

ABE 4231C
Irrigation and Drainage Engineering
2018 Course Syllabus

- 1. Catalog Description:** *4 credits.* Irrigation & drainage systems design including pump sizing & specification, water distribution systems, plant water requirement, drainage systems, & flood control. (*Offered Fall*).
- 2. Pre-requisites and Co-requisites:** *ABE 3212C. Co-requisites: CWR 3201 or EGN 3353C.*
- 3. Course Objectives:**
 - Understand the hydrologic cycle, principles and processes necessary to effectively manage water resources through well designed drainage and irrigation systems.
 - Apply appropriate techniques and analyses to the effective design of both irrigation and drainage systems.
 - Design, test, and analyze agricultural irrigation and drainage systems and their components.
 - Enhance communication skills, and impart a sense of professional, ethical and societal responsibility gained through knowledge and discussion of contemporary issues.
- 4. Contribution of course to meeting the professional component for ABET:** This course contributes four (4) credit hours toward meeting the minimum 48 credit hours of Engineering Topics in the basic-level curriculum for the Bachelor of Science Degree in Agricultural and Biological Engineering.
- 5. Relationship of course to ABET program outcomes:** From the list of (a) through (k) program outcomes listed below, this course addresses outcomes 1 through 7.

ABET Program Outcomes:

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;
3. an ability to communicate effectively with a range of audiences;
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;
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;
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; AND
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

6. Instructor: Richard V. Scholtz, III

- Office location: 107 Rogers Hall
- Telephone: 352-392-1864 x 107
- E-mail address: rscholtz@ufl.edu
- Office hours: Monday, Wednesday, and Friday - Period 4 (10:40 – 11:30 am), or by appointment.

7. Teaching Assistant: Satbyeol (Joy) Shin

- Office location: 141 Rogers Hall
- Telephone: 352-281-1646
- E-mail address: satbyeol.shin@ufl.edu
- Office hours: Tuesday, Wednesday, and Thursday - Period 9 (4:00 - 5:00 pm), or by appointment.

8. Lecture Meeting Times: Monday, Wednesday and Friday - Period 6 (12:50 am – 1:40 pm)

9. Discussion and Laboratory Meeting Times: Tuesday: Period 5-7 (11:45 pm – 2:45 pm)

10. Meeting Location: 106 Rogers Hall, unless otherwise indicated.

11. Material and Supply Fees: \$30

12. Textbooks, Materials and Software Required:

1. NCEES. 2008. *FE Supplied-Reference Handbook*, Eighth Edition. National Council of Examiners for Engineering and Surveying. Clemson, SC. 258 pages. (\$18 @ www.ncees.org)
2. NCEES approved calculator.
3. USB Flash Drive (≥ 1 GB).
4. Ring Binder (≥ 2 inch).
5. Access to Microsoft Office 2010 or compatible Office Suite (word processor, spreadsheet, presentation programs compatible with the *.docx, *.xlsx and *.pptx formats).
6. Other handout material as it becomes available.

13. Source Materials:

1. Butler, D. and J.W. Davies. 2004. *Urban Drainage*. Taylor & Francis, Inc. New York. 568 pages.
2. Fangmeier, D.D., W.J. Elliot, S.R. Workman, R.L. Huffman, and G.O. Schwab. 2006. *Soil and Water Conservation Engineering*, Fifth Edition. Thomson Delmar Learning. Clifton Park, NY. 552 pages.
3. James, L.G. 1988. Principles of Farm Irrigation System Design. John Wiley and Sons. New York. 480 pages.
4. Jensen, M.E., Editor. 1980. Design and Operation of Farm Irrigation Systems. ASAE Monograph No. 3. Amer. Soc. Agric. Engr. St. Joseph, MI. 829 pages

5. Hoffman, G.J., T.A. Howell and K.H. Soloman. 1990. Management of Farm Irrigation Systems. Amer. Soc. Agric. Engr. St. Joseph, MI. 1040 pages.
6. Keller, J. and R.D. Bliesner. 1990. Sprinkle and Trickle Irrigation. Van Nostrand Reinhold. New York. 652 pages.
7. Nakayama, F.S. and D.A. Bucks. 1986. Trickle Irrigation for Crop Production: Design, Operation and Management. Developments in Agric. Engr. 9. Elsevier Press. New York. 383 pages.
8. Pair, C.H., Editor-in-Chief. 1983. Irrigation. 5th Edition. The Irrigation Assoc. Silver Springs, MD. 686 pages..
9. U. S. Bureau of Reclamation. 2005. *Drainage Manual: A Guide to Integrating Plant, Soil, and Water Relationships for Drainage of Irrigated Lands*. University Press of the Pacific. Honolulu, HI. 308 pages.

14. Course Outline:

Lecture Topics:

- Introduction and Mathematics
 - Common mathematical tools
 - Economy
- Soil-Plant-Water Relationships
 - Consumptive use and evapotranspiration
 - Nutrient and water requirements and use efficiencies
 - Water Management (scheduling)
- Natural Resources
 - Sources of water
 - Aquifers and wells
 - Water quality
 - Water quantity
 - Water law
- Hydrologic Cycle
 - Determining evapotranspiration
 - Determining rainfall
 - Determining infiltration
- Hydraulics
 - Water measurement
 - Friction loss
 - Pipe sizing
 - Pumps
 - Pump performance
 - Pump selection
- Irrigation
 - Type of irrigation systems
 - Performance of irrigation systems
- Uniformity of water application
- Efficiency
- Design standards
- General system components
- Protecting municipal water supplies
- Design criteria
- Types of sprinkler systems
- Sprinkler system components
- Sprinkler system design
- Microirrigation benefits and problems
- Micro system components and aspects
- Clogging control
- Micro system design
- Subirrigation (seepage) systems
- Seepage methods
- Seepage irrigation process
- Design of seepage irrigation systems
- Land Forming
 - Surveying and spatial data
 - Maps and GIS
 - Watersheds
 - Land grading
 - Ditch and channel cuts
 - Impoundments
- Drainage
 - Surface field ditches
 - Steady state design
 - Nonsteady state design

- Drain tubing aspects

- Loads on underground conduits

15. Course Format: Formal lectures develop the theory and methods used in analysis and design. Example problems are presented in class. The laboratory section will be used to reinforce lecture and study materials through problem discussion, lab assignments, field trips, and guest speakers.

16. Attendance and Expectations:

Attendance is required – Lectures will cover material from the text as well as material in other references, so it is imperative that students make every effort to attend classes and take good notes. Students are especially encouraged to ask questions during lectures.

All deliverables will comply with the requirements and due date specified at the time of assignment (no deliverable will be made due earlier than 3 business days after assignment).

No late deliverable will be accepted.

The student is expected to manage their time efficiently, and should anticipate spending three times the length of lectures studying and preparing deliverables outside the classroom. The student should focus on the following: assignments, preparing both design and laboratory reports, review of notes and lecture materials, and assigned readings.

This class will predominately utilize USCS units, though there is significant interaction with SI units. Mastery of both systems is required.

17. Announcement Policy: Students will be held responsible for *all* announcements made in class, which includes *any and all* changes to this syllabus and the course lecture schedule. Students are expected to attend all lectures and laboratory periods scheduled.

18. Grading Policy: The following distribution of grades is dependent on the makeup of class and student participation and therefore is subject to change.

40% Examinations.

There will be three exams, all equally weighted. The exams will be conducted in limited access manor. The only materials allowed during an exam are: necessary text books, reference manuals, course binder, NCEES approved calculator and writing implement. All loose material must be secured in the course binder before entering an exam. Upon approval of the class as a whole, one or more examination may be replaced with a design project.

55% Laboratory Reports, Design Tools and Partial Designs.

There will be between eight to ten total assignments. Full experimental reports are required for lab reports. Weight of each assignment will be variable, depending on complexity.

5% Executive Summaries and Professional Communications.

There will be four to eight field trip/guest speaker executive summaries, equally weighted. Executive summaries should detail what was covered/experienced, emphasizing elements of greatest utility and importance. Students are expected to write "Thank you" Letters to each guest/host.

19. Grading Scale:

A:	91-100%	C:	71-76%
A-:	89-90%	C-:	69-70%
B+:	87-88%	D+:	67-68%
B:	81-86%	D:	61-66%
B-:	79-80%	D-:	59-60%
C+:	77-78%	E:	< 59%

20. Make-up Grade Policy: The arrangements for-make up examinations or any assignments should be made before the date in question unless there is an emergency situation. In which, reviews will be on a case by case basis.

21. Professionalism and Academic Honesty: Students should also strive to think and act as professionals, an idea that is embodied by the *Engineering Code of Ethics*. Students should extend all guests both professional and common courtesy. The instructor reserves the right to assess penalty points toward the class, or toward individuals who have chosen to disregard these guidelines.

Students will be *strictly held* to the University of Florida's policy on Academic Honesty. Suspected violations will result in no points awarded (failure) for the deliverable, and the offending student will be referred to the Dean of Students Office and Office of Student Judicial Affairs. Dropping or replacing the lowest grade will not be an option under these cases. Any and all disputes regarding the suspected infraction will be handled by the Student Judicial Affairs according to Regulations of the University of Florida.

In the process of enrolling and registering for classes at the University of Florida, every student has signed and presumably understands the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University." The following information will be placed on examinations. On my honor, I have neither given nor received unauthorized aid on this examination.

22. Accommodation for Students with Disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation the level and type of accommodation of required to meet the student's disability.

23. UF Counseling Services: Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

22. Use of Library Materials: These items are university property and should be utilized with other users in mind. Never remove, mark, modify nor deface resources that do not belong to you. If you're in the habit of underlining text, do it only on your personal copy. It is inconsiderate, costly to others, and dishonest to use common references otherwise.

23. Software Use: All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.