

INSTRUCTORS: Lead Instructor:
Peter Livingston, PhD, PE
Office: Shantz 509
Office hours: M/W 1:30 pm to 3:30 pm
Phone: (520) 621-1890
Email Address: pal2@email.arizona.edu

TIME AND PLACE: 2:00 – 3:15 p.m. T/TH Shantz 440

OFFICE HOURS: By appointment

Catalog Data

ABE 458/558, CE 458/558 (3 Units) Soils, Wetlands, and Wastewater Treatment and Reuse – Water quality and system design for wastewater treatment and recharge systems. This course also covers environmental permitting, including NEPA and ACOE 404 permits. May be co-convened with ABE 458. For graduate credit, additional work will be required.

EXPECTED LEARNING OUTCOMES:

To provide students an ability to:

- Understand the role of the engineer with respect to the environment
- Know how to design a wetland to treat wastewater generated from facilities discharging 1,000 to 100,000 gpd
- Understand the permitting and design process for small wastewater treatment facilities and options for discharging the reclaimed water
- Students will gain experience in problem solving, design, and written communication.

RELATIONSHIP TO PROGRAM OUTCOMES (ABET CRITERIA)

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (c) Can design a system, component or process to meet desired needs within realistic constraints
- (e) Can identify, formulate and solve engineering problems
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

TEXT: “Basic Environmental Technology Water Supply, Waste Management, and Pollution Control. (RECOMMENDED, but not required

SUPPLEMENTAL REFERENCES:

As provided or referenced in class

COURSE TOPICS:

- **NEPA**
- **ACOE 404 Permitting**
- **Natural Wetlands**
- **Constructed Wetlands for treatment**
- **Small Wastewater System Design and Permitting**
- **Groundwater Recharge**
- **Biosolid Disposal**

	Topic
	<p>Introduction</p> <ul style="list-style-type: none"> • Water related ABE careers – Soil Water Interface • What do you need to know as a practicing Engineer • Sign up for field trips • Irrigation (crop water use, field irrigation, canals and pipelines) • Natural and Constructed wetlands • Wastewater Treatment • Beneficial use of treated effluent <ul style="list-style-type: none"> Irrigation Recharge
	<p>Environmental Permitting</p> <ul style="list-style-type: none"> • NEPA <ul style="list-style-type: none"> EA EIS Bugs, bunnies and arrowheads <p>Natural Wetlands</p> <ul style="list-style-type: none"> • CWA to protect wetlands • 404 Permitting <ul style="list-style-type: none"> General Permit Individual Permit Mitigation

	<p>Constructed Wetlands</p> <ul style="list-style-type: none"> • Introduction • Client Goals • Agency Goals • Design <ul style="list-style-type: none"> Open Water Subsurface (Darcy Equation)
	<p>Small Wastewater Treatment System Design</p> <ul style="list-style-type: none"> • Client/Regulator Goals (discharge requirements) • Waste characterization (industrial and domestic) • Identification of disposal opportunities • Process diagram • General Permit 3,200 gpd to 24,000 gpd <ul style="list-style-type: none"> Orenco textile fabric Wisconsin Mound Septic system Nitrogen Density Loading • Individual Permit 25,000 gpd to 100,000 gpd (Package Treatment Plants) <ul style="list-style-type: none"> MBR (membrane bioreactor) SBR (sequencing batch reactor) Aerobic Plants • Disposal <ul style="list-style-type: none"> Effluent Solids
	<p>Groundwater Recharge</p> <ul style="list-style-type: none"> • Overview (Managed, Natural, Injection) • Water source • Goals: short-term and long-term • General site suitability <ul style="list-style-type: none"> Soils Depth to groundwater Known contaminants in vadose zone or groundwater • Site specific investigations <ul style="list-style-type: none"> Infiltration rate Vadose zone Mounding analysis • Permitting

	Water source (quality) Resident groundwater
	Biosolid Disposal <ul style="list-style-type: none"> • Characterization • Beneficial Uses • NIMBY • Permitting

METHODS OF TEACHING:

1. Lecture
2. Guest lectures

GENERAL PROCEDURES:

Problem sets will be assigned to further the understanding of each unit. Problem assignments will be given regularly. Assignment must be turned in via D2L by 11:59 pm on the due date. **LATE HOMEWORK WILL NOT BE ACCEPTED IN ANY CIRCUMSTANCES.** There will be two one-hour tests, covering the topics indicated on the Course. These tests will be taken during class time and will only be available through D2L, so students must bring lap top computers to the exams. There will be a comprehensive final examination over the course material covered each semester at the regularly scheduled final examination time, as published in the University Schedule of Hours.

ATTENDANCE: Roll will be taken during the lecture. If you miss any required work because of absence, you will lose credit for that work. For good reasons, I advise you not to miss classes. Note: Excessive absences (more than four unexcused absences) may result in a student being administratively dropped at the discretion of the instructor (see University's General Catalog). If a student is administratively dropped AFTER the end of the FOURTH week of classes, it will result in a failing grade of "E" being awarded in the course.

GRADING: Your grade in the course will be based on your performance on examinations and on the assigned homework problems, weighted as follows:

Item	Undergraduate Level	Graduate Level
Final Exam	15%	15%
Exams (2 each)	30%	30%
Class Participation	20%	20%
Homework (8 each)	35%	25%
Review of Professional Paper	N/A	10%

With 45% to 55% of the total score based on class participation and homework, it is obvious that your final grade is not only based on exams, but

class participation. Further, the test problems will generally be similar to homework problems, so that doing these problems NEATLY WITH CLEAR UNDERSTANDING is one of the best ways to prepare for tests. In general, course grades will be based on a percentage of total points possible as follows:

A	90 - 100%
B	80 - 89%
C	70 - 79%
D	60 - 69%
E	< 60%

The final grading scale for the course will be no stricter than the above scale and will be determined by the instructor after the results from all the examinations and homework have been tabulated. **Note:** Examinations will be taken via the University's D2L system.

Graduate students shall prepare a review of a published paper within the topics of this class. A list of topics will be provided to the students by the third week of class. The paper is due by the end of the 13th week of class.

WITHDRAWALS: You may withdraw without the permission of the instructor in accordance with University Policy. Although your courtesy in notifying the instructor will be appreciated. Students may withdraw from the course with a grade of "W" prior to the University official last day to drop one or more classes without dropping "0" units (complete withdrawal to "0" units can be done until the last day of classes for the term). An incomplete will be given only if the student is doing passing work and is prevented from completing a small portion of the coursework by illness or other legitimate emergency. Note that students wishing to drop the course, AT ANY TIME, must follow the University's procedure. Ceasing attendance does not automatically drop you from the course. If you are still on the class roll at the end of the semester, you will receive 0's for any work not completed and will be graded accordingly.

**A DETAILED LECTURE SCHEDULE, HOMEWORK ASSIGNMENTS, AND
SUPPLEMENTAL READING MATERIAL, IN ADDITION TO ANNOUNCEMENTS
WILL BE POSTED ON D2L.**

Information on how to use D2L

1. Go to <http://d2l.arizona.edu/> to access D2L
2. Enter your netID login and password
3. Go to "My Academic Courses" If your course does not appear:
 - a. Click on the down arrow beside the current semester.
 - b. Click on the down arrow beside the department name, and then
 - c. Click on your course name.
 - d. You should now be at your D2L Course Home Page.

Links to the Directions for all assignments are under the content heading in the course site found in the lower tool bar.

If you have difficulty with D2L, please read the D2L Tip Sheet at <http://eebweb.arizona.edu/faculty/dornhaus/courses/d21%20tip%20sheet%20students.pdf> . Problems using D2L can also be reported using this Web link <http://help.d2l.arizona.edu/node/153> .

Additionally you can contact UITS 24/7 at: <http://uits.arizona.edu/departments/the247> or directly at - (520) 626-TECH (8324)

General course policies and requirements

1. **Students are expected to spend 2 to 3 hours per week on work related to this course.**
2. You should check D2L announcements daily for new information related to the course.
3. E-mails will be answered within 24 hours on week.
4. Work turned in early will be held until the due date and graded with the rest of the papers or assignments, unless the student asks for feedback prior to submitting a final draft.
5. Weekly announcements will be posted every Sunday for the upcoming week.

Student Interaction Guidelines:

- 1) The Arizona Board of Regents' Student Code of Conduct <http://deanofstudents.arizona.edu/student-code-conduct-student-faqs> , ABOR policy 5-308, prohibits threats of physical harm to any member of the University community, including one's self. See: <http://policy.arizona.edu/threatening-behavior-students> .
- 2) It is expected that students may disagree with the research presented or the opinions of their fellow classmates. To disagree is fine but to disparage others views is unacceptable. All comments should be kept civil and thoughtful.
- 3) **This Class runs under university policies regarding disruptive behavior.** <http://policy.arizona.edu/disruptive-behavior-instructional> .

Academic Integrity:

Students are encouraged to share intellectual views and discuss freely the principles and application of course materials. However, all graded work/exercises must be the product of independent effort unless otherwise instructed. **Students are expected to adhere to the UA code of Academic Integrity as described in the UA General Catalog. See:** <http://deanofstudents.arizona.edu/codeofacademicintegrity> .

Policy on Threatening Behavior:

The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety or welfare. The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. Threatening behavior can harm and disrupt the University, its community and its families. Please see the following document for more information: <http://policy.arizona.edu/threatening-behavior-students>

Statement of Copyrighted materials:

Students are advised that all lecture notes, lectures, study guides and other course materials disseminated by the instructor to the students, whether in class or online, are original materials and as such reflect intellectual property of the instructor or author of those works. All readings, study guides, lecture notes and handouts are intended for individual use by the student. Students may not distribute or reproduce these materials for commercial purposes without the express written consent of the instructor. Students who

sell or distribute these materials for any use other than their own are in violation of the University's Intellectual Property Policy (available at <http://techlaunch.arizona.edu/university-arizona-intellectual-property-policy>). Violations of the instructors copyright may result in course sanctions and violate the Code of Academic Integrity.

Confidentiality of Student Records:

<http://www.registrar.arizona.edu/ferpa/default.htm> . Students should have read and be aware of federal regulations regarding the privacy of their academic records.

Special Needs Policy:

Students needing special accommodations or special services should contact the Disability Resources Center, 1224 East Lowell Street, Tucson AZ 85721, (520)621-3268, FAX (520)621-9423, email: uadrc@email.arizona.edu , <http://drc.arizona.edu/> . Resources/CDRR (621-5227). You must register and request that the center or DRC send the instructor official notification of your needs as soon as possible. Please plan to meet with via phone or office hours to discuss accommodations and how this course's requirements may impact your ability to fully participate. **The need for accommodations must be documented by the appropriate office.**

Subject to Change Statement

Information contained in the course syllabus, other than the grade policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.