UNIVERSITY OF CALIFORNIA, DAVIS
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

COURSE: WATER RESOURCES SIMULATION (ECI 146)

INSTRUCTOR: ***Fabián A. Bombardelli***
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OFFICE: 3105, Ghausi Hall (former Engineering III building)
Class: Tuesdays and Thursdays-10:30 to 11:50 AM (119 Wellman)
Computer lab: Fridays-8:00 AM to 8:50 AM and 2:10 PM to 3 (Ghausi Hall 2030)

COURSE DESCRIPTION

This course focuses on the development and application of numerical simulation techniques for the analysis, design, and operation of surface water systems. The course especially addresses problems associated with surface run-off, water quality in streams and ponds, and management of reservoirs. The course possesses a strong emphasis on the theory conducive to the development of simple codes, and to use open-source codes to analyze different cases of practical import.

PRE-REQUISITES

ECI 141 and ECI 142 (recommended).

TEXT

There is *no* formal text that covers what we cover in the course. I have not been able to find a book which contains all materials discussed in the course. Instead, hand-outs and supplemental reading material will be provided, compiled in a notebook (pdf).

SOME REFERENCES

1. Chapra, S. C., and Canale, R. P. (2006). "*Numerical Methods for Engineers*." Fifth Edition, McGraw Hill Higher Education Series. Only some chapters from this book will be used.
2. Mays, L. (2011). "*Water Resources Engineering.*" John Wiley and Sons. Only some chapters from this book will be used.
3. Mays, L., Ed. in Chief (2001). "*Stormwater Collection Systems Design Handbook*." McGraw-Hill.
4. Chow, V. T., Mays, L., and Maidment, D. (1998). "*Applied Hydrology*." McGraw-Hill.
5. Linsley, R. K., and Franzini, J. B. (1979). "*Water-Resources Engineering*." McGraw-Hill.
6. Burden, R. L., and Faires, J. D. (2004). *"Numerical analysis."* Brooks-Cole Publishing, Eighth Edition.
7. Isaacson, E., and Keller, H. B. (1966). *"Analysis of Numerical Methods."* Dover.

8. Abbott, M. B. (1979). *"Computational Hydraulics. Elements of the Theory of Free Surface Flows."* Pitman, UK.
9. Koutitas, C. G. (1983). *"Elements of Computational Hydraulics."* Pentech Press, UK.
10. Press, W. H., Teukolsky, S. A., Vetterling, W. T., and Flannery, B. P. (2007). *"Numerical Recipes in Fortran. The art of scientific computing."* Cambridge.
11. Recktenwald, G. R. (2000). *"Numerical Methods with Matlab: Implementations and Applications."* Prentice-Hall, Upper Saddle River, NJ.

OFFICE HOURS

Mondays 10:00 AM to 12:00 PM and Wednesdays 10:00 AM to 12:00 PM. Also, e-mail me to make special appointments (fabianbombardelli2@gmail.com, bmbrdll@yahoo.com).

GRADING

Assignments	10%
Computer problems	20%
In class exam	20% **(individual effort)**
1 special project	20% **(individual effort)**
Final exam (2 hours)	30% **(individual effort)**

NUMERICAL TOOLS

The codes can be developed in Fortran, Basic, C++, Pascal, Matlab, Python, or Excel (if applicable).

ASSIGNMENT, COMPUTER PROBLEM, PROJECT, AND EXAM POLICIES

The purpose of homework (assignments or computer problems) is to contribute significantly to the learning process. Students are *strongly* encouraged to develop assignments, and computer problems in teams. The total number of team members should not exceed four (4). The composition of the team can be varied from homework to homework, but the students have to turn in just *one* solution to the homework. Team members receive the same grade. Based on this, it is mandatory that the students of the team share similar loads of work. It is not necessary to report the names of the team members to the instructor in advance. Just make a cover page with the names of the members when turning in the homework solution.

Normally, each homework should be completed in 7 to 15 days. Assignments, computer problems and projects turned in one (1) week after the deadline will be penalized with 30 points out of 100. After two (2) weeks, assignments, computer problems or projects will not be accepted.

Examination *and project* solutions must represent the efforts of *individuals* only. It is strongly recommended that the students have a copy of the graded solution before the examination, to appropriately help the learning process. Exams will be *closed notes, closed books*, and they will include the development of *code flow charts*. Please practice the construction of flow charts as they help clarify the ideas before building a code.

IMPORTANT DATES

NOTE: THESE DATES ARE THE BEST SCHEDULE WE CAN HOPE FOR. HOWEVER, THEY CAN BE SUBJECT TO CHANGE

Midterm exam (in class): Thursday, February 14, 2019.
Final exam (in class): Thursday, March 21, 2019, 3:30 PM.
Review session for the midterm: February 13, 2019, 6:00 PM.
Review session for the final: March 20, 2019, 6:00 PM.

Computer Problem 1: Iterative solution of the Colebrook-White Equation and applications to the design of pipes
Assigned: 01/10/19
Due with no penalization: 01/24/19
Due with 30% penalization: 01/31/19

Computer Problem 2: A water-quality model for a lake
Assigned: 01/22/19
Due with no penalization: 01/29/19
Due with 30% penalization: 02/07/19

Computer Problem 3: Solution of backwater curves and uniform flow using commercial software **(after Midterm)**
Assigned: 02/14/19
Due with no penalization: 02/28/19
Due with 30% penalization: 03/07/19

Assignment 1
Assigned: 01/31/19
Due with no penalization: 02/07/19
Due with 30% penalization: 02/14/19

Assignment 2 (after Midterm)
Assigned: 02/28/19
Due with no penalization: 03/07/19
Due with 30% penalization: 03/14/19

Project
Assigned: 01/31/19
Due with no penalization: 03/17/19
Due with 30% penalization: 03/21/19