

COURSE DESCRIPTION

Name of the Course:		Vulnerability and risk produced by natural hazards						
Specialization Code:		U02.07.ICV.IZ.M26		Course Code:		3.DS.OB10		
Year of study:	2	Semester:	3	Examination form: (E-Exam; Co- Colloquy; P-Project; P/F-Passed/Failed)		ECTS credits granted (CR):	E (Co)	6
					E			P (P/F)
Course Category: (DF- Fundamental; DD- General engineering; DS-Specialty engineering; DC-Complementary; PR-Practical stage)								DS
Course Type: (OB-Compulsory; OP-Elective; FC-Facultative)								OB
Number of hours per semester: Total of hours per week (TH) x Number of weeks per semester								
TOTAL :	112	Individual study (IS):		56	Contact hours (C + S;L;P):			56
Academic staff member in charge: (Full name, Academic position and Department)				<i>Prof. Radu VACAREANU, Reinforced Concrete Department</i> <i>Assoc. Prof. Alexandru ALDEA, Reinforced Concrete Department</i>				

Faculty	Engineering in foreign languages Master study programme	Number of contact hours per semester				
		Total	Course	Seminar	Laboratory	Project
Field	Civil Engineering					
Specialization	Structural Engineering	56	28		28	

Course objectives - Description of the main competences: The course provides to the student the basic information for analyzing hazard, vulnerability and risk produced by natural hazards. Meanwhile, the course provides the methodological and mathematical framework for the application of performance based design in structural engineering.

Content description:

1. COURSE	1. Definitions. Conceptual and mathematical frameworks 2 hours 2. Statistics of extremes and probabilistic assessment natural hazards 3 hours 3. Seismic hazard: recurrence and attenuation 4 hours 4. Buildings at risk: typology 3 hours 5. Stochastic dynamic response of structures subjected to wind, seismic and/or wave loads 4 hours 6. Evaluation of structural damage degree: description of damage states, empirical and analytic methods 4 hours 7. Fragility and vulnerability functions for structures in seismic areas: empirical and analytic methods 5 hours 8. Risk analysis; estimation of direct economic losses 3 hours 9. Solution of elliptic partial differential equations of second order. (4 hours).
2. Seminar / Laboratory / Project / Practical stage	1. Evaluation of actions produced by natural hazards on buildings and structures 5 hours 2. Probabilistic zonation of natural hazards in Romania using GIS technologies 4 hours 3. Fragility/vulnerability and risk analyses for typical structures 5 hours

3. Bibliography	<ol style="list-style-type: none"> 1. D. Lungu, R. Văcăreanu, A. Aldea, C. Arion, 2000 - Advanced Structural Analysis, <i>Technical University of Civil Engineering of Bucharest, Editura Conspres</i>, 177 p. 2. Kramer, S. (1996). Geotechnical Earthquake Engineering, Prentice Hall, Upper Saddle River, New Jersey. 3. Reiter, L. (1990). Earthquake Hazard Analysis: Issues and Insights, Columbia. University Press, New York 4. McGuire, R. (2004). Seismic hazard and risk analysis. Earthquake Engineering Research Institute MNO-10 5. Chen, W-F., Scawthorn, C. (eds.) (2003). Earthquake engineering handbook, <i>CRC Press</i> 6. J. D. Holmes (2004). Wind Loading of Structures, <i>Taylor & Francis</i> 7. Simiu, E., Scanlan, R. H. (1996) Wind Effects on Structures: Fundamentals and Applications to Design, 3rd Edition, <i>Wiley-Interscience</i> 8. Theodorakatou, A. (2007). <u>Sensitivity Analysis in Probabilistic Seismic Hazard Assessment</u>. Master Degree Dissertation, European School for Advanced Studies in Reduction of Seismic Risk, Rose School, Pavia, Italia. http://www.roseschool.it/downloads/masters-dissertations-individual-studies-2007.html/2 9. Douglas, J. (2011). Ground motion prediction equations 1964-2010. PEER report 2011/102. http://peer.berkeley.edu/publications/peer_reports/reports_2011/webPEER-2011-102-Douglas.pdf
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Criteria to be considered for the final mark	Weight of each criterion in the final mark (%)
1. Exam defence (final examination)	70
2. Appreciation during the entirely semester	
2.1 Seminar activity	15
2.1 Laboratory activity	
2.2 Project activity (the project has not a distinct final mark)	
3. Periodical examinations	
3.1 Written / oral examination	
3.2 Home works, reports, essays etc.	15
4. Other criteria (to be specified)	
Short description of the final evaluation procedure: The exam consists of three parts: a written examination of the theoretical background, a written application of the knowledge acquired and a professor-student discussion on various topics related to the course content.	

Estimation of the total number of hours per semester requested for the individual study (IS)			
Type of individual activity	No. of hours	Type of individual activity	No. of hours
1. Study of the course notes	10	8. Preparation of the final examination	10
2. Study of the compulsory bibliography	6	9. Advisory class participation	
3. Study of the supplementary bibliography	5	10. Practical documentation on site	
4. Preparation of specific activities		11. Additional documentation on library	10
5. Preparation of home works	10	12. Internet network documentation	5
6. Preparation of periodical written examinations		13. Others (to be specified)	
7. Preparation of periodical oral examinations		TOTAL number of hours	56

Date:
septembre 2017

Signature of the Academic Staff member in charge:
Prof. Radu VACAREANU,
Prof. Alexandru ALDEA,