SUBJECT TEACHING GUIDE

546 - Numerical Models in the Coastal and Port Field

Master's Degree in Coasts and Ports

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in Coasts and Ports			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline					
Course unit title and code	546 - Numerical Models in the Coastal and Port Field				
Number of ECTS credits allocated	3	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS Y TECNICAS DEL AGUA Y DEL MEDIO AMBIENTE
Name of lecturer	GABRIEL DIAZ HERNANDEZ
E-mail	gabriel.diaz@unican.es
Office	Edificio IH Cantabria. Planta: + 2. DESPACHO (225)
Other lecturers	

3.1 LEARNING OUTCOMES
- The student will know and handle the different existing numerical models of wave propagation , port agitation, breaking currents, long wave, wave-structure interaction, sediment transport and morphodynamic evolution, which are currently used for port design, and characterization and study of coastal dynamics.
- Know each of the families of existing models in the state of the art of coastal and port applications. Identify and properly apply each of the numerical models according to the needs, objectives, hypotheses and limitations that each study assumes.
- Learn, at an advanced user level, the management of the different numerical models developed by the Institute of Environmental Hydraulics of Cantabria.
- Be able to interpret adequately the results that each of the models provides, and determine the quality of them.
- Be able to apply the knowledge acquired to the solution of problems, situations and real projects of port and coastal studies.
- Start in the use of numerical models to calculate the propagation of long waves in cases in which the analytical resolution of expressions is not possible.

4. OBJECTIVES
The student will know and manage the different numerical models existing in the current state of the art for the solution of problems, on coastal management, port design, wave propagation, sea level rise (elevation) of flood), port agitation, wave-structure interaction, and marine and coastal dynamics.

6. COURSE ORGANIZATION	
CONTENTS	
1	INTRODUCTION TO NUMERICAL MODELS IN COASTAL AND PORT ENVIRONMENT
2	MODELS OF PROPAGATION OF SURFACE TO THE COAST AND CURRENTS
3	MODELS OF HARBOR AGITATION
4	NUMERICAL RESOLUTION OF NON-LINEAR SHALLOW WATER EQUATIONS. SWASH MODEL
5	INTRODUCTION TO ADVANCED MODELS BASED ON BOUSSINESQ EQUATIONS
6	INTRODUCTION TO ADVANCED MODELS OF INTERACTION OF THE SURF WITH STRUCTURES (CFD)
7	EXAMPLE OF PROJECTS BASED ON NUMERICAL MODELING

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Homework 1	Work	No	Yes	20,00
Homework 2	Work	No	Yes	20,00
Homework 3	Work	No	Yes	20,00
Homework 4	Work	No	Yes	20,00
Homework 5	Work	No	Yes	20,00
TOTAL				100,00

Observations

The assessment of student learning will be carried out, on the one hand, continuously throughout the development of the subject and will be completed with a final test.

In the assessment criteria of the evaluation, the following will be taken into account:

• Participation in class and interest shown.
• Master the basic concepts exposed in the subject
• Be able to apply the knowledge acquired, solving practical problems
• Present in a correct and orderly manner the proposed works

The instruments used to carry out the evaluation will be:

Practical activities (P1 to P5) related (valuation of 25% each).
The minimum grade must be 5.0 in total (practical + final test). The repeated lack of attendance and punctuality not justified to the classes of the subject may lead to the loss to the continuous evaluation.

Only for duly justified causes (eg sanitary restrictions), the evaluations may be organized remotely, with prior authorization from the Center's Directorate.

Observations for part-time students

Part-time students will apply the same assessment criteria as full-time students. The temporary distribution of activities will be adapted to the particular conditions of each student when deemed necessary.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Díaz G. "Análisis de Resonancia Portuaria: Generación, Transitoriedad, No linealidad y Acoplamiento Geométrico", Tesis de Doctorado en programa Ciencias y Tecnologías Marinas de la Universidad de Cantabria". Universidad de Cantabria.
Zeki Demirbilek, Vijay Panchang, "CGWAVE: A Coastal Surface Water Wave Model of the Mild Slope Equation". Technical Report CHL-98-xx. August 1998.
Diaz G, Losada I. González M. "Metodología de trabajo y recomendaciones prácticas para el estudio de agitación y resonancia en puertos", GIOC (2006). GIOC
LIU Philip L-F. ; LOSADA Inigo J., "Wave propagation modeling in coastal engineering : Maritime hydraulics", Journal of Hydraulic Research ISSN 0022-1686 CODEN JHYRAF, 2002, vol. 40, no3, pp. 229-240 (1 p.3/4).
Booij, R.C. Ris, L.H. Holthuijsen "A third-generation Wave Model for coastal Regions, Part I: Model Description and Validation". Delft University of Technology, Stevinweg 1, Delft, 2628 CN, the Netherlands.
Guanche R. "Dr. Iñigo Losada Rodríguez y Dr. Mauricio González Rodríguez. 2006." Análisis de la Funcionalidad y Estabilidad de Obras Marítimas mediante un Modelo Numérico Basado en las Ecuaciones de Reynolds.". Tesis de Doctorado en programa Ciencias y Tecnologías Marinas de la Universidad de Cantabria". Universidad de Cantabria, Dirigida por Dr. Iñigo Losada Rodríguez y Dr. Javier López Lara. 2008.
Dean, R.G., Dalrymple, R.A., 1984. Water wave mechanics for engineers and scientists. Advanced Series on Ocean Engineering, Vol.2, World Scientific.
Kowalik, Z., Murty, T.S., 1993. Numerical modelling of ocean dynamics. Advanced Series on Ocean Engineering, Vol.5, World Scientific.
Parker, B.B., 1991. Tidal hydrodynamics. National Ocean Service. National Oceanic and Atmospheric Administration. John Wiley & Sons.
Pugh, D., 2004. Changing sea levels. Efects of Tides, Weather and Climate. Cambridge University Press. ISBN 0 521 53218 3.