COURSE DESCRIPTION

Name of the Course:	**EXPERIMENTAL METHODS IN STRUCTURAL ENGINEERING**							
Specialization Code:	**U02.07.ICV.IZ.M24.**			**Course Code:**	**1.DD.OP02**			
Year of study:	**1**	**Semester:**	**1**	**Examination form:** (**E-**Exam; **Co-** Colloquy; **P-**Project**; P/F-**Passed/Failed)	**Co**	**ECTS credits granted (CR):**	**E (Co)**	**4**
							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)								**OP**
Number of hours per semester: Total of hours per week (TH) x Number of weeks per semester								
TOTAL :	84	**Individual study** (IS)**:**		42	**Contact hours (C + S;L;P):**			42
Academic staff member in charge: (Full name, Academic position and Department)		*Cristian-Lucian GHINDEA, senior lecturer, PhD, Eng.* Department of Strength of Materials, Bridges and Tunnels						

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: Underlying principles of experimental testing, applicability, testing equipment and techniques, data processing and evaluation of experimental results.

Content description:

1. COURSE

1.1. **Tensometry basics (4 hours)**
- Introduction
- Stresses. Stress state
- Deformations and displacements
- Stress – strain relationships
- Strength criteria
- Main characteristics of the devices used in tensometry
- Basic principles for selecting the tensometry method or technique

1.2. **Electrical tensometry (4 hours)**
- Introduction
- Electric strain gauges transducers
- Experimental measurement principles
- Measurement errors
- Mechanical quantities measurement transducers
- Electrical strain gauges circuits used for experimental measurements
- Measurement set up technique and experimental data recording
- Experimental data processing and results interpretation
- Examples for experimental tests using electrical strain gauges.

1.3. **Photoelasticity (4 hours)**
- Introduction
- Photoelasticity theory
- Recording of experimental data in photoelasticity
- Principal stresses determination using photoelasticity tests
- The conversion of the experimental model results to the real elements
- Photoelasticity in plane and spatial stress state. Case studies.
- Typical materials used for photoelastic models.

1.4. **Experimental determination of the remanent stresses (4 hours)**
- Origin and classification of remanent stresses
- Destructive, semi destructive and non-destructive testing methods
- Remanent stresses induced by joints welding

	- X-Radiography used in tensometry 1.5. **Strain gauge measurements on models (4 hours)** - Introduction - Basis for the modeling theory - Model design - Choosing materials for the models - Model building up - Experimental testing on models - Practical applications (buckling, fatigue). 1.6. **Statistical analysis of experimental data (4 hours)** - Introduction - Measurement errors - Normal distribution of random measurement errors - The metrological characteristics of measuring devices - Statistical analysis of measurement results - Examples. 1.7. **In site experimental testing (4 hours)** - Practical applications and commentaries on new structures testing (video samples) - Practical applications and commentaries on existing structures testing
2. Seminar / Laboratory / Project / Practical stage	Elaboration of an experimental test program on models (conception of models, model and load size setting, testing program, stresses and strains measurements, interpretation of the testing results. (**14 hours**)
3. Bibliography	1. "Încercarea Construcţiilor" ("Experimental testing in constructions")– editors: Şt. Bălan, M. Arcan, Ed. Tehnică, 1965 2. "Analiza Experimentală a Tensiunilor" ("Experimental Stress Analysis") (2 volumes) – editor: D. R. Mocanu, Ed. Tehnică 3. "Prelucrarea Datelor Experimentale cu Calculatoare Numerice" ("Experimental Data Processing with Computers") – I. Constantinescu, D. Golumbovici, C. Militaru, Ed. Tehnică, 1980 4. "Dynamics of Structures". Third Edition, A. K. Chopra., Prentice Hall, 2007 5. "An Introduction to Measurements using Strain Gages", Karl Hoffmann ,Hottinger Baldwin Messtechnik GmbH, 2012, www.hbm.com 6. User Manuals for SPIDER data acquisition devices, www.hbm.com 7. CATMAN PROFESSIONAL software for data acquisition, www.hbm.com

Criteria to be considered for the final mark	Weight of each criterion in the final mark (%)
1. Exam defence (final examination)	-
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)	-
3. Periodical examinations	
3.1 Written / oral examination	50%
3.2 Home works, reports, essays etc.	50%
4. Other criteria (to be specified)	-
Short description of the final evaluation procedure: • For course 6 tests will be held in the 3rd, 5th, 7th, 9th, 11th, and 13th weeks. Every test will have 3 or 4 questions from chapters 1.1, 1.2, 1.3, 1.4, 1.5, 1.6. Students have at their disposal the course support and the corresponding bibliography. Grades average will represent 50% from the final grade of the colloquy. • Grading the practical applications work is done during the semester with grades in 4th, 8th and 12th weeks. Grades average will represent 50% from the final grade of the colloquy.	

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	14		8. Preparation of the final examination	-
2. Study of the compulsory bibliography	6		9. Advisory class participation	4
3. Study of the supplementary bibliography	-		10. Practical documentation on site	-
4. Preparation of specific activities	10		11. Additional documentation on library	-
5. Preparation of home works	-		12. Internet network documentation	2
6. Preparation of periodical written examinations	6		13. Others (to be specified)	-
7. Preparation of periodical oral examinations	-		**TOTAL number of hours**	42

Date:
20.03.2013

Signature of the Academic Staff member in charge:
Cristian-Lucian GHINDEA