

# **AGEN/BSEN 350: Soil & Water Resources Engineering**

## **Fall 2021**

**Instructors:** Dr. Aaron Mittelstet  
245 Chase Hall  
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**Time/ Room:** Lecture: 12:00-12:50 M-W, CHA 112  
Lab: 9:00-10:50 M, CHA 116 & outdoors

**Teaching Assistant:**  
Ali Mohammed  
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**Course Description:**  
Introduction to soil and water resources and the engineering processes used to analyze watersheds. Soil water relations, evapotranspiration, precipitation, runoff, erosion, flow in natural waterways and through reservoirs, wetland and groundwater hydrology, and water quality. Geographic information system utilized to develop maps and analyze watershed characteristics. A selected watershed is investigated.  
3 credit hrs (2 hrs lecture | 2 hr laboratory)

**Prerequisites:**  
Math 221 and parallel MECH/CIVE 310 or CHME 332

**Textbook (Required):**  
Soil and Water Conservation Engineering 7<sup>th</sup> Edition by R.L. Huffman, D.D. Fangmeier, W.J. Elliot, S.R. Workman; ISBN 1-892769-4; DOI: ([doi: https://doi.org/10.13031/swce.2013](https://doi.org/10.13031/swce.2013))

E-Book available for free download for ASABE Members at (\$25 membership for students  
<https://www.asabe.org/join>): <https://elibrary.asabe.org/textbook.asp?confid=swce2012>

or

Purchased hardback book for ~\$75 from the following vendors:  
<https://www.amazon.com/Soil-Water-Conservation-Engineering-Seventh/dp/1892769867>

## Objectives

Following this course, students will:

- 1) **Recognize** basic principles that drive the hydrologic cycle by assessing watershed hydrologic inputs and outputs (ABET 1)
- 2) **Analyze** availability and fluxes of water across various components of the hydrologic cycle by solving and executing engineering watershed design procedures (ABET 2 and 6)
- 3) **Innovate** data and systemic analyses for water management based on experiential learning by conducting a watershed assessment (ABET 2)
- 4) **Deploy** existing models to assess data and **conduct** systemic analyses for water management based on experiential learning (ABET 2 and 4)
  - *Selecting appropriate watershed design principles, equations, and/or approaches for design solution*
  - *Solving and executing engineering design solution procedures*
- 5) **Recognize** basic policy and regulatory issues related to soil and water resources engineering for Lincoln, Nebraska and federal agencies to execute in watershed evaluations by:
  - *Recognizing ethical and professional responsibilities of soil and water resources engineering design (ABET 4)*
  - *Considering the global, economic, environmental, a societal context for individual water resources engineering (specifically with the “Soil and Water Resources in the News” assignment) (ABET 4)*
- 6) **Work** effectively on a laboratory teams to utilize new knowledge to complete a team watershed design:
  - *Making informed judgement for watershed design project (ABET 4)*
  - *Contributing to a collaborative and inclusive environment in a multidisciplinary context (ABET 5)*
  - *Establishing goals for watershed design project (ABET 5)*
  - *Planning tasks to meet deadlines for watershed design project (ABET 5)*
  - *Presenting methods and accomplishments to meet objectives outlined in watershed design project (ABET 5)*
  - *Acquiring new knowledge on watershed design (ABET 7)*
  - *Applying new concepts to watershed design (ABET 7)*

## ABET Outcomes Covered in this Course:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (Course Outcome 1)
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (Course Outcomes 2,3 and 4)
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (Course Outcomes 5 and 6)
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (Course Outcome 6)

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (Course Outcome 2)
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies (Course Outcome 6)

## **Course Structure**

The course is taught as two weekly lectures and one weekly laboratory.

### **Lectures and Notes:**

Lectures will be presented using varying delivery methods. Electronic materials presented in class (PowerPoint presentations, etc.) will be posted on Canvas (typically a day prior to each lecture). However, material presented in PowerPoint format will be expanded upon and further developed during class lectures and class discussions requiring students to take additional notes in class.

Due dates for homework will be included when assigned. Labs and homework assignments should be scanned and uploaded to Canvas. **If turned after the due date, your grade will be reduced by 5 percentage points. For each day the paper is late, your grade will be reduced by an additional 10 percentage points. No credit will be given on homework that is handed in after the homework set has been graded and returned to the other students.** Special circumstances regarding homework deadlines must be arranged with the instructor in advance when possible. All work should be well organized and neat. To encourage neatness, engineering paper should be used. Ten percent will be deducted if engineering paper is not used. If reports are poorly written, they may not be accepted. Spelling and grammar will be considered in grading reports. **Since a significant portion of the course grade is based on class participation and graded homework and reports, students should place priority on timely preparation of high quality homework and be an active participant in class.**

The engineering problem solving methodology must be used for each problem unless stated otherwise. Write out the problem completely and document any equations that are used. Put a box around your final answer. Include all units. Points will be deducted if units are not included. Write out your homework and labs neatly. If the graders cannot read it, the problem will be counted incorrect.

### **Laboratories:**

Laboratories will provide more practical aspects of Soil & Water Resources Engineering. During laboratories, we will apply the material learned in lecture.

### **Assignments:**

Typically, homework will be assigned for each topic covered. Further, assignments are designed to prepare students for exams and water resource work in their future professional careers. All homework problems should be completed on engineering paper. If you choose not to use engi

### **Student Design Projects:**

Students will be placed in laboratory groups to evaluate a watershed using techniques taught and practiced throughout the semester. Each lab will build onto the overall watershed evaluation project.

### **Canvas:**

Check Canvas regularly for announcements, assignments, readings, etc. Be sure that the email address Canvas has for you is current. All PowerPoint notes will be made available prior to or after class on Canvas. ***Not all information provided in class will be on the PowerPoints, but should help guide you through the lectures while taking notes.*** These presentations are an excellent resource, but they **cannot** replace quality lecture notes and class attendance.

### **ADA and Accommodation:**

Students with disabilities are encouraged to contact me (the instructor or teaching assistant) for a confidential discussion of their individual needs for academic accommodation as determined by Services for Students with Disabilities (SSD). This includes students with mental health disabilities like depression and anxiety. It is the policy of the University of Nebraska-Lincoln to provide individualized accommodations to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with SSD which is located 117 Louise Pound Hall (472-3787)

### **Writing Center:**

The Writing Center, located in 102 Andrews Hall and satellite locations from 5-7 pm in Adele Hall, is a free service for all UNL students, faculty, and staff. You can work with an individual writing consultant on any type of writing at any stage in your writing process. For an appointment, call 472-8803 or [schedule online](#)[Links to an external site.](#)

### **Academic Support Services:**

You can schedule free appointments for individual academic coaching with First-Year Experience and Transition Program staff through MyPLAN. You can also take advantage of study stops--which provide individual and group study with learning consultants in a variety of disciplines--and free group workshops on topics such as time management, goal setting, test preparation, and reading strategies. See [success.unl.edu](http://success.unl.edu)[Links to an external site.](#) for schedules and more information.

### **Counseling and Psychological Services:**

UNL offers a variety of options to students to aid them in dealing with stress and adversity. [Counseling and Psychological & Services \(CAPS\)](#)[Links to an external site.](#); is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. [Big Red Resilience & Well-Being](#)[Links to an external site.](#) (BRRWB) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice

resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.

### **Academic Honesty:**

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's Student Code of Conduct[Links to an external site.](#) addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

### **Diversity & Inclusion:**

The University of Nebraska-Lincoln does not discriminate on the basis of race, ethnicity, color, national origin, sex (including pregnancy), religion, age, disability, sexual orientation, gender identity, genetic information, veteran status, marital status, and/or political affiliation. Trespass Policy (Regents' Policy 6.4.7)

The areas of University academic, research, public service, and administrative buildings of the University used for classrooms, laboratories, faculty and staff offices, and the areas of University student residence buildings used for student living quarters are not open to the general public. Any person not authorized to be or remain in any such building area will be deemed to be trespassing on University property and may be cited and subject to prosecution for criminal trespass in violation of Neb. Rev. Stat., § 28-520 or § 28-521.

### **Email Policy**

Students are encouraged to email or visit during online office hours. I will do my best to answer emails in a timely fashion. As a policy, I will get back to you within 24 hours on a weekday and within 48 hours on a weekend. This means if you wait to do your homework assignment until the very last day I may or may not get back to you. **Therefore, procrastinate at your own risk!**

### **Emergency Response:**

- **Fire Alarm (or other evacuation):** In the event of a fire alarm: Gather belongings (Purse, keys, cellphone, N-Card, etc.) and use the nearest exit to leave the building. Do not use the elevators. After exiting notify emergency personnel of the location of persons unable to exit the building. Do not return to building unless told to do so by emergency personnel.
- **Tornado Warning:** When sirens sound, move to the lowest interior area of building or designated shelter. Stay away from windows and stay near an inside wall when possible.
- **Active Shooter**
  - o **Evacuate:** if there is a safe escape path, leave belongings behind, keep hands visible and follow police officer instructions.
  - o **Hide out:** If evacuation is impossible secure yourself in your space by turning out lights, closing blinds and barricading doors if possible.
  - o **Take action:** As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.
- **UNL Alert:** Notifications about serious incidents on campus are sent via text message, email, unl.edu website, and social media. For more information go to: <http://unlalert.unl.edu>.

- Additional Emergency Procedures can be found here:  
[http://emergency.unl.edu/doc/Emergency\\_Procedures\\_Quicklist.pdf](http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf)

## **COVID 19**

Masks will not be required in lecture, but are required for labs.

*Students in this course must work in close physical proximity to one another for extended periods of time in order to achieve the academic goals of the course. For this reason, the Department of Biological Systems Engineering and the College of Agricultural Sciences and Natural Resources have determined that face coverings will be required in this course. If you are unwilling to comply with this requirement, please visit with your advisor about possible alternative courses that you might take in lieu of this one.*

## **Evaluation**

### **Assessment Plan:**

<b>Undergraduate Students</b>	
Exams (70 pts each)	210 pts
Watershed Design Project	70 pts
Water Resource Engineering in the News	20 pts
<u>Assignments and labs</u>	<u>150 pts</u>
<b>Overall</b>	<b>500 pts</b>

### **Grading Scale:**

A+	98-100
A	93-97
A-	90-92
B+	88-89
B	83-87
B-	80-82
C+	78-79
C	73-77
C-	70-72
D+	68-69
D	63-67
D-	60-62
F	<60

**BSEN 350**  
**Fall 2021**

DATE	LECTURE TOPIC	LECTURE READING	LAB TOPIC	REMARKS
8-23	<b>INTRODUCTION</b> Course overview	Chapter 1	Introduction	
8-25	Land Surveying	Handout		
8-30	Water Quality	Chapter 2	Profile Surveying	Alan, Ali lab
9-1	Precipitation	Chapter 3		
9-6	<b>Labor Day</b> <b>No class</b>			
9-8	Precipitation	Chapter 3		<b>Readiness Test 1</b> <b>Chapters 1-3</b>
9-13	Evaporation/Evapotranspiration	Chapter 4	Precipitation lab	Mittelstet lab Jas lecture
9-15	Evaporation/Evapotranspiration	Chapter 4		Ali lecture
9-20	Infiltration and Runoff	Chapter 5	Evapotranspiration lab	Ali, Jas lab
9-22	Infiltration and Runoff End of Exam 1 Material	Chapter 5		<b>Readiness Test 2</b> <b>Chapter 4-5</b>
9-27	<b>Exam 1</b>		Infiltration lab	Alan, Ali lab
9-29	Open Channel Flow	Chapter 6		
10-4	<b>No class. Extended lab</b>		Flow Measurement Lab	Alan, Griff, Yaser, Ali lab
10-6	Open Channel Flow	Chapter 6		
10-11	Soil Erosion by Water	Chapter 7	Transducer/ Manning's n Lab	Mittelstet lab

DATE	LECTURE TOPIC	LECTURE READING	LAB TOPIC	REMARKS
10-13	Soil Erosion by Water	Chapter 7		Guest lecture Jeff McPeak
10-18	<b>Fall Break</b>		<b>No Lab</b>	
10-20	Terraces and Vegetated Waterways	Chapter 8 Handouts		
10-25	Terraces and Vegetated Waterways	Chapter 8 Handouts	Erosion Lab/Web Soil Survey	<b>Readiness Test 3 Chapters 6, 7</b>  Mittelstet lab
10-27	Modeling End of Exam 2 Material			Yaser lecture
11-1	<b>Exam 2</b>		Holmes Lake/Tierra Park/Cooper YMCA	Mittelstet, Matt C. lab
11-3	Water and Sediment Control Structures	Chapter 9		
11-8	Water and Sediment Control Structures	Chapter 9	SWMM model	Matt C. lab
11-10	Water Supply/Groundwater	Chapter 11		<b>Readiness Test 4 Chapters 9, 11</b>
11-15	Channel Stabilization and Restoration	Chapter 10	GIS Lab	Mittelstet lab
11-17	Channel Stabilization and Restoration	Chapter 10		
11-22	Pumps and Pumping	Chapter 19	Pumping lab	Ali, Jas lab Ali lecture
11-24	Thanksgiving Holiday			
11-29	Irrigation Principles	Chapter 15	Groundwater lab	Jas lecture Mittelstet lab
12-1	Design Projects			<b>Readiness Test 5 Chapters 10, 15, 19</b>
12-6	Wetlands	Chapter 12		Messer lecture
12-8	Design Projects/Review for Final			



12-16	<b>Final Exam</b> <b>3:30-5:30 PM</b> -----			Cumulative
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