 143-160
Lab 4. Building Stones; Earth Materials Identification	
WEEK 5	
September 20, Class Time, Exam 1 (8 lectures, 6 chapters, 4 labs)	
Mountain building and rock deformation	
Lab 5. Lehigh Gap; Outcrop Lab	
WEEK 6 Chap. 6 and Chap. 7	
September 27	
Volcanoes and volcanic rocks	Pgs. 161-179 & 209-211
Sedimentary rocks and depositional environments	Pgs. 185-200
Lab 6.Tectonics	
WEEK 7 Chap. 7 and Chap. 18	
October 4	

Natural resources Pgs. 202-208 & 541-572
Surface water Pgs. 223-240
Lab 7. Hazards

WEEK 8
October 11
Pacing Break, Monday No Class and No lab
Groundwater Pgs. 241-256
Glaciers and glaciation
Lab 8. Forest Ecology

WEEK 9 Chap. 8 and Chap. 9
October 18
Glaciers and Glaciation Pgs. 257-286
Coastlines Pgs. 287-306
Lab 9. Quantitative Data Analysis, Satistics

WEEK 10 Chap. 10 DJA. October 22-30 Fieldwork in Spain,
October 25
Oceanography, Downing
October 27, 2021 Exam 2 (10 lectures, 7 chapters, 5 labs)
No Lab

WEEK 11 Chap. 11
November 1
Structure and Composition of the Atmosphere Pgs. 307-318
Moisture in the Atmosphere Pgs. 335-348
Lab 10. Topography, Augmented reality landscapes

WEEK 12 Chap. 11
November 8
Wind Pgs. 348-378
Sevier weather
Lab 11. Daisy World Modeling

WEEK 13 Chap. 12, Chap. 13 and Chap. 14
November 15
Climate system Pgs. 379-414
Evolution Pgs. 415-448
Lab 12. *Predator Prey Modeling*

WEEK 14 Thanksgiving week
No classes or Lab

WEEK 15 Chap. 15, Chap. 16, Chap. 17, and Chap. 19
November 29
Ecosystems and Biodiversity Pgs. 449-516
Anthroposphere discussion Pgs. 517-540 & 573-601
Lab 13. Poster presentation

Final Exam at Class's scheduled final time. Finals are December 7-15, 2020 (8 lectures, 9 chapters 3 labs, plus comprehensive course review)