COURSE DESCRIPTION

Name of the Course:	**Random processes: applications in structural engineering**							
Specialization Code:	**U02.07.ICV.IZ.M26**			**Course Code:**	**1.DD.OB02**			
Year of study:	**1**	**Semester:**	**1**	**Examination form:** (**E-**Exam; **Co-** Colloquy; **P-**Project**; P/F-**Passed/Failed)	**E**	**ECTS credits granted (CR):**	**E (Co)**	**6**
							P (P/F)	
Course Category: (**DF**- Fundamental; **DD**- General engineering; **DS**-Specialty engineering; **DC**-Complementary; **PR**-Practical stage)								**DD**
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 :	98	**Individual study** (IS)**:**		56	**Contact hours (C + S;L;P):**			42
Academic staff member in charge: (Full name, Academic position and Department)		*Prof. dr. Sorin DEMETRIU* *Prof. dr. Radu VACAREANU*						

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**		42	28	14		

Course objectives - Description of the main competences: The course provides to the student the basic information on the applications of stochastic processes in structural engineering. Meanwhile, the course provides the methodological and mathematical framework for performing risk analyses

Content description:

1. COURSE	1. Random models with applications in civil and structural engineering 2 hours 2. Statistics of extremes and probabilistic assessment of loads induced by natural hazards on buildings and structures; applications in design codes of Romania, EU and USA. Calibration of hazard level against the design safety/reliability level 6 hours 3. Stochastic processes: mathematical background (Distribution functions, correlations, power spectral density. Moments of various orders. Differential and integral relations and linear transformations of processes. Spectral bandwidth indicators. Assumptions for stochastic processes in structural engineering) 4 hours 4. Stochastic modelling of wind, earthquake and wave loads on structures 6 hours 5. Dynamic Stochastic response of single degree and multi degree of freedom systems. Extreme values of dynamic stochastic response 6 hours 6. Stochastic response spectra and floor response spectra in nuclear engineering 4 hours
2. Seminar / Laboratory / Project / Practical stage	**Seminar – 14 hours** 1. Probabilistic assessment of natural hazards loads 4 hours 2. Stochastic analysis of seismic records in free-field, in boreholes and in buildings and structures 4 hours 3. Analysis of extreme values of seismic response for wide band and narrow band ground motions 3 hours 4. Analysis of stochastic response spectra. Comparison of deterministic versus stochastic response spectra 3 hours

3. Bibliography	1. D. Lungu, R. Văcăreanu, A. Aldea, C. Arion, 2000 - Advanced Structural Analysis, *Technical University of Civil Engineering of Bucharest, Editura Conspress*, 177 p. 2. B. M. Ayyub, R. H. McCuen, 2003 – Probability, Statistics and Reliability for Engineers and Scientists, Chapman & Hall/CRC 3. Soong, T. T. (2004). Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons 4. Ang, A. H.-S., Tang, W. H. (2007). Probability Concepts in Engineering. Emphasis on Applications to Civil and Environmental Engineering (2nd Edition), John Wiley & Sons 5. Stochastic structural dynamics. IISC Bangalore course. http://freevideolectures.com/Course/3044/Stochastic-Structural-Dynamics 6. Uncertainty in engineering - lecture notes. MIT open courseware. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-010-uncertainty-in-engineering-fall-2008/ 7. Gray, R. (2010). Probability, random processes and ergodic properties. Springer Verlag, New York. http://www-ee.stanford.edu/~gray/arp.pdf 8. Koski, T. (2012). Supplemental notes on probability and random processes. Institutionen för matematik, Stockholm. http://www.math.kth.se/matstat/gru/sf2940/gauss.pdf

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	15
2. Study of the compulsory bibliography	5		9. Advisory class participation	
3. Study of the supplementary bibliography	5		10. Practical documentation on site	
4. Preparation of specific activities	5		11. Additional documentation on library	5
5. Preparation of home works	6		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. dr. Sorin DEMETRIU
Prof. dr. Radu VACAREANU