

ABEN 464/664 Resource Conservation and Irrigation Engineering

University Bulletin Course Description:

ABEN 464. Resource Conservation and Irrigation Engineering. 4 Credits. Engineering principles and design of systems for soil and water resource management and environmental protection. 3 lectures, 1 three-hour laboratory. Prereq: CE 309. (Offered spring semester of odd years.)

Times, Days, and Locations:

Class: 10:00 to 10:50 a.m. MWF. Ladd Hall 209.
Lab: 2:00 to 4:30 p.m. on Wednesdays. Ladd Hall 318 or other locations to be announced. Some labs such as field trips may last until 4:30 p.m. Labs may include lab work, field trips, and/or guest speakers.

Instructor:

Dean Steele
101D Ladd Hall
Phone 701-231-7268
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Office hours:

11:00 a.m. to 12:00 p.m. on Mondays and Fridays or by appointment. Variations in this schedule will be announced in class, via Blackboard, and/or via e-mail.

Class Numbers:

ABEN 464: 34758
ABEN 664: 34755

Text:

Huffman, R.L., D.D. Fangmeier, W.J. Elliot, and S.R. Workman. 2013. *Soil and Water Conservation Engineering*, 7th Ed. St. Joseph, Michigan: ASABE. ISBN 10: 1892769867; ISBN 13: 9781892769862.

Required Student Resources:

In addition to the textbook, students will need note-taking resources, Internet access, an e-mail account, data storage devices, folders or notebooks for handouts and homework, and a scientific or engineering calculator.

Prerequisites:

CE 309, Fluid Mechanics.

Topics:

Chapter titles from the text are: 1) conservation and the environment, 2) water quality, 3) precipitation, 4) evaporation and evapotranspiration, 5) infiltration and runoff, 6) open channel flow, 7) soil erosion by water, 8) terraces and vegetated waterways, 9) water and sediment control structures, 10) channel stabilization and restoration, 11) water supply, 12) wetlands, 13) drainage principles and surface drainage, 14) water table management, 15) irrigation principles, 16) surface irrigation, 17) sprinkler irrigation, 18) microirrigation, 19)

pumps and pumping, and 20) soil erosion by wind. Refer to the attached schedule for more details. We will likely not cover chapters 10-12, or the coverage will not be detailed.

Course Schedule:

A tentative course schedule will be published in a separate document. Changes are likely because of variations in the availability of lab space, tour hosts, guest speakers, etc.

Objectives:

Following is a list of course objectives and a student outcome for the course. The Accreditation Board for Engineering and Technology (ABET) requires that accredited engineering programs publish their program educational objectives (PEOs) and student outcomes (SOs). A goal of this course is to meet ABET requirements. Additional details on the ABEN program's PEOs and SOs are provided in the appendix, Table 2, page 5, of this document.

After completing this course, students should be able to:

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (PEO# 1, SO 1);
2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (PEO # 1, SO 6); and
3. complete and present an extra project during the semester (graduate students only). Details are described later in the syllabus.

Modality:

In person. Please plan to attend all class and lab sessions.

Video and audio recordings of lecture segments using a video capture system will likely *not* be attempted this semester.

If any recordings are made, please note the following:

- Any video recordings will serve as supplementary material to help you review concepts, complete homework, etc.
- Video recordings should not be expected to replace class attendance.
- Technical difficulties or other obstacles may prevent recordings on a given day, or the recordings may be incomplete.
- Transcripts of recordings are expected to contain errors.

Computer Usage:

Students will be required to use computers for some reading, homework, and/or lab assignments. Blackboard will be used in the course.

Laboratory Projects:

Laboratory sessions may involve field trips, work in on-campus laboratories, work in computer clusters, and/or work in the classroom. The location of each lab will be announced

in advance. Students need to sign and submit release forms for safe lab/shop use and for field trips. If these forms are needed but not signed, credit may not be given for the course. See the Course Information area of Blackboard for more information. NDSU policies require the use of seat belts in NDSU vehicles.

Students with Special Requirements:

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 Center for Accessibility and Disability Resources (https://www.ndsu.edu/accessibility_disability) as soon as possible. The instructor may ask for verification, which along with other assistance, can be requested from the Center for Accessibility and Disability Resources in Lower Level of Main Library, Suite 17, 701-231-8463.

Veterans and Active-Duty Military Personnel:

The instructor thanks veterans and active-duty military personnel for their service to the country and for their efforts to preserve the freedoms we enjoy. 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.

Family Educational Rights and Privacy Act (FERPA)

Your personally identifiable information and educational records as they relate to this course are subject to [FERPA](#).

Dead Week Policy:

The NDSU Dead Week policy is available at <https://www.ndsu.edu/onestop/dates/calendar>.

Academic Honesty:

The following general statement of academic honesty was taken from NDSU Policy 331.1: Course Syllabus:

The academic community is operated on the basis of honesty, integrity, and fair play. [NDSU Policy 335: Code of Academic Responsibility and Conduct](#) applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the [Office of Registration and Records](#). Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

Practically speaking, you may consult with a classmate on procedures for homework and laboratory assignments, but the final product must be your original work. Homework, laboratories, or other work that involves team work will be designated as such and sharing of the workload, lab time, calculations, reporting, etc. is acceptable and expected. Tests,

quizzes (if applicable), and the final exam will require individual work with no help from anyone in any form or by any means. To help prevent the temptation of academic dishonesty due to inadvertent observation of a neighbor, intentional collaboration, etc., the instructor may require seating to be dispersed across the room during test sessions.

Use of artificial intelligence, ChatGPT, or similar tools for any work in this class is prohibited.

Additional details on graduate student projects—including writing or design projects and presentations—will be provided to graduate students. All projects and reports are expected to be original work from the student. Assignments or presentations showing evidence of plagiarism will incur penalties such as a point reduction, a zero score on the assignment or part of an assignment, or, for more severe cases, referral to the University. To avoid plagiarism, you must do or note at least the following:

1. Enclose in quotation marks (" ") any wording or narrative that is directly copied or quoted from any other source.
2. Limit direct quotations to a small fraction of your writing. In general, direct quotes should be used sparingly and for emphasis only.
3. When citing the work of others or compiling a review of literature, the generally accepted approach is to read the source document, close it or hide it from view, and attempt to convey in your own words what you think the author meant.
4. Equations and their variables can be cited directly without quotation marks because there is generally only one way to present an equation—as it is in the original. However, you should cite the source of the equation whenever possible.
5. The references cited in your narrative should have a one-to-one correspondence with those in the bibliography and vice-versa. The citations should include author (s), date of publication, title, and source or publisher. Please refer to the [ASABE Guide for Authors](#) for additional details.

Use of Cell Phones and Other Portable Electronic Devices:

As a courtesy to other students and the instructor, all cell phones and other portable electronic devices except handheld calculators should be turned off or placed in a vibrate-only mode during class and laboratory time. Initiating text messages and phone calls during class time is unacceptable unless there is a genuine emergency.

Use of cell phones or other portable electronic devices for verbal communication, text messaging, e-mail, web surfing, taking pictures, etc. during the administration of a test, quiz, or exam may be considered an incident of academic dishonesty. The only foreseeable exception to this policy is the use of handheld calculators for computational purposes.

All participants in this class are subject to NDSU University Senate Policy 158: Acceptable use of Electronic

Communication Devices

(<http://www.ndsu.edu/fileadmin/policy/158.pdf>).

Homework, File Management, and Backups:

Most of the homework in this course will consist of handwritten solutions to problems from the textbook. Refer to the documents in the "Problem-Solving Formats" item in the "Course Information" area of Blackboard for more information on the format required for homework. Laboratory report formats may vary and will be specified as needed. Handwritten work must be legible to receive full credit. Illegible work may be returned for revision, rewriting, typing, etc. with a possible loss of credit. Typing of your homework is optional—it is acceptable but not required.

Some homework and/or laboratory activities may require the use of a spreadsheet, word processor, or other software. Computer printouts should exhibit reasonable effort at organization, documentation, and clarity. Students are responsible for backing up their data and ensuring that electronic file submissions, if required, are received by the instructor. Please do not restrict yourself to only one location for data storage. Students often want to save time by storing documents, spreadsheets, and drawings on only one flash drive. I encourage you to use multiple tools for backing up your documents, such as two or more of the following:

1. Flash drives,
2. The "Files" tab on Blackboard,
3. An online data storage service,
4. A folder on your e-mail account (you can send yourself an e-mail with an attached file to store important documents), or
5. An external hard disk drive.

Evaluation Procedures and Grading Criteria:

Undergraduate students will have the following four categories of work in the course: homework, lab-based reports or problem sets, tests, and a comprehensive final examination. The relative weighting of these work categories is shown in Table 1. Each student's final grade in the course will be determined by a weighted grade percentage ranging from 0 to 100% which will be computed as follows: 1) divide the total points earned in each work category by the total points possible for that work category, 2) multiply the numbers from step (1) by the weight percentages for each respective work category, and 3) add the results. The weighted grade percentage will be converted to a letter grade using the following straight grading scale: $90 \leq A \leq 100\%$, $80 \leq B < 90\%$, $70 \leq C < 80\%$, $60 \leq D < 70\%$, and $0\% \leq F < 60\%$. The scale may be lower, but will not be higher.

Table 1. Grade weighting for undergraduate and graduate students in ABEN 464 and 664.

| Work Category | Weighted Percentage of Total Grade | |
|------------------------------|------------------------------------|-------------------|
| | Undergraduate Students | Graduate Students |
| Homework | 25% | 15% |
| Labs (including attendance) | 25% | 15% |
| Tests | 30% | 30% |
| Final Exam (comprehensive) | 20% | 20% |
| Project & Oral Presentations | 0% | 20% |
| Totals | 100% | 100% |

Due dates for homework and laboratory reports or problem sets will be given with the assignments. Work must be submitted before 5 p.m. to be credited to the day it is received. Late work will be accepted with a 10% penalty per NDSU class day, but will not be accepted after solutions have been posted, handed out, or discussed (unless advance arrangements have been made). Homework submitted after the last day of class will not receive credit. Your scores on homework or laboratory work involving teams may be increased or decreased based on your participation in your team's efforts.

According to NDSU Policy 333

(www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. Attendance is not required for lecture sessions but you are responsible for all materials, discussion, and other items presented in class as well as all scheduling changes discussed in class. If you miss class, the instructor will provide handouts upon your return if asked; you are responsible for obtaining notes from a classmate and checking Blackboard and your e-mail for additional material, notices, etc.

Missed tests, exams, and quizzes will receive zero points unless missed for an acceptable reason and with advance notification where possible. This policy is intended to improve exam security and to improve the fairness of the course for all students. Acceptable reasons for missing tests, exams, and quizzes include a medical or family emergency; university-sanctioned events (see NDSU Policy 333), or a co-curricular activity (such as an unusually-scheduled field trip for another class, a one-time requirement for a major, or another similar event with advance notice to and approval by the instructor). Unacceptable reasons for missing tests, exams, and quizzes include non-curricular activities such as sports, work schedules, farming operations, etc. If you are sick on the day of a quiz or test (or on the due date for a homework assignment), please call or e-mail the instructor before class so arrangements can be made for a make-up session, replacement work, or an adjusted due date.

Attendance will be taken for laboratory sessions and will be factored into that portion of the grade. You may miss one

laboratory session during the semester and there will be no make-up laboratory sessions. The reason for this policy is that time, travel, personnel, material, and other constraints associated with laboratory sessions often make it difficult to provide repeated (make-up) material or laboratory sessions. For your one allowed missed laboratory session, the number of points possible for that lab will not be included in the computations for the laboratory component of the grade. It will be to your advantage to attend all laboratory sessions because: a) all information discussed in the laboratory sessions is subject to inclusion in test and/or final exam questions, and b) the points possible for laboratory sessions may vary from one session to another and point values will not be announced in advance.

If you enroll in the course after its start date and miss one or more labs, the first missed lab will be dropped from the laboratory portion of your weighted grade total. Subsequent missed laboratory sessions will receive zero points with no make-up sessions.

Graduate students will be required to complete a written report on a project and make two oral presentations to the class in addition to the regular requirements of the course. The project will consist of an engineering design, a literature review, or a scientific experiment on a topic related to the class. Each project will be subject to approval from the instructor to ensure appropriate scope and content. The oral reports will consist of a short project description during the first half of the semester and a longer final presentation near the end of the semester. The project and presentations will count for 20% of the grade for graduate students. The weight percentages for each work category are listed in Table 1 and the grade computation will follow the same procedure as that for undergraduate students. Additional details and requirements will be provided separately to graduate students enrolled in the course.

Dates and Deadlines:

<https://www.ndsu.edu/onestop/dates>

Metadata:

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Author: Dean Steele

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ABEN Program Educational Objectives and Student Outcomes

Table 2 below was developed in 2019, has been updated periodically since then, and is intended to be used in the 2024 ABEN ABET self-study report, Criterion 3, Student Outcomes, Section B, Relationship of Student Outcomes to Program Educational Objectives. The ABEN Program Educational Objectives are available at https://www.ndsu.edu/aben/about/abet_accredited/. Student Outcomes describe the knowledge, skills, and behaviors that ABEN students are expected to have by the time of graduation.

Table 2. ABEN program educational objectives and supporting student outcomes⁽¹⁾.

Graduates are expected to have established themselves as practicing engineers who, within a few years of graduation:

A Successfully address emerging engineering challenges in the design or evaluation of machine, processing, environmental, and natural resources systems that affect the production of food, feed, fuel, and other biobased products.

Technical learning outcomes include student outcomes (1), (2), and (6):

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
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
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

B Effectively use professional communication, critical thinking, and interpersonal skills as team leaders and members.

Communicational learning outcomes include student outcomes (3) and (5):

3. an ability to communicate effectively with a range of audiences
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

C Responsibly serve the public and their employers by participating in and promoting professional development, while maintaining the highest standard of professional engineering ethics.

Contextual learning outcomes include student outcomes (4) and (7):

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
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

⁽¹⁾ See <https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2024-2025/#GC3> for information on ABET student outcomes 1-7, effective as part of the "Criteria for Accrediting Engineering Programs, 2024 – 2025".

AppendixTable 3. Important dates for spring 2025 (full NDSU dates/deadlines can be found [here](#))

| | | |
|----------------------|---------|---|
| Jan 1 | Wed | HOLIDAY — New Year's Day (offices closed) |
| Jan 13 | Mon | Classes begin at 4:00 p.m. |
| Jan 14 | Tue | First full day of classes |
| Jan 20 | Mon | HOLIDAY — Martin Luther King, Jr. Day (no classes, offices closed) |
| Jan 21 | Tue | Last day to be added to Campus Connection Wait Lists |
| Jan 23 | Thu | Last day to Add classes via Campus Connection* Permit needed after this date. |
| Jan 23 | Thu | Last day for no-record Drop of classes @ 100% refund*(full semester classes only) |
| Jan 23 | Thu | Last day to Withdraw to Zero Credits @ 100% refund*(full semester classes only) |
| Jan 28 | Tue | Financial aid applied to NDSU account balances |
| Jan 29 | Wed | Payments due for NDSU account balances |
| Feb 3 | Mon | Last day to submit requests to Audit, Pass/Fail |
| Feb 17 | Mon | HOLIDAY — Presidents' Day (no classes, offices closed) |
| Feb 24 | Mon | Last day to Withdraw to Zero Credits @ 75% refund*full semester classes only) |
| Mar 10-14 | Mon-Fri | Spring Break Week (no classes, offices open) |
| Mar 15 | Sat | Late fee applied to unpaid account balances (11:59 p.m.) |
| Mar 27 | Thu | Last day to Withdraw to Zero Credits @ 50% refund*(full semester classes only) |
| Apr 11 | Fri | Last day to Drop classes with 'W' record* |
| Apr 11 | Fri | Last day to Withdraw to Zero Credits for Spring |
| Apr 15 | Tue | Late fees applied to unpaid account balances (11:59 p.m.) |
| Apr 18-21 Monday) | Fri-Mon | HOLIDAY -- Spring Recess (no classes, offices closed Friday, offices open Monday) |
| May 5-9 | Mon-Fri | Dead Week |
| May 9 | Fri | Last day of Spring classes |
| May 12-16 | Mon-Fri | Final Examinations |

Available at <https://www.ndsu.edu/onestop/academic-calendar>**Metadata**

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