CWR 4204-U01 (14505) – HYDRAULIC ENGINEERING
Prerequisite: CWR 3201
Department of Civil and Environmental Engineering
Florida International University
Spring 2025

Instructor: Professor Fuentes, Ph.D., P.E., B.C.E.E.
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Office Hours: M: 10:00AM-12:00PM & W: 12:00-2:00PM (first-come, first-served)
All other office hours by appointment.

Lecture location and time: EC-3665; Monday: 2:00-4:40PM.

A. Course Description & Objective

Hydraulic engineering principles and methods are essential in the practice of the civil engineering profession. They are needed to design, analyze, control, and operate the conveyance and storage of water in natural and engineered water systems (e.g., rivers, streams, water supply, wastewater collection, and drainage). Their application most appropriately supports design, analysis and all management aspects of water resources by communities within goals of sustainability and resilience. The authors of the text state that "*the text bridges the gap between fundamental principles and the techniques applied to the analysis and design of hydraulic engineering systems. The book builds problem solving skills in students and practicing engineers by presenting efficient and effective design procedures, appropriate equations, tables and graphs, and applicable computer software.*"

The main *learning objective* of this course is to apply conservation principles and their supporting methodologies in the solution of analysis and design problems. The course will start by reviewing fundamental fluid mechanics concepts and principles, then continuing to study pipes, open channels, and specialized hydraulic systems. Examples of relevant questions are: What are the main conservation principles that govern water flow in a pipeline? What is the most nearly diameter of a pipeline to ensure a target water flow rate? What is the dynamic head that a pump should provide to a required flow rate at maximum energy efficiency? How can an engineer make sure that a water supply distribution network operates within an allowed range of pressure in a residential area? What are the data and methods that are needed to design the capacity of a storm collector to safely drain a runway in an airport during a tropical storm?

Beyond the course website, CANVAS is used in this course to post the instructor's contact information, the course syllabus and most grades, except the final course grade, which will be posted on Panther Soft as it is required by the University on Wednesday, April 30, 2025.

B. Textbook & Study Material

Required textbook/study material:

1. Houghtalen, R. J., Akan, A. O. and Hwang, N. H. C., *Fundamentals of Hydraulic Engineering Systems*, 5th Edition, Pearson, ISBN 9780134292380 / ISBN 0134292383, Pearson Education, Inc., Hoboken, New Jersey, 2017. Refer to the student companion site at

   https://www.pearson.com/us/higher-education/program/Houghtalen-Fundamentals-of-Hydraulic-Engineering-Systems-5th-Edition/PGM332582.html

2. Supplementary Study Materials: posted as needed.

The required textbook contains the main study material of the course. Supporting material that complements textbook content will also be referred to, as needed.

C. Use & Management of Class Time

Lecture time is primarily used to present and discuss background theory and examples of application; time may also be used for announcements, feedback on study material, exams, assignments, exams, project, and team responsibilities. Lectures will follow the sequence of topics that are listed below; they will focus on concepts, representative methodologies, and problem solving. In advance to each lecture, students are expected to have studied any assigned material to then follow up with examples of applications.

Assigned Study Material	**Estimated No. of Lectures**
Introduction & Overview	
Program Overview, Teams, and Chapter 1	1-2
Chapters 2 and 3	1-3
Pipelines and Pipe Networks	
Chapter 4	4-5
Pumps	
Chapter 5	4-5
Open Channels	
Chapter 6	4-5
Hydraulic Structures	
Chapter 8 (8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10)	4-5
Special Structures	
Chapter 11 (11.1 thru 11.7)	4-5
Chapter 7 (7.1 thru 7.9)	
Chapter 10 (10.1 thru 10.9)	

D. Grading Policies

Exam No. 1 (individual)	25 (M, February 3)
Exam No. 2 (individual)	25 (M, March 17)
Assignments (team)	15 (each one graded over 100)
Engineering Project (EP) (team)	35 (WR due April 18; OP on April 21)
Total Maximum	*100*

EP-WR = written report; EP-OP – oral presentation (using MSPowerPoint) and defense

Assignments will be posted for students to practice the application of laws, principles and methodologies in design and analysis problems. Student teams are strongly encouraged to timely discuss their solutions, before and after grading, with the instructor, as may be needed. Assignments will be collected at the start of the lecture that follows the completion of all their related topics; they should be presented in engineering paper and organized in accordance with the posted template. Assignments that are not turned in to the instructor, when collected, will automatically receive "zero" points. Although effort is made to return graded assignments prior to an exam, a pending return of it to the students does not affect the extent of assigned study material for that exam.

Exams will be held on February 3 (No. 1) and March **17** (No. 2). Material covered by Exams Nos. 1 and 2 will be confirmed in the week prior to the official exam date. Exams are closed book and notes and, unless announced exceptions, will comply with exam protocols of the National Council of Examiners for Engineering and Surveying, NCEES (www.ncees.org), including its approved calculators. The instructor will randomly assign a seat to each student for each exam. During exams, the instructor and any other proctors do not answer questions that relate to the exam methods, equations, or exam questions. *Details for the Engineering Project are presented in the attached Addendum to this syllabus*.

Given the importance of team effort in the course, the instructor expects perfect attendance and timely participation in team effort from all students. However, if a student cannot join a scheduled in-person activity (i.e., lecture, homework, exam, or project defense) on officially scheduled times due to justified reasons (e.g., health-related), the student must report and meet with instructor (and team members, if needed) as promptly as possible to identify best options to make up for any missed effort and time.

ADVICE: BEGIN YOUR STUDY, ASSIGNMENTS, AND PROJECT PROMPTLY. DO NOT PROCASTINATE. QUESTIONS ON GRADES WILL ONLY BE CONSIDERED WITHIN THE FIVE WORKING DAYS AFTER THEIR OFFICIAL ANNOUNCEMENT.

Final grade is a function of the total number of points accumulated by the student at the end of the course, as follows:

93.3 ≤ A ≤ 100.0 70.0 ≤ C < 76.7

90.0	≤ A-	< 93.3		60.0	≤ D	<	70.0
86.7	≤ B+	< 90.0			F	<	60.0
83.3	≤ B	< 86.7					
80.0	≤ B-	< 83.3					
76.7	≤ C+	< 80.0					

E. Other Performance Policies
Class attendance is expected and documented in *FIU-Check-In 2.0*. Please be on time for all classes and, unless otherwise instructed by the instructor, keep all unapproved e-devices (e.g., cellphones, I-Pads, notebooks, laptops, etc.) off during all lectures and exams.

The updated *FIU Check-In 2.0* platform uses Bluetooth beacons instead of QR codes in the classroom paired with a new *FIU Check In-2.0* app where students can check in starting 10 minutes before the scheduled class start time. Please refer to CheckIn2.0_Student.pdf (fiu.edu) for technical assistance and contact information, if needed. A student with three unacceptable, unjustified absences may be dropped from the course with a DR on March 17. Students will automatically lose 0.45 points per unjustified absence after March 17, including those prior to March 17. *Students with a perfect record of attendance, as recorded in FIU Check In 2.0 or in the "urgency roster" (if applicable), including up to three acceptable, justified absences, will receive 2.5 points added to the final calculated grade.*

Photographing and (audio- or video-) recording by any student are not allowed at any time during all exam times. Any violation will be handled under *Student Conduct and Academic Integrity* policies and procedures.

Students may use one selected e-device to access CWR4204 study materials (e.g., e-textbook or posted files in the course website or both) during lectures, but that type of use is fully prohibited during exams. *Exams must be individually completed by each student; any access to the Internet or any type of communication with any organization, individual, or website is considered a violation and may result in a grade of "zero" in either parts of the exam or the entire exam, at the discretion of the instructor.*

Students should always carry their *FIU One Card* for official identification purposes and be ready to present it if requested by the Instructor or Assistant Proctor(s) during any scheduled activity, but most especially during quizzes and exams.

F. Days to Remember (refer to the Official FIU Spring 2024-2025 Academic Calendar and Deadlines)

UG_Academic_Calendar.pdf (fiu.edu)

January 6:	Classes start
January 20:	Martin Luther King Holiday (University Closed)

Feb 24 - Mar 1	Spring Break (University Open; No Classes)
March 17:	Deadline to drop with a DR grade.
April 19:	Classes end
April 21-26:	Finals week
April 21:	Project Oral Presentation and Defense (2:15PM-4:15PM)
April 30:	Deadline (by 11:59 pm) for faculty to submit grades

The instructor will comply and enforce all applicable FIU's Policies and Regulations. It is the students' responsibility to know all applicable policies and requirements. All students should refer, for details, to the *FIU Student Handbook* (which includes the Student Code of Conduct) at

docs=257

All students are deemed by the university to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the FIU Student Handbook. Misconduct includes, among other actions, *cheating, plagiarism, misrepresentation misuse of computer services, bribery, conspiracy and collusion, falsification of records and academic dishonesty*. Please see details at:

Student Conduct and Academic Integrity | FIU Division of Academic & Student Affairs

Students should be aware of both Panthers Care and CAPS services for students, which support their well-being.

G. Some Recommended References

In addition to a diverse number of references that are located at the Steve and Dorothea Green Library, the following books can be checked out from the instructor for up to 24 hours (please note that the instructor only has one copy of each reference):

Bedient, P. B., W. C. Huber and B. E. Vieux, "*Hydrology and Floodplain Analysis*," Prentice-Hall, Upper Saddle River, NJ, 2008.

Gupta, R. S., *"Hydrology & Hydraulic Systems",* Waveland Press, Inc., Long Grove, IL, 2017.

Haestad Methods, "*Computer Applications in Hydraulic Engineering"*, Bentley Institute Press, Eight Edition, Exton, PA, 2013.

Julien, P. Y., "Essentials of Hydraulics", Cambridge University Press, Cambridge CB@ Press, United Kingdom, 2022.

Mays, L. W., "*Water Resources Engineering"*, John Wiley & Sons, Inc., Hoboken, NJ, 2011.

Roberson, J. A., J. J. Cassidy and M. H. Chaudhry, *"Hydraulic Engineering,"* John Wiley & Sons, Inc. New York, NY, 1998.

Whitman, B. E. and T. M. Walski (2021), *Computer Applications in Hydraulic Engineering,* 9th Edition, Bentley Institute Press.

Wurbs, R. A. and W. P. James, *"Water Resources Engineering,"* Prentice-Hall, ISBN: 0-13-081293-5, Upper Saddle River, NJ, 2002.

Important websites:
www.nws.noaa.gov, www.nrcs.usda.gov, www.usgs.gov

H. Relationship to ABET Objectives & Outcomes

This course is required by all students. Its contents make a partial contribution to the following objectives:

Student Outcome (1): An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. *Example: Use of equations that are derived from the mass conservation principle to express the relationship between precipitation and the peak flow to design the capacity of a storm collector.*

Student Outcome (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. *Example: Given the need to pump water in a pressured storm to control flooding in an urban commercial area, what is the information that is required to best select the pump type and dynamic head and flow range characteristics.*

Student Outcome (3): An ability to communicate effectively with a range of audiences. *Example: Implementing the objective of a specific engineering project, with either focus on design or analysis of a hydraulic engineering system or component, culminating with the writing of an engineering report and an oral presentation, both of good quality.*

Student Outcome (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. *Example: Students are expected to work in teams to present a project proposal and complete a project, submitting an engineering written report and defending it in an oral presentation.*