

## SUBJECT TEACHING GUIDE

M1866 - Geological Risk Analysis: Tsunamis

Master's Degree in Coasts and Ports

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Master's Degree in Coasts and Ports			Type and Year	Optional. Year 1
Faculty	School of civil Engineering				
Discipline					
Course unit title and code	M1866 - Geological Risk Analysis: Tsunamis				
Number of ECTS credits allocated	3	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS Y TECNICAS DEL AGUA Y DEL MEDIO AMBIENTE				
Name of lecturer	ERNESTO MAURICIO GONZALEZ RODRIGUEZ				
E-mail	mauricio.gonzalez@unican.es				
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 0. ERNESTO MAURICIO GONZALEZ RODRIGUEZ (0046A)				
Other lecturers					

3.1 LEARNING OUTCOMES	
- The student will be able to understand and to evaluate the different components of the risk (Hazard, vulnerability and risk)	
- The Student will know the principal tools and methodologies for Risk assessment	
- The student will be able to propose mitigation and adaptive measures to reduce tsunami threat in coastal zones	
- The student will be able to develop oral public presentations in order to expose his ideas and results in regards with a risk study	

#### 4. OBJECTIVES

To know the different risk components in regards with tsunami flooding at different spatial and temporal scales
The student will be able to work with different data bases required for tsunami risk assessment.
To know and to understand different risk tools: mathematical models, statistical models and numerical tools in order to study vulnerability and risk flooding induced by tsunamis

#### 6. COURSE ORGANIZATION

CONTENTS	
1	Tsunami Introduction
2	Methodology for Tsunami risk assessment
3	Exposition case study
4	Tsunami Hazard Maps
5	Vulnerability Tsunami Maps
6	Elaboration of Tsunami Risk Maps
7	Elaboration of Evacuation Tsunami Maps
8	Mitigation Measurements
9	Final Project

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Presentation of Practical Case 1	Work	No	Yes	40,00
Presentation of Practical Case 2	Work	No	Yes	40,00
Oral presentation of the final project	Work	No	No	20,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
-It is obligatory to attend the 80% of the on-site classes - Only for duly justified causes (eg sanitary restrictions), the evaluations may be organized remotely, with prior authorization from the Center's Direction.				
<b>Observations for part-time students</b>				
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

IH Cantabria-MARN: Instituto de Hidráulica Ambiental IH Cantabria, Ministerio de Medio Ambiente y Recursos Naturales de El Salvador MARN: Catálogo de Peligrosidad debida a la inundación por Tsunami en la costa de El Salvador , Spanish Agency for International Development Cooperation (AECID), available at: <http://www.ihcantabria.com/es/proyectos-id/item/839-tsunami-hazard-el-salvador>

IH Cantabria-MARN: Instituto de Hidráulica Ambiental IH Cantabria, Ministerio de Medio Ambiente y Recursos Naturales de El Salvador MARN: Catálogo de Vulnerabilidad y Riesgo debido a la inundación por Tsunami en la costa de El Salvador , Spanish Agency for International Development Cooperation (AECID), available at: <http://www.ihcantabria.com/es/proyectos-id/item/843-tsunami-vulnerability-risk-el-salvador>

González-Riancho, P., Aguirre-Ayerbe, I., Aniel-Quiroga, I., Abad, S., González, M., Larreynaga, J., Gavidia, F., Gutiérrez, O. Q., Álvarez-Gómez, J. A., and Medina, R.: Tsunami evacuation modelling as a tool for risk reduction: application to the coastal area of El Salvador, *Nat. Hazards Earth Syst. Sci.*, 13, 3249– 3270, doi:10.5194/nhess-13-3249-2013, 2013.

P. González-Riancho, P., Aguirre-Ayerbe, I., García-Aguilar, O., Medina, R., González, M., Aniel-Quiroga, I., Gutiérrez, O. Q., Álvarez-Gómez, J. A., Larreynaga, J., and Gavidia, F., 2014. Integrated tsunami vulnerability and risk assessment: application to the coastal area of El Salvador. *Nat. Hazards Earth Syst. Sci.* 14, 1223-1244, 2014. doi:10.5194/nhess-14-1223-2014

Álvarez-Gómez, J. A., Aniel-Quiroga, Í., Gutiérrez-Gutiérrez, O. Q., Larreynaga, J., González, M., Castro, M., Gavidia, F., Aguirre-Ayerbe, I., González-Riancho, P., and Carreño, E., 2013. Tsunami hazard assessment in El Salvador, Central America, from seismic sources through flooding numerical models. *Nat. Hazards Earth Syst. Sci.*, 13, 2927–2939, 2013 doi:10.5194/nhess-13-2927-2013

J. A. Álvarez-Gómez, I. Aniel-Quiroga, O. Gutiérrez, M., González., 2012. Tsunamigenic potential of outer-rise normal faults at the Middle America trench in Central America. *Tectonophysics* 574–575 (2012) 133–143. <http://dx.doi.org/10.1016/j.tecto.2012.08.014>

R. Jelínek, E. Krausmann, M. Gonzalez, J. A. Álvarez-Gómez, J. Birkmann, T. Welle, 2012. Approaches for tsunami risk assessment and application to the city of Cádiz, Spain. *Nat Hazards* (2012) 60:273–293

José A. Álvarez-Gómez, Íñigo Aniel-Quiroga, Mauricio González, Luís Otero, 2011. Tsunami hazard in the Western Mediterranean Spanish coast from seismic sources . *Nat. Hazards Earth Syst. Sci.*, 11, 227–240. doi:10.5194/nhess-11-227-2011

Birkmann, J., Teichman, K.V. , Welle, T. , González, M., Olabarrieta, M., 2010. The unconscious risk at Europe´s coasts: Tsunami and the vulnerability of Cádiz, Spain. *Nat. Hazards Earth Syst. Sci.*, 10, 2659-2675, doi:10.5194/nhess-10-2659-2010

Birkmann, J. (2006) *Measuring vulnerability to natural hazards: towards disaster resilient societies*, United Nations University