

## 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	CCM
1.4	Field of study	Civil Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Civil Engineering / Engineer
1.7	Form of education	Full time
1.8	Subject code	41

### 2. Data about the subject

2.1	Subject name	Buildings II									
2.2	Subject area	Civil Engineering									
2.3	Course responsible/lecturer	Assoc. Prof. PhD. eng. Nicoleta Cobîrzan									
2.4	Teachers in charge of seminars	Assoc. Prof. PhD. eng. Nicoleta Cobîrzan									
2.5	Year of study	III	2.6	Semester	II	2.7	Assessment	Exam	2.8	Subject category	DS/DOB

### 3. Estimated total time

3.1	Number of hours per week	4	3.2	of which, course:	2	3.3	applications:	2
3.4	Total hours in the curriculum	56	3.5	of which, course:	28	3.6	applications:	28
Individual study								hours
Manual, lecture material and notes, bibliography								20
Supplementary study in the library, online and in the field								5
Preparation for seminars/laboratory works, homework, reports, portfolios, essays								18
Tutoring								2
Exams and tests								3
Other activities								-
3.7	Total hours of individual study	48						
3.8	Total hours per semester	104						
3.9	Number of credit points	4						

### 4. Pre-requisites (where appropriate)

4.1	Curriculum	knowledge of statics, reinforced concrete and buildings I.
4.2	Competence	N/A

### 5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	N/A

## 6. Specific competences

Professional competence	<p>After acquiring the subject matters, the students will know:</p> <ul style="list-style-type: none"> <li>- advantages and disadvantages in designing the masonry structures.</li> <li>- the behaviour of masonry buildings subjected to gravitational and horizontal loads.</li> <li>- reinforcement of tie beams, tie-columns, lintels, piers and infrastructures.</li> <li>- the role of lintels and slabs in taking over the horizontal loads.</li> </ul>
Cross competences	<p>After acquiring the subject matters, the students will be able to:</p> <ul style="list-style-type: none"> <li>- determine the geometrical and the stiffness characteristic of the structural masonry walls.</li> <li>- evaluate and distribute the seismic load among the transversal and longitudinal structural walls.</li> <li>- determine the efforts for coupled and uncoupled shear walls.</li> <li>- analyse the buildings by using different software.</li> <li>- dimension and to verify the active cross section of masonry walls subjected to shear, compression and bending in the wall plane.</li> <li>- determine the reinforcement area and to design the lintels, tie-beams and tie-columns reinforcement plans.</li> </ul>

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

7.1	General objective	Develop skills on compliance with safety requirements and sustainability.
7.2	Specific objectives	Assimilation of theoretical knowledge concerning the dimensioning and verification of reinforced and unreinforced masonry wall.

## 8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Masonry definition. Buildings materials for masonry works. Advantages and disadvantages of designing masonry structures. Mechanical and physical properties of masonry units and mortars.	Exposure, Video-projector	Video-projector
2	Classification of masonry works. Mechanical and physical properties of masonry works. The complex state of stresses in the case of masonry subjected to centric compression. The working stages of the masonry members subjected to centric compression.		
3-4	Types of structures for masonry buildings. General conformation. Preliminary design of masonry buildings. Preliminary design of superstructure and infrastructure. Details for structural and non-structural elements.		
5-6	Masonry structures subjected to vertical and lateral loads. Verification of masonry walls subjected to vertical and lateral loadings.		
7-9	Geometrical and stiffness characteristics of masonry walls. Methods for structural analysis and modeling issues.		
10	Verification of masonry walls to shear and eccentric compression.		
11-12	Calculation of masonry walls subjected to compression and bending in their plane.		
13	Specific details. Reinforcement details for confined elements. Specific and reinforcement details for infrastructures.		
14	Design principles for non-structural elements. Verification of floors as horizontal diaphragms.		

## Bibliography

1. M. Dumitras, N. Cobirzan, D. Dumitras, *Constructii Civile II*, Editura UTPRES, Cluj-Napoca, 2011.
2. N. Cobirzan, M. Brumaru, *Buildings- Structural and Nonstructural Elements*, Ed. U.T. PRES, 2012.
3. M. Brumaru, *Handbook of civil engineering. Masonry buildings*, Ed. Dacia, 1997
4. R. Agent, T. Postelnicu, *Calculul structurilor cu diafragme din beton armat*, Vol I, 1982, Vol II, Editura Tehnică, 1983
5. I. Brînzan, M. Barbaiani, *Calculul și alcătuirea structurilor etajate cu diafragme*, Ed. Tehnică București, 1976.
6. Indicativ CR6-2013. Cod de proiectare pentru structuri din zidărie.
7. Indicativ P 100-1/2013. Cod de proiectare seismică — Partea I — Prevederi de proiectare pentru clădiri.
8. SR EN 1996-1-1: Eurocod 6: Proiectarea structurilor de zidărie. Partea 1-1: Reguli generale pentru construcții de zidărie armată și nearmată.
9. SR EN 1996-1-2: Proiectarea structurilor de zidărie. Partea 1-2: Reguli generale- Calculul structurilor la foc.
10. SR EN 1996-2: Eurocod 6: Proiectarea structurilor de zidărie. Partea 2: Proiectare, alegere materiale și execuție zidărie.
11. SR EN 1996-3: Proiectarea structurilor de zidărie. Partea 3: Metode de calcul simplificate pentru construcții de zidărie nearmată.
12. Indicativ NE 036-2014. Cod de practica privind executarea și urmărirea execuției lucrărilor de zidărie.
13. SR EN 1052-1:2001. Metode de încercare a zidăriei. Partea 1: Determinarea rezistenței la compresiune.
14. SR EN 1052-2:2001. Metode de încercare a zidăriei. Partea 2: Determinarea rezistenței la încovoiere.
15. SR EN 1052-3:2003. Metode de încercare a zidăriei. Partea 3: Determinarea rezistenței inițiale la forfecare.
16. SR EN 998-2: 2011. Specificație a mortarelor pentru zidărie. Partea 2: Mortare pentru zidărie.

8.2. Applications/Seminars		Teaching methods	Notes
1	Project theme: Block of flat having masonry wall structure.	Exposure, Video-projector	Video-projector
2	Current floor and ground floor plan. Cross section. Details (walls, floors, terrace roof, basement walls).		
3	Preliminary design of buildings. Selection of materials and number of floors above ground. Evaluation of vertical loads (live, dead, snow). Evaluation of horizontal loads (earthquake).		
4	Calculation of active cross section areas of masonry walls. Finding the axial loads derived from vertical loading. Verification of masonry walls subjected to vertical loading.		
5	The geometrical characteristics of masonry walls. The stiffness characteristics of structural walls. Equivalent moment of inertia. Distribution of total horizontal load among the transversal shear walls.		
6	Calculation of $M_{Ed}$ , $N_{Ed}$ , $V_{Ed}$ coming from horizontal loads using the equivalent frame method.		
7-10	Statically analysis of building by using software for seismic design of masonry.		
11-12	Verification of masonry walls to shear and eccentric compression.		
13	Reinforcement plans for confined elements (lintel beams, tie-beams, and tie-columns).		
14	Final verification.		

## Bibliography

1. D. Marusciac, M. Dumitraș, H.-A. Andreica, P. Bogdanovits, C. Munteanu, *Proiectarea structurilor etajate pentru construcții civile*, Ed. Tehnică, 2000.
2. Indicativ CR6-2013. Cod de proiectare pentru structuri din zidărie.
3. Indicativ P 100-1/2013. Cod de proiectare seismică — Partea I — Prevederi de proiectare pentru clădiri.
4. Indicativ CR0-2012. Cod de proiectare. Bazele proiectării construcțiilor.
5. Indicativ CR 1-1-3/2012. Cod de proiectare. Evaluarea acțiunii zăpezii asupra construcțiilor.

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

**10. Evaluation**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	The exam consists in the verification of the acquirements through a written test.	Written Test (WT)	75%
Applications	Verification of the project.	Project (W)	25%
10.4 Minimum standard of performance			
G= 0,75 WT + 0,25 W with the condition that WT $\geq$ 5 and W $\geq$ 5			

Date of filling in  
septembrie 2016

Teachers in charge of seminars  
Assoc. Prof. PhD. eng. Nicoleta Cobirzan

Date of approval in the department  
septembrie 2016

Head of department  
Assoc. Prof. PhD. eng. Claudiu Aciu