Engineering School of Sustainable Infrastructure and Environment

EOC 6934 – "Hydrodynamic models for estuarine and coastal waters"

3 Credits – Fall 2020 – (modified on 05/20/2020)

Description: This course will focus on describing and understanding hydrodynamic models used for studying and predicting flow processes in estuaries and coasts. The students will learn the basics of numerical discretization and how to implement simple serial and parallel numerical models in Fortran. The course will follow a progressive approach by which simple zero-dimensional and one-dimensional models will be initially taught, followed by more complex 2D and 3D models.

Course goals: By the end of the course, the students will have a good understanding of:

- the general hydrodynamics in estuarine and coastal waters
- which is the best model to use for a specific problem (3D can often be overkill).
- which are the dominant processes for a specific problem, and which can be neglected.
- coding from scratch simple numerical models.

Lectures: M,W (Monday and Wednesday) | Period 9 - 10 (4:05 PM - 6:00 PM) *(Note: I will go for one and half hour with no break, so at 5.35 pm the class will be over)*

Room: RNK 0215

Prerequisites: none, but it is suggested to have attended Mathematical analysis 1 and 2.

Final Exam: To be defined.

Instructor: Alberto Canestrelli
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(352) 294 7583
alberto.canestrelli@essie.ufl.edu

Office hours: Monday and Wednesday (5.40 pm to 6.40 pm, after class). If you are planning to chat with me please let me know at the end of the class. By appointment I can accommodate other times.

Text and Notes: The student will be required to take notes in class, I would not follow any specific textbook. However, all the multimedia material which will be presented, as well as open source numerical codes, will be shared on Canvas.

Referenced texts:

Chanson, H. (2004). "The hydraulics of open channel flow: an introduction." Butterworth Heinemann, 2nd edition, Oxford, UK.
Roelvink, D. (2011), A Guide to Modeling Coastal Morphology, World Scientific Editions.

Savenije, H. H. G. (2012). “Salinity and tides in alluvial estuaries” (2nd ed.). New York: Elsevier.

Assignments: There will be 2 assignments and 1 project. The final exam could be a multiple choice test or a second project.

Grading:

	Exam	= 40%
	Assignments	= 30%
	Project	= 30%

Final letter grades will be assigned based on the following scale.

A	100-90%
B	89-80%
C	79-70%
D	69-60%
E	59-0%

Late work: for each assignment/project turned in late, 2% will be removed from the final grade. If it more than 5 days late, 5% will be removed. For 10 days or more, 20% will be removed.

Accommodations for Students with Disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the instructor when requesting accommodation.

Course Outline:

- Introduction: the importance of numerical models.
- The simplest model: the box model (Zero-D).
- Derivation of the 1D shallow water equations. Discussion of the importance of each terms of the relevant system of partial differential equations.
- Some analytical solutions of the 1D shallow water equations.
-Introduction to numerical methods for solving Ordinary Differential Equations (ODE) and Partial Differential equations (PDE).
- Introduction to Fortran programming
- Lab and assignment: implementing a 1D model in fortran .
- Tidal propagation in a 1D channel.
- Extension to 2D shallow water equations. Different approaches for turbulence closure. Importance of Coriolis force.
- Lab and assignment: implementing: Introduction to Fortran code parallelization with MPI.
- 2DV (Vertical) shallow water equations. Stratification, baroclinic and barotropic flow.
- 3D shallow water equations. Examples of 3D simulations.
- How to choose the best model: a trade-off between computational time and accuracy of the results. Concluding remarks.
-coupling waves with Shallow water models

-setting up a 2D model with Deltf3D

- Exam.

Note: this syllabus is subject to change; students who miss class are responsible for learning about any changes to the syllabus

Commitment to a safe and inclusive learning environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu