CE 422/522 Open Channel Flow

Spring 2017

Catalog Description: (3 units) Specific energy, momentum and energy principles**;** Uniform flow and gradually varied flow versus rapidly varied flow; Hydraulic structures: spillways, culverts, bridges**;** Differential equations governing unsteady flow in open channels; Simple surface waves in subcritical and supercritical flows; Introduction of kinematic, diffusion, and dynamic wave methods; Simplified methods of flow routing.

Prerequisite(s): C E 218.

Course Objectives: It aims to provide an introduction of fundamental principles governing steady and unsteady flow in open channels and apply these theories to solve practical problems such as analyzing flood waves, understanding flood routine in reservoirs, sizing stable channels, designing bridges, culverts, energy dissipater, and spillways.

ABET outcomes:

Primary

A. Apply mathematics, science and engineering principles
C. Ability to design a system, component, or process to meet desired needs
K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Secondary

E. Ability to identify, formulate, and solve engineering problems
G. Ability to communicate effectively
J. Knowledge of contemporary issues
L. Pass the FE exam as the first step towards professional registration

Instructor: Jennifer G. Duan, Ph.D., P.E.

Class time & place: Tues, Thurs 11:00-12:15pm @ RP Harvill Bldg, Rm 332C
Office Hours: Tuesday 1:00-3:00pm
Review Sessions: TBA

Office: CE 324E, Civil Engineering Building, 1209 E. 2nd Street. Voice: 626-5946
E-mail: gduan@email.arizona.edu

Textbook: "Open Channel Hydraulics" by Terry W. Sturm, 2010 (ISBN 978-0071267939).
Other materials will be supplied through course D2L website

Website: https://d2l.arizona.edu (follow instructions to the CE422/522 site)

Evaluation (CE 422 Students)

Homework	10%
Projects (3)	30% (10% each)
Midterm Exam (1)	25%
Final Exam	30%
Presentation	5%

Evaluation (CE 522 Students)

Homework	10%
Three Projects (3)	30% (10% each)
Mid-term Test	20%
Final Exam	25%
Graduate Project	10%
Presentation	5%

Graduate students will need to complete a technical report or paper in addition to all other requirements. Exams will be open book, and you will be allowed to bring only the textbook. Tests dates are approximate and will follow the termination of the topics assigned to the test.

Homework assignments will be posted at D2L site each Thursday and will be due on the following Thursday **at the start of class**. No late assignments will be accepted, including assignments turned in during or at the end of the class.

Tentative Schedule

Week #1: L.1. Introduction (Syllabus, office hour)

Week #2: L.2. Ch 1: Basic Principle
L.3. Ch 2.1: Specific Energy
Homework #1

Week #3: L.4. Ch 2.2: Critical flow depth
L.5. Ch 2.3: Weirs
Homework #2

Week #4: L.6. Ch 3.1: Hydraulic Jump
L.7. Ch 3.2: Momentum Principle
Homework #3

Week #5: L.8. Ch 3.3: Supercritical flow transition
L.9. Ch 4.1: Uniform flow
Homework #4

Week #6: L.10. Ch 4.2: Uniform flow computation
L.11. Ch 4.3: Compound Channel

Homework #5

Week #7: L.12. Ch 5.1: Gradually Varied Flow
L.13. Ch 5.2: Water Surface Profile Computation
Homework #6

Week #8: L.14. Ch 5.3: Natural Channel
L.15. HEC-RAS: Steady Flow Basics

Project #1: Steady Flow Hydraulics of the Rillito River

Week #9 L.16: **Mid-term Exam**
L.17: Ch 6.1: Hydraulic Structure: Spillways
Homework #7

Week #10 L.18: Ch 6.2: Hydraulic Structure: Culverts
L.19: Ch 6.3: Hydraulic Structure: Bridge

Project #2: Culvert and Bridge Design in the Rillito River

Week #11 L.20. Ch 7.1: St. Venant Equation
L.21: Ch 7.2: Simple Wave Analysis
Homework #8

Week #12 L.22. Ch 9.1: Hydrologic Routing
Homework #9

Week #13: L.23. Ch 9-2: Kinematic Wave Routing
L.24. Ch 9-3: Diffusion Routing

Project #3: Diffusion wave model of the Rillito River

Week #14: L.25. Ch 9-4: Muskingum-Cunge Method
Homework #10

Week #15: L.26. Advanced Computational Models
L.27. Student Presentation

Week #16: L.28. Student Presentation

Final Exam: Wednesday, May 13, 2015, 3:30 a.m. - 5:30 p.m.

Academic Integrity

Principle Integrity and ethical behavior are expected of every student in all academic work. This Academic Integrity principle stands for honesty in all class work, and ethical conduct in all labs and clinical assignments. This principle is furthered by the student Code of Conduct and disciplinary

procedures established by ABOR Policies 5-308 through 5-404, all provisions of which apply to all University of Arizona students.
This Code of Academic Integrity (hereinafter "this Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the Student Code of Conduct as permitted by ABOR Policy 5-308.C.1.
Failure to follow the code of academic integrity will result in failing the course and be reported to the Dean of Students' office.

Prohibited Conduct: Conduct prohibited by this Code consists of all forms of academic dishonesty, including, but not limited to:

1 Cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Student Code of Conduct, ABOR Policy 5-308-E.6, E.10, and F.1
2 Submitting an item of academic work that has previously been submitted without fair citation of the original work or authorization by the faculty member supervising the work.
3 Violating required professional ethics rules contained or referenced in the student handbooks (hardcopy or online) of undergraduate or graduate programs, or professional colleges.
4 Violating health, safety or ethical requirements to gain any unfair advantage in lab(s) or clinical assignments.
5 Failing to observe rules of academic integrity established by a faculty member for a particular course.
6 Attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts.

Student Responsibility
Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the generally applicable provisions of this Code whether or not faculty members establish special rules of academic integrity for particular classes. Students are not excused from complying with this Code because of faculty members' failure to prevent cheating.