COURSE DESCRIPTION

Name of the Course:	**Rehabilitation of Masonry and Wooden Structures**							
Specialization Code:	**U02.07.ICV.IZ.M24.**			**Course Code:**	**3.DS.OP14**			
Year of study:	**2**	**Semester:**	**3**	**Examination form:** (**E-**Exam; **Co-** Colloquy; **P-**Project**; P/F-**Passed/Failed)	**E**	**ECTS credits granted (CR):**	**E (Co)**	**7**
					P		**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)								**OP**
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)	*Stoica Nicolae Daniel – Associate Professor - CCIUT*							

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:
Knowledge and facilities in masonry and wooden structural systems rehabilitation.

Content description:

1. COURSE

First part – Rehabilitation of masonry structural systems …… 16 hours

1. Types of existing masonry structural system buildings designed and erected in the 1890-1963 period, without seismic design codes; Issues about how to structural elements were made, architectural and structural irregularities; Structural behaviour and responses; Issues concerning the infrastructure composition, forms and design;
2. Types of masonry structural systems designed and erected according to low-codes (P13-63, P13-70, P2-63); Issues about how to structural elements were made, architectural and structural irregularities; Structural behaviour and responses; Issues concerning the infrastructure composition, forms and design;
3. Behavior and vulnerabilities of masonry structural systems due to seismic actions;
4. Cracks and degradations of components and structural systems made of masonry:
   - Types of damages;
   - Degradations through mechanical actions;
   - Degradation due to physicochemical actions.
5. Technical Survey for the existing buildings:
   - The need for and scope of technical survey;
   - Correlation between different types of requirements (stiffness, strength, stability, structural, functional and thermal rehabilitation).
6. General criteria for estimating the safety index for the existing buildings:
   - Constructive overall concept;
   - Strength, stiffness and ductility verification.
7. Calculation methods for determining the structural performance to gravitational and seismic actions: automatic calculation methods, seismic risk classes;
8. Principles of rehabilitation for masonry structural systems to ensure a ductile behaviour under the current codes;
9. Retrofitting strategies and solutions for different building functionality.

	Strengthening technologies. **Second part – Rehabilitation of Wooden Structural Systems** …….. 12 hours 1. Principles of retrofitting and structural rehabilitation of wood elements; degradations and failures for wooden structures. 2. Strengthening solutions for wooden structural elements required to work at tension, compression or bending. 3. Joints degradation in wooden construction - retrofitting solutions for joints. 4. Biological degradation of wood building elements, chemical protection measures and constructive compliance to avoid the appearance of biological degradation phenomena. 5. Retrofitting solutions for structural assemblies and wooden construction – case studies
2. Seminar / Laboratory / Project / Practical stage	**Rehabilitation of masonry structural systems Project** ……18 hours Case study for an existing building: • Development of technical documentation for existing buildings: architectural surveys, structural surveys, resistance characteristics of materials (mortar, masonry elements) determination; structural and non-structural degradation identification; • Determination of the strength characteristics for masonry; • Models for structural analysis of masonry walls, structural calculations to identify their gravitational and seismic actions behavior; • Retrofitting solution to improve seismic performance or to change the building functions: structural calculation models and structural calculations to identify their gravitational and seismic actions behavior. **Rehabilitation of Wooden Structural Systems Project** ……10 hours Technical survey for an existing wooden structure: • Structural surveys; • Mechanical and biological degradation surveys; • Structural models to determine the strength capacities for the existing structure elements; • Proposals for structural rehabilitation; • Proposals for protection against biodegradation and fire at the buildings surveyed.

3. Bibliography	- CR6 - Masonry Structures Design Code - Daniel Stoica - Structural modeling of masonry wall with ETABS program - Daniel Stoica – Soil-structure interaction modeling with ETABS program - Daniel Stoica – Wooden structure modeling with ETABS or SAP2000 program - Daniel Stoica – Courses notes - Ehsan Minaie – Vulnerability of reinforced masonry structures in seismic regions - Miha Tomazevic – Earthquake resistant design of masonry buildings - Narendra Taly – Design of reinforced masonry structures - Frederick Putnam Spalding – Masonry structures -Thomas Paulay, M.J.Nigel Priestley – Seismic design of reinforced concrete and masonry buildings - A.W. Hendry, B.P. Sinha, S.R. Davies – Design of Masonry Structures - Paulo José Brandão Barbosa Lourenço - Computational strategies for masonry structures - Donald E. Breyer, Kenneth J. Fridley, Kelly E. Cobeen, David G. Pollocj Jr. – Design of wood structures - E.C. Ozelton, J.A. Baird – Timber Designers's Manual - J. Porteous, A. Kermani – Structural Timber Design to Eurocode 5 - A. Kemany – Structural Timber Design - F. Naeim, J.M. Kelly – Design of Seismic Isolated Structures – From Theory to Practice - FEMA 273. (1997). NEHRP guidelines for the seismic rehabilitation of buildings. http://www.wbdg.org/ccb/DHS/ARCHIVES/fema273.pdf - Bay Area Regional Earthquake Preparedness Project Strengthening wood frame houses for earthquake safety http://www.johnmartin.com/earthquakes/Eqresid/ - Rashadul I., Inventory of FRP strengthening methods in masonry structures http://upcommons.upc.edu/pfc/bitstream/2099.1/7901/1/01.pdf

Criteria to be considered for the final mark	**Weight of each criterion in the final mark (%)**
1. Exam defence (final examination)	40%
2. Appreciation during the entirely semester	
2.1 Seminar activity	
2.1 Laboratory activity	
2.2 Project activity (the project has not a distinct final mark)	50%
3. Periodical examinations	
3.1 Written / oral examination	
3.2 Home works, reports, essays etc.	10%
4. Other criteria (to be specified)	
Short description of the final evaluation procedure:	

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	12		8. Preparation of the final examination	8
2. Study of the compulsory bibliography	6		9. Advisory class participation	
3. Study of the supplementary bibliography	6		10. Practical documentation on site	
4. Preparation of specific activities	14		11. Additional documentation on library	
5. Preparation of home works	6		12. Internet network documentation	4
6. Preparation of periodical written examinations			13. Others (to be specified)	
7. Preparation of periodical oral examinations			**TOTAL number of hours**	56

Date:
March 15, 2013

Signature of the Academic Staff member in charge:
Stoica Nicolae Daniel