CWR 3540, UO1A (52987)
WATER RESOURCES ENGINEERING – SYLLABUS
Prerequisites: CWR 3201, CWR 3201L and STA 3033 (or equivalent – see the instructor)
Department of Civil and Environmental Engineering
Florida International University
Summer A 2025 (In-Person)

Instructor: Professor Fuentes, Ph.D., P.E., B.C.E.E.
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Home Page: http://myweb.fiu.edu/fuentes/ Course Website: http://web.eng.fiu.edu/fuentes/
Office Hours: T & R: 11:00 AM -12:15 PM (in-person, first-come, first-served).
For an appointment, in-person or by phone, please email Professor Fuentes at fuentes@fiu.edu.

Teaching Assistant (TA): Ms. Amy Aida, PhD Student
Physical Office: EC-3720; E-mail: aida005@fiu.edu; Phone No.: (786) 631-1416
Assistance Sessions (in-person, first-come, first served):
M (3-5 PM), W (9 to 12 AM) and F (11 to 2 PM)
For appointments at times other than office hours, please email Ms. Yahyavi at aida005@fiu.edu

Lecture location and time:
EC-2420
Tuesday & Thursday: 1:30-4:50 PM

A. Course Description & Objective

Hydrologic and hydraulic engineering theory, principles and methodologies are essential in the professional practice of civil engineering and environmental engineering. They are needed to estimate the quantity of water that is either stored or conveyed in natural and engineered water systems (streams, rivers, storm collectors, channels, reservoirs, ponds, etc.). Their application should support the design and analysis of water resources systems within goals of resilience and sustainability. The main *learning objective* of this course is to provide basic knowledge to the future civil engineer or environmental engineer to support their solution of problems in water resources engineering. The course will consequently address the nature of water resources issues, hydrologic cycle, processes and measurements, surface hydrology, probability analysis, risk and design, and groundwater occurrence, flow and well hydraulics. Examples of relevant questions are: What is a hyetograph? What is the average precipitation on an urban watershed after a rainfall event? What are hydrographs used for? What is the design runoff for a storm collector that drains a parking lot? How does the hydraulic conductivity of soils and rocks relate to groundwater velocity? What soil and rock properties do we need to know to design a well to extract groundwater for water supply? What are the principles and methods that are needed to answer all the previous questions?

This summer version of the course compresses the required program of study from a sixteen (16)-week schedule into a period of six (6) weeks. The course program is thus a much

more intense, faster, and time-demanding study of the same content that is regularly offered in the fall and spring 16-week academic terms. Professor Fuentes consequently expects each student to give a high level of time commitment, dedication, and discipline to each learning module, on a daily and weekly basis, as follows:

a) Timely study of assigned material (i.e., textbook and course website handouts).

b) Thorough understanding and mastering of all textbook example problems beyond their lecture coverage.

c) Timely consultation *with Teaching Assistant or Instructor on the individual application of theory and methods to solving problems from recommended homework, during their office hours (or by appointment), in direct preparation for prep-quizzes and exams.*

B. Textbook & Reading Assignments

Required textbook/material:

1. Gupta, R. S., Hydrology & Hydraulic Systems, Waveland Press, Inc., ISBN: 1-4786-3091-4, Long Grove, IL, 2017. Refer to the student companion site at http://waveland.com/browse.php?t=384&r=a%7C491

2. Selected Handouts and Examples that are posted in the Course Website (students must download their own copies).

The assigned study of textbook sections, including their solved example problems, and called for posted handouts (i.e., course website) are the prime information of the course. Students are also provided additional example problems in the course website, in support of their preparation for prep-quizzes and exams. Lecture Summaries, Recommended Homework and Reference Websites are also posted in the course website for any student who wishes to further study additional details.

The instructor's course website is the official location where students will find all supporting materials, including syllabus, recommended homework, handouts, and references. *CANVAS* is primarily used to post individual grades thus ensuring each student's privacy. Students are also asked to leave confidential, specific, actionable, and respectful feedback in the CANVAS Feedback Box. The final course grade will be officially posted on *Panther Soft* by the official University deadline (i.e., 06/25/2025)

C. Use & Management of Class Time

Lectures will follow the sequence of topics that are herein listed. Topics cover foundation theory, methodologies, and example solved problems. *Students are expected* to have perused all assigned material in advance to each lecture, to then reaffirm concepts during lectures, and practice solving problems in their preparation of the exams.

Module 1	**Assigned Study Material**	**Week #**
1.	*Introduction*	
	Program Overview	1
	Water Users, Supplies, and Sustainability (UNDP)	1
	Water Demand and Drainage: 1.1-1.10, 1.12, 1.18, 1.19	1
	Mass Conservation Principle (Handout)	1
2.	*Hydrologic Cycle Elements*	
	Hydrologic Cycle: Handouts, 2.1-2.2	1
	Water Budgets and Balance Equations: 2.3-2.4	1, 2
	Precipitation: 2.5-2.8	2
	Evaporation and Transpiration: 3.1-3.4, 3.7-3.9	2
	Runoff and Infiltration: 4.1, 4.2 (4.2.1), 4.4, 4.5, 4.6	2
	Streamflow Measurements: 8.1-8.9, 8.12 (8.12.1, 8.12.2), 8.13 (8.13.1), 8.18-8.21, 13.1-13.4 (student review)	2
3.	*Surface Hydrology*	
	Storm Sewer System: 16.1-16.2	3
	Rational Method: 16.10-16.11	3
	NRCS (SCS) TR-55 Method: 16.12, 16.13, 16.14	3
	Hydrographs and Unit Hydrograph Methods: 9.1-9.9 (9.9.1), 9.10-9.12	3, 4
4.	*Probability and Extreme Flows*	
	Probability and Design Flood: 11.1-11.3	4
	Frequency Analysis: 11.6-11.12	4
	PMP and PMS: 11.14-11.16	4
5.	*Groundwater Flow Basics and Applications*	
	Occurrence: 5.1-5.3	4, 5
	Energy Components and Darcy's Law: 5.4-5.9	5
	Groundwater Flow Types and General Equation: 5.10-5.12	5
	Steady and Unsteady Flow Well Hydraulics: 6.1, 6.2-6.4	5

D. Grading Policies

Prep Quizzes (6-10)	20 (each one graded over 100)
Mid-term Exam	40 (May 29, 2nd lecture)
Final Exam	40 (June 19, 1:30-4:50 PM)
Total Maximum	*100*

Quizzes will be given on either Tuesdays or Thursdays or both days at any time. They test

your timely study of assigned text material and lecture coverage. They will focus on material from either the most recent or current lectures or both. Prep-quizzes last within about 5 to 10 minutes and are closed book. You are allowed to have a scientific calculator and 2 pencils No. 2 with eraser.

The Mid-term and Final Exams will be respectively held on Thursday May 29 and June 19, 2024. The Final Exam is comprehensive and can include problems that integrate knowledge from all covered modules. All exams and prep-quizzes are fully closed book and notes and, unless announced exceptions, will comply with the exam protocols of the National Council of Examiners for Engineering and Surveying, NCEES (www.ncees.org), including its approved use of calculators. During prep-quizzes and exams, the instructor and any proctor(s) do not answer questions that relate to any given concepts, methods, or any applicable equations that are part of either test questions or problem statements or both.

Solved problems, in addition to those included in the assigned text study material and recommended homework, are posted for students to practice the application of theory, principles and methodologies in solving design and analysis problems. Students are expected to discuss their practice problems and their solutions with the TA during officially scheduled hours or the instructor (as it may be needed). All students are strongly encouraged to study and solve, upon their own initiative, additional problems from the textbook or recommended references and manuals of practice, either individually or in groups, in preparation for their exams.

No make-up or incomplete grades will be considered, unless properly justified, for instance, documented medical emergencies.

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

ADVICE: BEGIN YOUR STUDY AND PROBLEM-SOLVING PRACTICE PROMPTLY. DO NOT PROCASTINATE. ANY QUESTIONS ON GRADES THAT YOU MAY HAVE WILL ONLY BE CONSIDERED WITHIN THE THREE (3) WORKING DAYS AFTER THEIR OFFICIAL ANNOUNCEMENT ON CANVAS. FINAL COURSE GRADE IS POSTED, AS REQUIRED, IN PANTHERSOFT.

E. Attendance Policies

Class attendance is required, and it is monitored and recorded on *FIU Check In 2.0 and a hard-*

copy roster. Each student will use *FIU-Check-In 2.0* for the first lecture on each scheduled day (FIU Check-In Student Guide) **and** *sign on a roster for the second lecture on the same day*. Late arrival or early departures are considered absences. A student with three unjustified absences may be dropped from the course with a DR on June 9. Students will automatically lose 0.45 points per unjustified absence after June 9, including those prior to June 9. Students with a perfect record of attendance, as recorded in *FIU Check-In 2.0* and roster (including up to three justified absences) will receive 5 points added to the final calculated grade).

Photographing and (audio- or video-) recording by any student are not allowed during lectures and all testing times (i.e., both Prep Quizzes and Exams). Any violation will be handled under *Student Conduct and Academic Integrity* policies and procedures.

Students may use an e-device *only* to access CWR 3540 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 prep-quizzes and exam periods of time. *Exams and prep-quizzes must be completed by each student only; any access to the Internet or any type of communication with any organization, website or individual is considered a serious violation and should result in a grade of "zero" in either an entire quiz or exam or parts of them.*

AI tools include tools, such as ChatGtP, Elicit, etc.; the tools include text and artwork/graphics/video/audio. Students may use AI tools to help generate ideas and brainstorm. However, it is noted that the material generated by these programs may be inaccurate, incomplete, or otherwise problematic. Students should be aware that the use of AI may also stifle your own independent thinking and creativity. *Students may not submit any work generated by an AI program as your own. But a student includes material generated by an AI program, the student should cite it like any other reference material (with due consideration for the quality of the reference, which may be poor).*

Students should always carry their *FIU One Card* for official identification purposes and be ready to present it if requested by the Instructor or Teaching Assistant during any scheduled activity, including prep-quizzes and exams.

F. Days to Remember (refer to the Official FIU 2024-2025 Academic Calendar for details)

2024-2025-academic-calendar-rev-dmb-11-15-24.pdf

May 13:	Classes begin
May 29:	Mid-term Exam (2nd lecture)
May 26:	Memorial Day (University Closed)
June 9:	Deadline to drop a course with a DR grade
June 19 (Thursday):	Final Exam (1:30 PM-4:50 PM)
June 20:	Classes end
June 25:	Deadline (by 11:59PM) 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 those applicable policies and requirements. All students should refer, for details, to the *FIU Student Handbook* (which includes the Student Code of Conduct) at FIU Student Handbook 2024-25 .

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 others, *cheating, plagiarism, misrepresentation, misuse of computer services, bribery, conspiracy and collusion, falsification of records and academic dishonesty*.

Student Conduct and Academic Integrity | Division of Academic & Student Affairs | Florida International University (fiu.edu)

docs=322.

Students should be aware of both Dean of Students | FIU Division of Student Affairs and CAPS services for students, which support their well-being.

G. Some Recommended References

In addition to references that are located at the Steve and Dorothea Green Library, Professor Fuentes recommends the following selections to either complement or expand knowledge:

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

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

Mays, L. W., *"Ground and Surface Water Hydrology,"* John Wiley & Sons, Inc. Hoboken, NJ, 2012.

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.

Viessman, Jr., W. and G. L. Lewis, Introduction to Hydrology, 4th Edition, Prentice-Hall, Upper Saddle River, NJ, 2003.

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 from all students pursuing a BS degree in either CE or EnvE. Its contents relate and make a partial contribution to the following objectives:

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 direct runoff and its use to estimate a peak flow to design the capacity of a storm collector.

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 1: Estimation of the needs of water users to ensure water supply for the population and economic activities of communities, such as agriculture and industry. Example 2: Use of rainfall data collected at a rain gage over a 10-year period to assess the probability distributions that represent rainfall depth.