

ABEN 484/684  
**Drainage and Wetland Engineering**  
3 credits, Fall 2022

**Instructor and Contact Information**

**Instructor:** Dr. Xinhua Jia, Ph.D., P.E., Professor of Agricultural and Biosystems Engineering

**Office:** Morrill Hall 204 **Email:** [Xinhua.Jia@ndsu.edu](mailto:Xinhua.Jia@ndsu.edu) **Phone:** 701-231-6453

**Class time and location:** TTh 9:30 – 10:45 am in ABEN Room 208

**Office hours:** TTh 11:00 – 12:00 pm on Zoom or by appointment

**Zoom Personal ID:** 899 398 1395

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**Course Description**

Drainage and wetland engineering principles, design, and water quality for agricultural and natural resources applications. Topics include soil, water, and plant relationships, water movement in soils, water quality (nitrogen and salinity), surface drainage, subsurface drainage and its modeling, and wetlands.

**Prerequisite:** CE 309, or SOIL 433

**Course Objectives**

- To understand the fundamental process of soil water movement and soil-water-plant relationships on drainage and wetland systems.
- To understand the water quality issues associated with drainage and wetland systems.
- To design drainage and wetland systems for agricultural and natural resources practices, including surface drainage, subsurface drainage, water table control, and removal of pollutants.

**ABEN Department Educational Objectives and Program Outcomes for ABET**

Educational Objective 1: Provide students with technical knowledge, design, and problem solving skills that are foundational to their engineering careers by ensuring that graduates have ability to:

- a. Apply knowledge of mathematics, science, and engineering.
- b. Design and conduct experiments, as well as to analyze and interpret data.
- c. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- e. Identify, formulate, and solve engineering problems.
- k. Use techniques, skills, and modern engineering tools necessary for engineering practice.

Educational Objective 2: Provide learning experiences that build interpersonal and collaborative skills and the capacity for productive careers by ensuring that graduates have:

- d. An ability to function on multi-disciplinary teams.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.

**Evaluation Procedures and Criteria**

<b>For ABEN 484:</b>	<b>% of Grade</b>	<b>Percentage</b>	<b>Grade</b>
Homework	12%		
Quiz	8%	90-100	A
Design Project	20%	80-89.9	B
Exam 1	20%	70-79.9	C
Exam 2	20%	60-69.9	D
Final Exam	20%	<60	F
<b>Total</b>	<b>100%</b>		

<b>For ABEN 684:</b>	<b>% of Grade</b>	<b>Percentage</b>	<b>Grade</b>
Homework	12%		
Quiz	8%	90-100	A
Design Project	20%	80-89.9	B
Exam 1	15%	70-79.9	C
Exam 2	15%	60-69.9	D
Graduate Project	10%	<60	F
Final Exam	20%		
<b>Total</b>	<b>100%</b>		

*Note: The final grade cutoff percentages may be lowered, but will not be raised.*

### **Grading Policies**

1. The homework and project are due at the assigned time on the assigned date. Late homework and project report will generally not be accepted unless it is due to a medical or family emergency.
2. According to NDSU Policy 333 (<http://www.ndsu.edu/fileadmin/policy/333.pdf>), attendance in classes is expected. Quizzes are randomly given during the class to check your understanding of the course materials and attendance, and conduct course assessment/evaluation. No make-up quiz!!
3. You must take the exams at the scheduled times. Missed exams will receive ZERO point unless it is due to a medical or family emergency. You are required to notify the instructor in advance of missing a test. Documented proof from an authorized person is required. A makeup exam will be scheduled between the instructor and the student.
4. The entire class will be divided into three teams to work on a drainage and a wetland design projects that are identified by the instructor. Detailed instructions about the design projects will be announced in class.
5. In addition to the regular requirements of the course, ABEN 684 students will work individually on a graduate project related to DRAINMOD modeling. Details about the graduate project will be given later in the class.

### **Required Student Resources**

#### ***Textbook***

Waller, P. and M. Yitayew. 2016. Irrigation and Drainage Engineering. Springer International Publishing, Switzerland. 562p.

#### ***References***

DRAINMOD modules: [go.ncsu.edu/dmmodules](http://go.ncsu.edu/dmmodules)

<https://elementwater.design>

Skaggs, R.W., and J. van Schilfgaarde (Editors). 1999. Agricultural Drainage. ASA Monography No. 38. American Society of Agronomy, Madison WI. 1328p.

Campbell, C.S. and M.H. Ogden. 1999. Constructed wetlands in the sustainable landscape. John Wiley and Sons, Inc., New York, 270p.

Smedema, L.K., W.F. Vlotman and D.W. Rycroft. 2004. Modern land drainage: planning and design of agricultural drainage systems. A.A. Balkma Publishers, Leiden, The Netherlands. 446p.

Luthin, J. N. 1978. Drainage Engineering. Robert E. Krieger Publishing Co., Inc., Huntington, New York. 281p.

### **Blackboard**

Additional reading materials, lecture outlines, homework assignments, and your grades will be posted on Blackboard. You are responsible for checking the course Blackboard regularly and downloading/printing the materials on time.

### **Attendance Policy and Covid-19 Accommodation**

In accordance with NDSU Policy 333 (<http://www.ndsu.edu/fileadmin/policy/333.pdf>), class participation is expected at all regularly scheduled class and lab times as they are critical to every student's success in this course. Students are expected to attend every class and remain in class for the duration of the session.

If you are unable to attend class at the regularly scheduled time due to illness, contact the instructor for alternate arrangements, including recordings of class sessions and assignments as well as accommodations and extensions as needed. Do not come to class if you are sick.

Do not come to class if you have been exposed to individuals who tested positive for COVID-19 and/or you have been notified to self-quarantine due to exposure. If you are absent from class as a result of a COVID-19 diagnosis or quarantine, the decision for approval of all absences and missed work is determined by the course instructor. As instructor, I will do the following to help you make progress in the course:

- You will be able to participate in class remotely.
- You will be able to submit assignments and take exams remotely.
- Other remote learning options will be determined on a case-by-case basis.

### **Professional and Academic Integrity**

You are expected to conduct yourself in a respectful and professional manner in class per University policy. Students who are disturbing others during the class will be asked to leave the classroom immediately. Please review NDSU Policy 601 – Code of Student Behavior (<http://www.ndsu.edu/fileadmin/studentlife/StudentCode.pdf>).

*All work in this course must be completed in a manner consistent with NDSU University Senate Policy, Section 335: Code of Academic Responsibility and Conduct (<http://www.ndsu.edu/fileadmin/policy/335.pdf>).*

*All students taking any course in the College of Engineering are under the Honor System. Details can be found at [http://www.ndsu.edu/coe/undergraduate\\_students/honor\\_code/](http://www.ndsu.edu/coe/undergraduate_students/honor_code/).*

### **Students with Special Needs and/or Circumstances**

*Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office (<http://www.ndsu.edu/disabilityservices/>) as soon as possible.*

*Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.*

## Additional Resources for Students

As a member of the NDSU community, resources are available for you should you need help in dealing with adverse reactions to things happening in the world today. A variety of resources are listed below. For students on campus and remotely (telehealth):

- Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>
- Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>
- Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>
- Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>

In a crisis or emergency situation:

- Call University Police: 701-231-8998
- Call 9-1-1
- Go to a Hospital Emergency Room
- Go to Prairie St. Johns for a Needs Assessment: 701-476-7216 (510 4th St. S.)
- Call the FirstLink Help Line: 1-800-273- TALK (8255) or 2-1-1
- Call Rape and Abuse Crisis Center: 701-293-7273

## Important Dates

August 31	Last day to add classes via Campus Connection
August 31	Last day for no-record drop of classes @ 100% refund
August 31	Last day to withdraw to 0 credits @ 100% refund
September 5	Labor Day holiday (no classes/offices closed)
September 6	Financial Aid applied to Student Accounts
September 12	Last day to submit request to audit, pass/fail
October 14	Undergraduate fall graduation application due
October 14	Graduate student Intent to Graduate due
October 14	Grades of Incomplete convert to F
October 27	Spring/ Summer registration begins
November 11	Veteran's Day (no classes/offices closed)
November 10	Last day to drop classes with 'W' record
November 10	Last day to <a href="#">withdraw to zero credits</a> for Fall
November 18	Fall commencement participation deadline
November 23-25	Thanksgiving no classes (offices open on Friday)
December 5-9	Dead Week
December 12-16	Final Examinations
December 16	Commencement

## TENTATIVE COURSE OUTLINE

### Drainage and Wetland Engineering

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Date	Topic	Homework
8/23/2022	Introduction	
8/25/2022	Chapter 3. Soil physics (assign wetland group project)	HW#1
8/30/2022	Introduction of natural wetlands (guest lecture)	
9/1/2022	Topographic mapping (ABEN 210B)	HW #2
9/6/2022	Chapter 23. Wastewater contaminants and treatment	
9/8/2022	Chapter 24. Waste treatment in wetlands	HW #3
9/13/2022	Chapter 24. Waste treatment in wetlands	
9/15/2022	Wetland Design (EPA Manual, guest lecture)	HW #4
9/20 & 22/2022	Wetland Design (EPA Manual)	
9/27/2022	Review and catch up or field tour	
9/29/2022	<b>Exam 1</b>	
10/4/2022	Drainage and Wetland Law and Policies	
10/6/2022	Surface drainage (ASABE standard)	HW #5
10/11/2022	Student presentation for wetland design (Graduate student project title) (Assign drainage design projects)	
10/13/2022	Introduction and tools for drainage design	HW #6
10/18/2022	Chapter 30. Subsurface drainage design and installation (Wetland Design Report is due)	
10/20/2022	Chapter 30. Subsurface drainage design and installation	HW #7
10/25/2022	Sump pump design (guest lecture by Dr. Scherer)	
10/27 & 11/1/2022	Chapter 31. Subsurface drainage modeling	HW #8
11/3/2022	Drainage Design (ASABE standard)	HW #9
11/8/2022	Agricultural water management	
11/10/2022	<b>Exam 2</b>	
11/15/2022	Introduction of Drainmod	
11/17/2022	Student presentation for drainage design	
11/22/2022	DrainMod tutorial (ABEN 210B) (Drainage design project report is due)	HW #10
11/29, 12/1, & 12/6/2022	Drainage design using DrainMod	HW #11, 12
12/8/2022	Graduate student presentation	
12/16/2022	<b>Comprehensive final exam at 8:00 am – 10:00 am on Blackboard</b>	