



## **BE/CE/WSM 426/526 – Watershed Engineering**

**In-Person – Face-to-Face**  
**MWF 11-11:50 Shantz 440**

### **Description of Course**

Frequency analysis of precipitation; calculating infiltration and evaporation and estimating runoff using the SCS Curve Number Method. Analysis and Design of Open Channels including earthen channels, riprap lined channels and vegetated waterways; Analysis and Design of Erosion Control Structures including Gabion and Rockfill Structures, Chutes, Flumes, Culverts and Pipe Spillways; Channel and Reservoir Routing; Storm Detention Ponds; Predicting Upland Erosion using the Revised Universal Soil Loss Equation (RUSLE)

### **Course Prerequisites or Co-requisites**

CE 218 or AME 331a or equivalent or permission of the instructor.

### **Instructor and Contact Information**

**Instructor:** Dr. Donald C. Slack  
627 Shantz Building  
520-247-6757  
[slackd@arizona.edu](mailto:slackd@arizona.edu)

**Meeting Times:** The class will meet MWF 11-11:50 The lectures will be recorded in Panopto or D2L and available at the class D2L site.

**Office Hours:** MWF 9-10:30am or by appointment

### **Teaching Methods:**

1. Lecture-discussions
2. Guest Lectures
3. Group or individual projects
4. Computer software
5. D2L and Panopto

### **Course Objectives:**

To give BE, CE, WSM and other students a basic understanding of engineering analysis and design processes and procedures applied to small to medium watersheds. This includes analysis of rainfall to include methods of determining return periods, disaggregation of daily rainfall and methods of calculating runoff from ungaged watersheds. Students successfully completing this course will be able to design a variety of waterways including earthen, concrete lined, rock riprap lined and vegetated. They will also be able to design hydraulic structures for water measurement and erosion control as well as flow control. They will be able to route storms through both reservoirs and channel reaches and to appropriately size storm detention ponds and outlet structures. They will be introduced to the Revised Universal Soil Loss

equation and its application to sustainable watershed management.

**Relationship to BE Learning Outcomes:** BE 426 contributes directly to the following specific learning outcomes of the BE Department:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 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
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

**Learning outcomes for graduate students enrolled in BE 526:** In addition to the attaining the learning outcomes expected for undergraduate students enrolled in BE 426, graduate students are expected to achieve the following outcome:

- an ability to perform a critical review of a published technical paper and prepare a written report of that review which would be suitable for submission to a technical journal editor.

**Staying current:** You are required to complete reading assignments prior to the scheduled lecture relating to that particular topic on your own time in order to be ready to discuss the topic and to make progress on the course homework.

### **Absence and Class Participation Policy**

If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.

Notify your instructors if you will be missing an in person or online course.

Campus Health is testing for COVID-19. Please call (520) 621-9202 before you visit in person.

Visit the UArizona COVID-19 page for regular updates. <https://covid19.arizona.edu/>

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will

result in unexcused absences.

**Life challenges:** If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or [DOS-deanofstudents@email.arizona.edu](mailto:DOS-deanofstudents@email.arizona.edu).

**Physical and mental-health challenges:** If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

### **Makeup Policy for Students Who Register Late**

Students who register late may make up homework assignments so long as the solutions have not been posted on D2L. After that time, they will not receive a grade for any homework for which the solutions have been posted.

### **Course Communications**

The Instructor and TA will communicate with enrolled students via D2L and/or your official UA email.

### **Text and Reference Materials:**

Required Text: **Design Hydrology and Sedimentology for Small Catchments. C.T. Haan, B.J.**

**Barfield and J.C. Hayes. Academic Press. 1994. 588p.** – You can download from: [Design hydrology and sedimentology for small catchments - 01UA - University of Arizona \(exlibrisgroup.com\)](http://designhydrologyandsedimentologyfor-small-catchments-01ua-university-of-arizona.exlibrisgroup.com)

Supplemental References:

1. Appendix 10D Design and Construction Guidelines for Waste Impoundments Lined with Clay or Amendment-Treated Soil. Part 651 Agricultural Waste Management Field Handbook. USDA-NRCS
2. Engineering Field Manual USDA-SCS (Selected sections will be made available as handouts)
3. Richard H. Hawkins; Armando Barreto-Munoz | United States Dept. of Agriculture | U.S. Forest Service. (2016, April). *Wildcat5 for Windows, A Rainfall-Runoff Hydrograph Model: User Manual and Documentation*. Retrieved from fs.fed.us:  
<https://www.fs.fed.us/biology/nsaec/assets/rmrs-gtr-334-508compliant.pdf>
4. Technical Papers and Reports

**Assignments and Examinations: Schedule/Due Dates (refer to Tentative Topical Outline for details):**

### **Homework Requirements:**

1. Due one week after assigned, unless otherwise stated. Exercises will take 2-5 hours each

2. Work should be done with "**Engineering office quality**", i.e. neat, well-organized, complete, with data sources and equation numbers referenced, so that anyone familiar with the general subject can follow easily and so that you yourself can follow it several years later. **(grading will include all of these factors--not just "correctness" of answers). All homework should be done using EXCEL and submitted to the course D2L site.** Be sure that your name, date and a page number appear on each page of your homework as shown in the example on the D2L site!!
3. Grading will be on basis of 10 pts per assignment. Neatness and organization will be graded. Late assignments will be deducted 10% per class period after the due date. Assignments later than 2 weeks from due date will not be accepted. (You will receive a zero for such assignments. **You will also receive a zero for any assignments handed in after the solutions have been distributed to the class or posted on D2L)**
4. **Please note that it is impossible to receive a grade higher than a "D" if you do none of the homework! Completing and handing in the homework assignments is also important in helping you prepare for the examinations.**

### Final Examination or Project

Monday, December 14, 2020 – 10:30am – 12:30pm

Final Exam Regulations,

<https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information>, and

Final Exam Schedule, <http://www.registrar.arizona.edu/schedules/finals.htm>

### Grading Scale and Policies

University policy regarding grades and grading systems is available at

<http://catalog.arizona.edu/policy/grades-and-grading-system>

### Evaluation Procedures:

	<u>Grading Emphasis:</u>	
	<u>426</u>	<u>526</u>
Two one-hour exams	40 %	30%
Homework	30%	30%
Final Exam	30%	30%
Technical Paper Review	---	10%

### Additional Requirements for Graduate Credit (526):

All graduate students registered for BE/CE/WSM 526 will be required to complete a written critical review of a recent technical paper published in a relevant publication (e.g. ASCE Journal of Hydrologic Engineering, Transactions of the ASABE, etc.) The student will propose the paper the instructor no later than the fifth week of class. **The paper for review must be selected prior to the fifth week of class (NO LATER THAN SEPTEMBER 25, 2020) and formally approved by the instructor.** The paper review will be due at the time of the final exam.

**Requests for incomplete (I) or withdrawal (W)** must be made in accordance with University

policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

### **Honors Credit**

Students wishing to contract this course for Honors Credit should email me to set up an appointment to discuss the terms of the contract. Information on Honors Contracts can be found at <http://www.honors.arizona.edu/faculty-and-advisors/contracts>.

### **Scheduled Topics/Activities**

Please refer to the Topical Outline on the course D2L site for tentative dates of lecture topics and exams.

### **Classroom Behavior Policy**

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

### **Computers in the Class Room**

You may use your laptop or tablet during class so long as you are using it for class purposes. Anyone “surfing the web” during class will be asked to shut off their computer and close it. You will need to use your computers for the exams and will be expected to bring your computers to class for that purpose. You will be required to submit your exam results prior to the end of the exam period via email to the instructor.

**Equipment and software requirements:** For this class you will need daily access to the following hardware: laptop or web-enabled device with webcam and microphone, regular access to reliable internet signal and ability to download and run the following software: Web browser, Adobe Acrobat, PowerPoint, Excel and software provided by instructor.

### **Threatening Behavior Policy**

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

### **Accessibility and Accommodations**

**At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.**

## **Code of Academic Integrity**

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, 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/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://new.library.arizona.edu/research/citing/plagiarism>.

*Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent.* Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

## **UA Nondiscrimination and Anti-harassment Policy**

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

## **Additional Resources for Students**

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

## **Confidentiality of Student Records**

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

## **Class Recordings:**

For lecture recordings, which are used at the discretion of the instructor, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UA Arizona values and educational policies are subject to suspension or civil action.

## **Subject to Change Statement**

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