

# INTRODUCTION TO THE ENVIRONMENTAL SCIENCES (ENEC 202)

## **Course Description:**

This course is a general introduction to environmental science that will illustrate how energy and materials (e.g., organic matter, nutrients, water, etc.) flow through different environmental systems (i.e., atmosphere, soils, oceans, organisms etc.). You will learn about the important processes that influence the flow of energy and materials, the interactions among systems and organisms, and how natural and human-induced environmental changes alter these flows. This is **strictly a science-based course** so we will rarely cover the social, political, ethical, economic, or policy sides of environmental issues.

## **General Course Format:**

- **Classroom** (ENEC 202-001)

**Time & Place:** MWF 9:05 – 9:55 am in Greenlaw 222

**Instructor:** Dr. Geoffrey Bell

Curriculum for the Environment and Ecology

3305 Venable Hall

(919) 843-9713

[gwbell@email.unc.edu](mailto:gwbell@email.unc.edu)

Office hours: Tuesdays & Fridays 11 – 1:30 in Venable 3305

- **Laboratory** (ENEC 202 Sections 401 and 402)

**Time & Place:** 2 hr & 50 min lab each week in Venable 3302; lab time varies with section

**Teaching Assistants:** Lauren Goodman

**Note:** the lab portion of this syllabus, including contact information for the TA's follows the lecture section.

## **Prerequisites:**

There are no formal prerequisites for ENEC 202 beyond the science and mathematics preparation required for admission to UNC Chapel Hill.

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## **Attendance:**

There is no formal attendance policy for the lecture portion of this class. However, there will be frequent in-class graded poll questions and you will miss out on the active learning activities. Therefore, if you miss too many classes, your grade will suffer.

## **Course Objectives:**

The primary learning objectives for students in this course are as follows:

1. Develop your attention to detail and critical thinking skills that will serve you well in this course and beyond by enabling you to apply your knowledge to solve problems.

2. Comprehend the important concepts in environmental science by understanding the step-by-step mechanisms by which environmental processes work.
3. Understand what science is, how the scientific method works, and how scientists are using the scientific method to understand current environmental problems.
4. Understand how human activities are altering environmental processes and recognize your own contribution to these problems.

### **Course Structure:**

- **In-class:** This class will use a “flipped classroom” approach to teaching. This means that you will engage new material **before** coming to class via readings (~ 10 pages) or lecture videos (30 – 50 min) coupled with a short online assignment that tests your basic comprehension of the concepts. We will then use class time to do the harder work of assimilating and applying that knowledge through a series of problem-solving activities. These activities will not be posted online so the only way to get the material you missed is to get it from another student.
- **Lessons:** Sakai Lessons are the basic roadmap for this course. Each Lesson will be a single broad topic composed of several sections, each of which will address a particular aspect of the topic (see Course Calendar for a list of the Lessons and sections). Each class period will be devoted to a single Lesson section so before coming to class, complete the corresponding Lesson section. The Lesson sections will provide you with specific learning goals, instructions on what to do to prepare for class, as well as the readings and lecture videos.
- **Readings/Videos:** I do not require you to purchase a textbook for the lecture portion of the class (you are required to purchase the lab manual – see lab syllabus for details). I have written textbook-like content for certain topics, which will be available as a PDF or as a webpage within its corresponding Lesson. I have also created several lecture videos for the course and posted them online to my Vimeo page (<https://vimeo.com/gwbell/videos>); links to videos are posted in the Lecture Resources folder as well as in their respective Lesson section. **Any readings and videos posted to the course website are required.**
- **Web page:** We will use UNC’s Sakai service for both the lecture and lab portion of the class: <https://sakai.unc.edu/portal/site/6ab1de94-bf57-475d-8379-43c6b7bf7bc0>  
Check the course website regularly for updates.

### **Assessments:**

1. **Exams:** There are 3 mid-term exams during normal class periods (**Feb 7, Mar 7, and Apr 4**) and a cumulative final exam during exam week (**Monday, May 7 at 8:00 am**). Exam questions will be multiple choice, T/F, fill-in the blank, short answers, and explanations/interpretations of data or graphs. **No make-up exams** will be given (even for a university-approved absence) and I **will NOT curve exam or course grades**, however, you will have **2 lifelines** that take the place of a curving system: (1) I will replace your lowest midterm test grade (applies to a zero from a missed midterm), with your final exam grade **IF** your final exam grade is higher. (2) You can “retake” one exam (excluding the final exam) by correcting your incorrect answers, which will let you receive as much as 50% of the points you lost added to your original grade.

2. **Pre-class homework** will be given online for each module section to assess your comprehension of the material presented in the readings and/or lecture video(s) assigned for that topic. Homework will be posted to the Tests & Quizzes folder on the course website the week prior to the topic being covered in class and are due before the start of class (see Course Calendar). **You may consult lecture videos, readings, and your notes to complete these assessments.** Late submissions are not accepted and make ups are not given but I will drop your four lowest grades on these assignments.
3. **In-class Poll Everywhere** questions will be posted during class periods. These are multiple choice and true/false questions that are projected using Powerpoint and that you answer by texting or using a wifi-enabled device (smartphone, tablet, or laptop). You must create a Poll Everywhere account and register with my class to participate in these polls. Details on registering will be provided on the course website. Your Poll Everywhere grade will be based on the percentage of polls you participate in and answer correctly, with participation weighted more heavily than correctness (85% and 15%, respectively).

**Course grade breakdown:**

<u>Course Component</u>	<u>% of Course Grade</u>
Lecture:	
○ Midterm #1	13%
○ Midterm #2	13%
○ Midterm #3	13%
○ Pre-class homework	12%
○ In-class Poll Everywhere	8%
○ Final exam	16%
Laboratory	25%

Final grades are based on a +/- grading scale as follows: A  $\geq$  93; A- = 90-92; B+ = 87-89; B = 83-86; B- = 80-82; C+ = 77-79; C = 73-76; C- = 70-72; D+ = 67-69; D = 60-66; and F < 60.

- **Extra credit:** There are no opportunities to receive extra credit in this class so do not ask.

**Student Responsibilities:** All work in this course must be carried out within the letter and spirit of the UNC Honor Code (see pages 472 – 473 in the 2015-2016 Undergraduate Bulletin). All academic work in the lecture portion of the course, including homeworks, quizzes, and exams, is to be your own work, unless otherwise specifically provided. It is your responsibility if you have any doubt to confirm with the instructor whether or not collaboration is permitted.

**Tips for success**

Students that find this class rewarding and enjoy success follow the following formula:

- Attend class regularly and prepare for class by doing the readings, watching the lecture videos, and completing the online homework **before** class.
- Study the material **REGULARLY**. *Cramming the night before or even a day or two before exams is too little too late for a college-level science class. You should be spending a*

*considerable amount of time outside of class (> 7 hr) reading, watching lecture videos, taking/rewriting/reorganizing notes, completing pre-class homework, and working through the study guides.*

- Study independently and **THEN** in a group. *The concepts taught in this class are challenging and I will require you to apply them to solve problems rather than simply recall information. The most effective way of succeeding in learning the material is to put a substantial amount of time each week into reading, reviewing your notes, and completing the study guides, **on your own** before meeting to discuss the concepts in a group.*
  - Ask for help **EARLY** if you don't understand something. *This is a sign of engagement and strength in learning. If you don't ask early, the "hole" you dig gets deeper and it is harder to recover.*
  - Complete all assignments on time. *Late assignments are not accepted and make-ups are not provided so lateness will get you a zero.*
  - Do not use technology (iPods, laptops, tablets, and cell phones) inappropriately (including but not limited to texting, email, Facebook, Twitter, web surfing/stumbling, etc.) during class. *Your job is to discipline yourself and master the curriculum. Trying to multitask will guarantee that you miss important details about concepts.*
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## LABORATORY

### **Description:**

This lab is a required component of ENEC 202. It is a general introduction to environmental science that will use a variety of hands-on activities including computer-based assignments, hands-on activities, and field trips to natural areas on or near campus that will reinforce the concepts you learn about in the lecture portion of the class. You will have a written assignment for each lab that is due at the end of the lab class time. The TA's are in charge of laboratory instruction, please see them with any and all questions pertaining to labs.

### **Instructors:**

Teaching Assistant: Lauren Goodman  
Email: [lsgoodma@live.unc.edu](mailto:lsgoodma@live.unc.edu)

### **Format:**

Labs meet for 2 hr and 50 min each week in **3302 Venable Hall** (see table below for days and times) except for weeks when a university holiday forces one or more lab sections to be canceled (see Course Calendar below). The total lab time is broken up into a 2 hr lab period and a 50 min recitation period. During the lab period you will participate in computer-based assignments, hands-on experiments, active learning activities, and field trips to natural areas on or near

campus. The recitation period is for getting additional help on the lab activity for that week or submitting lab worksheets that were not completed before the end of the lab period.

Section	Day	Time
401	Wed	3:00 – 4:50
402	Tue	2:00 – 3:50
Recitation	TBD	TBD

*Note: There may be field-based labs that are located on or near campus. Be sure to check the course website for details on the meeting locations for these labs.*

### **Attendance:**

Attendance is mandatory for the lab period and will be recorded each week by your TA. To get credit for lab assignments you must be present in lab each week and hand in your report no later than the end of the recitation period for that week. **You may not leave the lab period early unless you submit a completed worksheet.** Field labs will meet at the regularly scheduled lab times but be held at local facilities and nature reserves.

You will receive a zero for labs you do not attend and **there are no make-up labs.** If you must miss a lab due to a family emergency, travel as part of an official UNC-CH athletic team (club teams excluded), or other university-approved absence you must notify your TA before lab, provide written documentation of the conflict that is signed by an authorized professional, and make arrangements to attend another lab section. If you miss lab due to personal illness you must notify your TA before lab, provide a signed doctors note, complete the lab on your own, and hand your answer sheet into your TA the Monday after your lab section meets. Failure to follow these procedures will result in a zero for the lab activity.

### **Objectives:**

There are three main learning objectives for students in this laboratory:

1. You will learn the important concepts in environmental science by participating in hands-on and computer-based exercises, as well as field trips.
2. You will learn to use the scientific method by generating hypotheses, analyzing data, and interpreting results.
3. You will learn how to use Microsoft Excel, which is a flexible spreadsheet program that you can use in your daily life.

### **Course Structure:**

- **Lab manual:** You are required to purchase the following book before the first lab period:

Environmental Science: Lab Manual (3<sup>rd</sup> Edition). 2014. Brian S. Evans, Geoffrey W. Bell, and Elizabeth Thurman-Irons. Kendall Hunt Publishing Co., Dubuque, IA. 172 pp.

This book can be purchased either from UNC Student Stores or directly through the publisher at: <http://kendallhunt.com/store-product.aspx?id=269617>. **Each student must purchase their own copy.** The answer sheets for each lab activity are located at the end of each lab section. These sheets are perforated so they can be torn out and handed in at the end of each lab period. **Answer sheets that have been photocopied will not be accepted.** Occasionally we may add a supplement to lab activities; these will be provided as a PDF on the course website.

- **Weekly agenda:** Bring your lab manual to class every week. In the rare case a new lab is introduced to the course a PDF will be posted to the lab website (see below). Read the labs before coming to class so you are familiar with the activity because: (1) there are parts to some labs that must be completed before class, (2) there will be a quiz on the lab content at the start of class some weeks, and (3) labs can be time consuming and you will not be allowed extra time. Some labs may require you to also download data from the course website. You will need to bring a writing implement (pencil is highly recommended) to class and **you must bring your laptop to every lab**, all other supplies will be provided by your TA. Dress appropriately for field-based labs; high-heeled shoes and flip-flops should not be worn. The TA will give a short overview of each lab (~ 5 min) and the rest of the time will be used to complete the assignment.
- **Website:** The lab component of this course shares the same Sakai website as the lecture.
- **Microsoft Excel:** You will be intensively using Microsoft Excel (a spreadsheet software program) throughout the semester in this lab; therefore it is critically important that you have the version of Excel that the lab instructions are written for. **If you are a Windows user then you must have MS Excel 2013 installed on your laptop and if you are a Mac user you MUST have the 2011 version of Excel for Macs installed.** If you do not already have MS Excel or an earlier version, the ITS office offers it for free.

### Assessments

Your final grade for the lab portion of the course will be broken up into two components: a grade based on the quality of the work you produce and a separate one for your professionalism.

**Work quality grade:** The following is a list of the assignments you will have for this course and the percent each will count towards your work quality grade:

- **Lab reports (80%):** Lab reports are to be handed to the TA either during the lab or recitation period. Late lab reports will not be accepted.
- **In-class quizzes (20%):** Every week you will complete an in-class quiz at the start of the lab to ensure that you have appropriately prepared for each lab by reading and comprehending the lab activity.

**Professionalism grade:** You will receive one professionalism grade for the lab based on how well you embody the good judgement and polite behavior expected of someone who is trained to

do a job well. You will start out with a 100% and can only lose points for being unprofessional. Below is a list of unprofessional behaviors and their corresponding per-occurrence penalty:

- Being late to class (-2%)
- Submitting an incomplete assignment or submitting it incorrectly (-1% to -4%)
- Inappropriate use of electronic devices (e.g., texting, messaging, social media, etc.) during class (-2%)
- Other (-1 to -10% at instructor’s discretion)

**Final lab grade:** Your final lab grade is calculated by multiplying your work quality grade by your professionalism grade. Below is a table of possible grade outcomes given your two grades.

		Quality %															
		100%	98%	96%	94%	92%	90%	88%	86%	84%	82%	80%	78%	76%	74%	72%	70%
Professionalism %	100%	100.0	98.0	96.0	94.0	92.0	90.0	88.0	86.0	84.0	82.0	80.0	78.0	76.0	74.0	72.0	70.0
	98%	98.0	96.0	94.1	92.1	90.2	88.2	86.2	84.3	82.3	80.4	78.4	76.4	74.5	72.5	70.6	68.6
	96%	96.0	94.1	92.2	90.2	88.3	86.4	84.5	82.6	80.6	78.7	76.8	74.9	73.0	71.0	69.1	67.2
	94%	94.0	92.1	90.2	88.4	86.5	84.6	82.7	80.8	79.0	77.1	75.2	73.3	71.4	69.6	67.7	65.8
	92%	92.0	90.2	88.3	86.5	84.6	82.8	81.0	79.1	77.3	75.4	73.6	71.8	69.9	68.1	66.2	64.4
	90%	90.0	88.2	86.4	84.6	82.8	81.0	79.2	77.4	75.6	73.8	72.0	70.2	68.4	66.6	64.8	63.0
	88%	88.0	86.2	84.5	82.7	81.0	79.2	77.4	75.7	73.9	72.2	70.4	68.6	66.9	65.1	63.4	61.6
	86%	86.0	84.3	82.6	80.8	79.1	77.4	75.7	74.0	72.2	70.5	68.8	67.1	65.4	63.6	61.9	60.2
	84%	84.0	82.3	80.6	79.0	77.3	75.6	73.9	72.2	70.6	68.9	67.2	65.5	63.8	62.2	60.5	58.8
	82%	82.0	80.4	78.7	77.1	75.4	73.8	72.2	70.5	68.9	67.2	65.6	64.0	62.3	60.7	59.0	57.4
	80%	80.0	78.4	76.8	75.2	73.6	72.0	70.4	68.8	67.2	65.6	64.0	62.4	60.8	59.2	57.6	56.0
	78%	78.0	76.4	74.9	73.3	71.8	70.2	68.6	67.1	65.5	64.0	62.4	60.8	59.3	57.7	56.2	54.6
	76%	76.0	74.5	73.0	71.4	69.9	68.4	66.9	65.4	63.8	62.3	60.8	59.3	57.8	56.2	54.7	53.2
	74%	74.0	72.5	71.0	69.6	68.1	66.6	65.1	63.6	62.2	60.7	59.2	57.7	56.2	54.8	53.3	51.8
	72%	72.0	70.6	69.1	67.7	66.2	64.8	63.4	61.9	60.5	59.0	57.6	56.2	54.7	53.3	51.8	50.4
70%	70.0	68.6	67.2	65.8	64.4	63.0	61.6	60.2	58.8	57.4	56.0	54.6	53.2	51.8	50.4	49.0	

**Student Responsibilities:** All work in this course must be carried out within the letter and spirit of the UNC Honor Code (see pages 472 – 473 in the 2015-2016 Undergraduate Bulletin). Although collaboration is encouraged when completing lab activities, each student must submit a worksheet with answers to questions written in their own words. It is your responsibility if you have any doubt about the uniqueness of your answers to confirm with the instructor.

**Course Calendar**

The following is a calendar for the topics and labs in this course. This course is still being fine-tuned so the order and topics are subject to change so regularly check the course website for updates.

<b>Date</b>	<b>Day</b>	<b>Lesson</b>	<b>Lesson Topic</b>	<b>Lab</b>
1/10	Wed	1. Intro to Course	1.1 Navigating the Course Website 1.2 Logistical Tasks	<b>1<sup>st</sup> Week of Class – NO LABS</b>
1/12	Fri	2. Scientific Method	2.1 Principles of science 2.2 Scientific Experiments	
<b>1/15</b>	<b>Mon</b>		<b>MLK Holiday (NO CLASS)</b>	<b>Short week – NO LABS</b>
1/17	Wed	3. Matter and Energy	3.1 Matter	
1/19	Fri		3.2 Types of Energy & Thermodynamics	
1/22	Mon		3.2 Types of Energy & Thermodynamics (cont.)	Scientific Method
1/24	Wed		3.2 Types of Energy & Thermodynamics (cont.) 3.3 Radiation	
1/26	Fri		3.4 Conduction & Convection	
1/29	Mon		3.5 Energy of State Changes	Thermodynamics
1/31	Wed	4. Environmental Systems	4.1 Systems Theory	
2/2	Fri		4.2 Dynamic Systems & Steady State	
2/5	Mon	5. Ecosystems	5.1 Ecosystems & How They Work	Primary Production
<b>2/7</b>	<b>Wed</b>		<b>Midterm Exam #1 (through Lesson 4.2)</b>	
2/9	Fri		5.2 Primary Production	
2/12	Mon		5.3 Biogeochemical Cycles	Plate Tectonics

2/14	Wed	6. Lithosphere	6.1 Continental Drift & Plate Tectonics	
2/16	Fri		6.2 Soils	
2/19	Mon	7. Atmosphere	7.1 Atmospheric Basics	Radiation & Earth's Temperature
2/21	Wed		7.2 Earth's Energy Budget	
2/23	Fri		7.3 Coriolis Effect	
2/26	Mon		7.4 Atmospheric Circulation	Atmospheric Moisture
2/28	Wed	8. Hydrosphere	8.1 Basic Properties of Water	
3/2	Fri		8.2 Water in the Atmosphere	
3/5	Mon		8.3 Water in the Lithosphere	
<b>3/7</b>	<b>Wed</b>		<b>Midterm Exam #2 (Lessons 5.1 through 8.2)</b>	
3/9	Fri		8.4 Lake & Ocean Circulation	
<b>3/12</b>	<b>Mon</b>		<b>Spring Break (NO CLASS)</b>	<b>Spring Break (NO LABS)</b>
<b>3/14</b>	<b>Wed</b>		<b>Spring Break (NO CLASS)</b>	
<b>3/16</b>	<b>Fri</b>		<b>Spring Break (NO CLASS)</b>	
3/19	Mon	9. Population Dynamics	9.1 Population Basics & Demography	Watershed Hydrology
3/21	Wed		9.2 Population Growth Models	
3/23	Fri		9.2 Population Growth Models (cont.) 9.3 Population Regulation	
3/26	Mon		9.3 Population Regulation (cont.)	Population Dynamics
3/28	Wed	10. Biodiversity Loss	10.1 Basic Genetics	
<b>3/30</b>	<b>Fri</b>		<b>University Holiday (NO CLASS)</b>	

4/2	Mon		10.2 Population Genetics	Species Diversity
4/4	Wed		<b>Midterm #3 (Lessons 8.3 through 10.1)</b>	
4/6	Fri		10.3 Species Loss	
4/9	Mon		10.4 Species Diversity & Ecosystem Properties	Milankovitch Cycles
4/11	Wed	11. Climate Change	11.1 Earth's Climate Record & Forcing (cont.)	
4/13	Fri		11.1 Earth's Climate Record & Forcings (cont.) 11.2 Climate Feedbacks	
4/16	Mon		11.3 Milankovitch Cycles	Air Quality
4/18	Wed		11.3 Milankovitch Cycles (cont.)	
4/20	Fri	12. Pollution	12.1 Pollution Basics & CFC's	
4/23	Mon		12.2 Air Quality & Inversions	<b>Last Week of Class (NO LABS)</b>
4/25	Wed		12.3 Eutrophication & Nutrient Loading	
4/27	Fri		12.3 Eutrophication & Nutrient Loading	
<b>5/7</b>	<b>Mon</b>		<b>Final Exam (Cumulative) – 8 am in our regular classroom</b>	