ABEN 484/684

Drainage and Wetland Engineering

3 credits, Fall 2018

Instructor and Contact Information

Instructor: Dr. Xinhua Jia, Associate Professor of Agricultural and Biosystems Engineering

Office: Morrill Hall 204 **Email:** Xinhua.Jia@ndsu.edu **Phone:** 701-231-6453

Class time and location: TTh 9:30 – 10:45 am in ABEN Room 201

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

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

For ABEN 484:	**% of Grade**	**Percentage**	**Grade**
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
Total	**100%**		

For ABEN 684:	**% of Grade**	**Percentage**	**Grade**
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%		
Total	**100%**		

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. Two homework are your designated guest lectures in the wetland and the drainage sections.

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 conduct course assessment/evaluation. They are pre-test, mid semester assessment, post-test, and a field trip. 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. Optional.

Waller, P. 2009. Drainage and Wetland Engineering. University of Arizona, Tucson, AZ. Free for students in class. However, it is copyrighted so please do not pass on the chapters to others.

References

DRAINMOD modules: go.ncsu.edu/dmmodules

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.

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/.

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.

TENTATIVE COURSE OUTLINE

Drainage and Wetland Engineering

ABEN 484/684, 3 credits, Fall 2018

Date	Topic
8/21/2018	Introduction
8/23/2018	Chapter 1. Introduction
8/28/2018	Chapter 2. Contaminants (Guest lecture by Sam, Grady, Matt, & Blake)
8/30/2018	Chapter 3. Soils
9/4/2018	Chapter 3. Soils (Guest lecture by Talon, Zach, Ethan, & Ryan S.)
9/6/2018	Drainage and Wetland Law and Policies (Guest lecture by Joanna, Anne, Alexa, & Ryan C.)
9/11/2018	Introduction of natural wetlands (guest lecture by Ray Norrgard, MN DNR)
9/13/2018	Chapter 4. Wetlands Design
9/18/2018	Chapter 4. Wetlands Design
9/20/2018	Chapter 4. Wetlands Design
9/25/2018	Wetland Design (EPA Manual) and review
9/27/2018	Topography mapping system
10/2/2018	**Exam 1 (Chapters 1-4)**
10/4/2018	Surface drainage
10/9/2018	Field Trip to Prinsco Inc.
10/11/2018	Chapter 10. Subsurface drainage models
10/16/2018	Agricultural water management
10/18/2018	*Sump pump design (Dr. Scherer)*
10/23/2018	Chapter 11. Subsurface drainage design
10/25/2018	Drainage Design (ASABE standard)
10/30/2018	Drainage Design (ASABE standard) and review
11/1/2018	**Exam 2 (Chapter 10-11)**
11/6/2018	Drainage design tools (ABEN 210B)
11/8/2018	Drainmod (ABEN 210B)
11/13/2018	Drainmod (ABEN 210B)
11/15/2018	Design using Drainmod (ABEN 210B)
11/20/2018	Design using Drainmod (ABEN 210B)
11/27/2018	Chapter 5. Salinity and nitrogen
11/29/2018	Chapter 5. Salinity and nitrogen
12/4/2018	Student presentation
12/6/2018	Student presentation
12/11/2018	**Final exam at 1:00-3:00 pm in ABEN 201**