CWR 4530 U01 (90250):
Modeling Applications in Water Resources Engineering
Prerequisites: Permission by Instructor
Department of Civil and Environmental Engineering1
Florida International University
Spring 2024

Instructor: Professor Fuentes, Ph.D., P.E., B.C.E.E.
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Consultation Hours: W: 1:00-4:00; R: 2:30-3:30 PM (all students, first-come, first-served).
All other office hours by appointment.

Lecture location and time: EC-2710; Thursdays: 5:00-7:40 PM. Delivery: *In-person*

A. Course Description & Objective

Models are crucial tools that are used by engineers in support of analysis, design, operation and maintenance of water systems. Those systems are part of water infrastructure that is in urban or non-urban settings. Systems include those related to water supply (e.g., uptake, conveyance, storage and distribution) and wastewater and stormwater (e.g., collection, conveyance, storage, treatment and discharge).

The overall goal of this course is to provide civil engineering and environmental engineering undergraduate students with a concerted opportunity to identify, study, assess, implement, and use computer models (also referred to as "codes"), in support of their engineering practice or research and development or both. Using models supports finding most appropriate engineering solutions by assessing technically feasible alternatives and their costs. Students, working either individually or in teams, will first study and apply several models to solve hydrologic and hydraulic problems. Second, all students will, individually or in group, upon instructor's approval, will complete a simulation (i.e., modeling) application for a water system or main components of a water system.

B. Textbook & Supplementary Material

Required text, reference material and computer access:

1. Whitman, B. E. and T. M. Walski (2021), *Computer Applications in Hydraulic Engineering CAiHE,* 9th Edition, Bentley Institute Press, ISNB-10: 1934493708 and ISBN-13: 978-1934493700. Your purchased copy includes a procedure to download the latest software from the Bentley website. Be very aware that the **software should only be used for academic purposes; any other use, including personal or commercial, is prohibited.** In consultation with the instructor, the student(s) may also consider other reference materials and software, in support of their course modeling experiences.

2. www.bentley.com and supplementary downloadable material.
3. Each student must have access to a computer to access software.

C. Use & Management of Class Time

Class time is used in two ways: a) organizational activities; b) presentation and discussion of hydrologic and hydraulic concepts, theory and models; c) e-training and reports; and d) completion of full model application. *CANVAS is primarily used in this course to post the instructor's contact information, and the course syllabus and grades.* The final course grade will be officially posted on *PantherSoft* by the University official deadline (i.e., 12/18/2024).

Activity	**Topic (Study Assignment)**	**Estimated No. of Lectures**
1.	Organization and Introduction	2 (August 29)
2.	Hydrology Review: Ch. 2 & Probability Software*	2 (September 5)
3.	Hydraulic Principles & FlowMaster*: Ch. 1	2 (September 12)
4.	Culvert Hydraulics & CulvertMaster*: Ch. 4	2 (September 19)
5.	Inlets, Gravity Piping Systems, and Storm Sewer Systems & StormCAD*: Ch. 3	2 (Sept 26, Oct 3)
6.	Detention Pond Design & PondPack*: Ch. 5	2 (October 3, 10)
7.	e-Training (i.e., on-demand courses, etc.)	2 (October 17)
8.	e-Training (i.e., on-demand courses, etc.)	2 (October 24)
9.	e-Training (i.e., on-demand courses, etc.	2 (October 31)
10.	Full Model Application Progress Report: (Theory, Model and System Description	2 (November 7)
11.	Modeling Work Period	2 (November 14-28)
12.	Full Model Application: Written Report Due	2 (December 6)
13.	Full Model Application: Oral Presentation	2 (December 12)

* Presentations by Responsible Student & Discussion

D. Application Case(s)

The Full Model Application can be accomplished either individually or in team(s), depending on level of effort, upon instructor's approval. Students should select one model amongst the following: SewerCAD, StormCAD, PondPack, and HAMMER. Other models may be considered in consultation with the instructor. *Examples of systems include those for water supply distribution, municipal wastewater and stormwater collection and conveyance, and drainage areas (i.e., watersheds).*

E. Grading Policies

Basic Hydrology (Quiz)	5
Basic Hydraulic Principles & *FlowMaster*	10*
Inlets, Gravity Piping Systems, and Storm	

Sewer Systems & *StormCAD*	10*
Culvert Hydraulics & *CulvertMaster*	10*
Detention Pond Design & *PondPack*	10*
e-Training (minimum 20 hours in official Bentley transcript)	15
Full Model Application: Progress Report (March 13)	0
Full Model Application: Written Report (April 17)	25
Full Model Application: Oral Presentation (April 24)	15
Total Maximum	*100*

**The student will study and learn each model (i.e., software package) to then demonstrate the ability to solve assigned problem(s). The student will make a presentation to explain the mode and the solutions to the problem(s). The solutions are submitted as a hard copy of both the printouts of the input data and results sheets, highlighting all answers to all questions. Printouts, including tables and graphs, are commonly generated by the software, upon users' command.*

The *Full Model Application Progress Report* of November 7 should be a 15-min oral presentation in MS Power Point, with 10 to 15 slides. For details on the Application Case Written Report and Oral Presentation, refer to the attached *Full Model Application Case Addendum*. The instructor may provide additional information.

The student is expected to open needed personal accounts to access the updated Bentley software directly or indirectly at the EC computer Labs where the software has been uploaded (EC 2830, EC 2840 and EC 2807 (onsite or remotely) and EC 2400, EC 2410, EC 2420, EC 2440 and EC 2330. When you purchase the 9th edition of CAiHE, you may also be provided with personal access to the software. Upon opening your personal account, you may also find information on the availability of the required textbook. When purchasing the 9th edition of CAiHE, you may also be provided with personal access to all the needed software.

ADVICE: ANY QUESTIONS OR CONCERNS ON GRADES WILL ONLY BE CONSIDERED WITHIN THE FIVE WORKING DAYS FOLLOWING 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			

F. Days to Remember (refer for confirmation to the FIU Fall 2024-2025 Semester Calendar and Deadlines)

2024-2025-academic-calendar---approved-fs-1_25_2022.pdf (fiu.edu)

August 26:	Classes begin.
September 2:	Labor Day (University Closed)
November 4:	Deadline to drop a course with a DR grade.
November 7:	Full Model Application: Progress Report
November 11:	Veterans Day (University Closed)
November 28-30:	Thanksgiving Day and Break
December 6:	Full Model Application: Written Report Due (or earlier)
December 7:	Classes end
December 12:	Full Model Application: Oral Defense (5:00 – 7:00PM)
December 18:	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 applicable policies and requirements. All students should refer, for details, to the *FIU posted Student Conduct and Honor Code* at

docs=322. (fiu.edu)

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

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

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

H. Some Recommended References

A good number of relevant references, for your consideration and use, are available at the main library. In addition, the items below may be checked out from the instructor for up to 48 hours:

Chow, V. T., Open Channel Hydraulics, McGraw-Hill Book Company, 1988.
Gupta, R. S., Hydrology & Hydraulic Systems, Waveland Press, Inc., 2017
Mays, L. W., Water Resources Engineering, John Wiley & Sons, Inc. 2011.

Version 09/04/24 - Final

Wurbs, R. A. and W. P. James, Water Resources Engineering, Prentice Hall, Inc. 2002.
www.bentley.com, www.usace.army.mil, www.usbr.gov
www.usda.gov, www.usgs.gov, www.nws.noaa.gov

I. Relationship to ABET Student Outcomes

This course is technical elective for senior undergraduate students. Its contents relate and make a partial contribution to the following ABET-based student outcomes:
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 fundamental conservation principles to mathematically simulate velocities, volumetric flow rates, and pressure heads among other quantities, in water supply distribution and wastewater and stormwater collection sewer systems.*

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: Use of mathematical and computer models to either characterize or forecast the operation of water systems to convey, collect, and distribute water in non-urban or urban settings.*

Outcome (3): An ability to communicate effectively with a range of audiences. Example: *All students are expected to prepare and communicate information to others on the theory and application of mathematical and computer models, in support of justifying or defending either analysis or design scenarios that define the performance of a water system.*