

# SYLLABUS

## 1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Civil Engineering
1.3 Department	Structures
1.4 Field of study	Civil Engineering
1.5 Cycle of study	Master of Science
1.6 Program of study/Qualification	Artificial intelligence in construction engineering and management
1.7 Form of education	Full time
1.8 Subject code	4.00

## 2. Data about the subject

2.1 Subject name	Experimental methods for structural behavior in Civil Engineering						
2.2 Subject area	Civil Engineering						
2.3 Course responsible/lecturer	Lecturer Ph.D. Eng. Constantinescu Horia – <a href="mailto:horia.constantinescu@dst.utcluj.ro">horia.constantinescu@dst.utcluj.ro</a>						
2.4 Teachers in charge of seminars	Lecturer Ph.D. Eng. Constantinescu Horia – <a href="mailto:horia.constantinescu@dst.utcluj.ro">horia.constantinescu@dst.utcluj.ro</a>						
2.5 Year of study	I	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DS/DI

## 3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 applications:	2
3.4 Total hours in the curriculum	125	3.5 of which, course:	14	3.6 applications:	28
Individual study					hours
Manual, lecture material and notes, bibliography					40
Supplementary study in the library, online and in the field					20
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					14
Tutoring					7
Exams and tests					2
Other activities					-
3.7 Total hours of individual study	83				
3.8 Total hours per semester	125				
3.9 Number of credit points	5.0				

## 4. Pre-requisites (where appropriate)

4.1 Curriculum	Knowledge about strength of material, statics, dynamics, and stability of structures, building materials
4.2 Competence	-

## 5. Requirements (where appropriate)

5.1. For the course	Onsite lectures, the attendance is not mandatory, but it will be a plus for the final grade.
5.2. For the applications	Class attendance is mandatory.

## 6. Specific competences

Professional competences	<p>In-depth knowledge of the techniques and equipment necessary to carry out experimental determinations on structural elements and structures. Development of theoretical, methodological, and practical knowledge specific to the field of civil engineering necessary for structural design assisted by experimentation. Learning the appropriate use of specific language in communication with professional environments involved in the design, execution, and verification of constructions.</p> <p>The use of specialized knowledge to explain and interpret some situations in the behavior of structural elements and structures for which there are no standardized design and verification models.</p> <p>The integrated use of the conceptual and methodological apparatus, in the conditions where the previous practice does not provide clear and complete information regarding the structural behavior under operational and ultimate loads, in order to design new elements and structures.</p> <p>The nuanced and pertinent use of experimental evaluation criteria and methods to interpret structural behavior and to establish constructive models of structures and structural elements.</p> <p>The development of technical and research projects, innovatively using a varied spectrum of quantitative and qualitative methods in the field of civil engineering.</p>
Cross competences	<p>The execution of complex professional tasks that bring together knowledge from all areas of engineering for the practical realization of the dimensioning/check of the structural behavior of construction elements and structures.</p>

## 7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Development of the theoretical and practical basis necessary for the application of experimental methods in the dimensioning of structures and structural elements.
7.2 Specific objectives	<p>Competences in the analysis, conceptual design, and practical realization of:</p> <ul style="list-style-type: none"> <li>- Experimental programs</li> <li>- Experimental testing stands</li> <li>- Experimental elements</li> <li>- Measuring the response of elements to loads</li> <li>- Interpretation of experimental data</li> <li>- Design based on experimental values</li> </ul>

## 8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
Course 1. Introductory. The need for experimental testing.	Power Point presentation	Onsite lectures
Course 2. Designing tests in the construction field.		
Course 3. Measurement methods in static load scenarios. Measuring equipment.		
Course 4. Measurement methods in dynamic load scenarios. Measuring equipment.		
Course 5 Measurement methods in static load scenarios. Stands for testing constructions and construction elements.		
Course 6. Measurement methods in dynamic load scenarios. Stands for testing constructions and construction elements.		

Course 7. Establishing the reference values for the building elements or the studied construction.		
Course 8. Design, organization and conduct of experimental testing (I).		
Course 9. Design, organization and conduct of experimental testing (II).		
Course 10. Processing and interpretation of experimental results (I).		
Course 11. Processing and interpretation of experimental results (II).		
Course 12. Evaluation of experimental data compared to reference values (I).		
Course 13. Evaluation of experimental data compared to reference values (II).		
Course 14. The use of data resulting from experimental programs in the validation and improvement of calculation models.		
Bibliography SR EN 1990 – Basis of structural design SR EN 1991 – Eurocod 1 Actions on structures SR EN 1992 – Eurocod 2: Design of concrete structures SR EN 1993 – Eurocod 3: Design of steel structures SR EN 1994 – Eurocod 4: Design of composite steel and concrete structures SR EN 1995 – Eurocod 5 Design of timber structures SR EN 1996 – Eurocod 6: Design of masonry structures SR EN 1997 – Eurocod 7: Geotechnical design SR EN 1998 – Eurocod 8: Design of structures for earthquake resistance SR EN 1999 – Eurocod 9: Design of aluminium structures		
8.2 Applications	Teaching methods	Notes
Laboratory 1. Introductory. Presentation of projects.	Presentation/Use of sensors and testing equipment	Laboratory work
Laboratory 2. Use of loading devices/systems and load sensors.		
Laboratory 3. Use of deformation measuring sensors.		
Laboratory 4. Use of optical measuring devices and systems.		
Laboratory 5. Experimental stand design and experimental project element.		
Laboratory 6. Experimental testing		
Laboratory 7. Presentation of experimental results and interpretation of the results.		
Bibliography SR EN 1990 – Basis of structural design SR EN 1991 – Eurocode 1 Actions on structures SR EN 1992 – Eurocode 2: Design of concrete structures SR EN 1993 – Eurocode 3: Design of steel structures SR EN 1994 – Eurocode 4: Design of composite steel and concrete structures SR EN 1995 – Eurocode 5 Design of timber structures SR EN 1996 – Eurocode 6: Design of masonry structures SR EN 1997 – Eurocode 7: Geotechnical design SR EN 1998 – Eurocode 8: Design of structures for earthquake resistance SR EN 1999 – Eurocode 9: Design of aluminium structures		

## 9 Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Students will acquire the ability to use experimental techniques to evaluate/predict the performance of structures and structural elements; the tools needed to design structures and structural elements using experiments and to quantify the achievement of the values established by numerical modeling and structural design.

## 10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Answer two theoretical subjects from the course.	Written test or oral presentation – assessment duration 2.0 hours	50%
10.5 Laboratory works	Evaluation of laboratory works	Oral test	50%
10.6 Minimum standard of performance			
(a) Eligibility condition for participating in the exam: attendance at project meetings and handing in the papers (project) on time. (b) Project grade (P): min. 5 (five); <b>P - Registered in the electronic catalog</b> (c) Theory grade (T): min. 5 (five) <b>E= 0.50*(T) + 0.50 (P);</b> <b>E- Registered in the electronic catalog</b> The condition of promotion/obtaining credits: $E \geq 5$ , if $T \geq 5$ , $P \geq 5$ OBS: When determining the final grade, the student's involvement during the semester will also be considered: participation in debates, scientific sessions, attendance, etc.			

Date of filling in:	Teachers	Title Name	Signature
10.06.2024	Lecturer	Lecturer Ph.D. Eng. Constantinescu Horia	
	Teachers in charge of application	Lecturer Ph.D. Eng. Constantinescu Horia	
Date of approval in the Structures department		Head of Structures department	
01.07.2024		Conf. Dr. Ing. Attila PUSKAS	
Date of approval in the Council of the Faculty of Civil Engineering		Dean	
12.07.2024		Prof. Dr. Ing. Daniela Lucia MANEA	