MINISTRY OF EDUCATION

TECHNICAL UNIVERSITY
OF CLUJ-NAPOCA, ROMANIA

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			Assist. Pălăcean Sebastian			
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 competences	After acquiring the subject matters, the students will know: - advantages and disadvantages in designing the masonry structures. - the behaviour of masonry buildings subjected to gravitational and horizontal loads. - reinforcement of tie beams, tie-columns, lintels, piers and infrastructures. After acquiring the subject matters, the students will be able to: - determine the geometrical and the stiffness characteristics of the structural masonry walls. - evaluate and distribute the seismic load among the structural walls. - statical analysis of coupled and uncoupled shear walls. - dimension and to verify the active cross sectional area of masonry walls subjected to shear, compression and bending in the wall plane. - determine the reinforcement and to design the lintels, tie-beams and tie-columns reinforcement plans.
Cross competences	Elaboration and presentation of a technical project containing the reinforcement plans.

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 masonry wall.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	Masonry definition. Buildings materials for masonry works. History and state of the art. Advantages and disadvantages of designing masonry structures. Mechanical and physical properties of masonry units and mortars.	Exposure, Video-projector	Video-projector
2-3	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.		
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	Methods for structural analysis and modeling issues.		
10-12	Verification of masonry walls to shear and eccentric compression.		
13-14	Calculation of masonry walls subjected to compression and bending in their plane.		
12-13	Specific details. Reinforcement details for confined elements. Specific and reinforcement details for infrastructures. Design principles for non-structural elements.		

Bibliography

1. Dumitras M., Cobirzan N., Dumitras D., *Constructii Civile II*, Editura UTPRES, Cluj-Napoca, 2011.
2. Cobirzan N., Brumaru M., *Buildings- Structural and Nonstructural Elements*, Ed. U.T. PRES, 2012.
3. Brumaru M., *Handbook of civil engineering. Masonry buildings*, Ed. Dacia, 1997
4. Agent R., Postelnicu T., *Calculul structurilor cu diafragme din beton armat*, Vol I, 1982, Vol II, Editura Tehnică, 1983
5. SR EN 1991-1-1:2004/AC:2009, Eurocode 1: Actions on structures – Part 1-1:General actions, - densities, self-weight, imposed loads for buildings.
6. SR EN 1998-1:2004/A1:2014, Eurocode 8: Design of structures for earthquake resistance - Part 1: General rules, seismic actions and rules for buildings.
7. SR EN 1991-1-3:2005/A1:2016, Eurocode 1 – Actions on structures – Part 1-3: General actions- snow loads.
8. SR EN 1996-1-2:2005 Eurocode 6: Design of masonry structures – Part 1-2 General rules – Structural fire design
9. SR EN 1996-2:2006 Eurocode 6: Design of masonry structures. Part 2: Design considerations, selection of materials and execution of masonry.
10. SR EN 1996-3:2006. Design of masonry structures. Part 3: Simplified calculation methods for unreinforced masonry structures.
11. SR EN 1052-1:2001. Methods of test for masonry- Part 1: Determination of compressive strength
12. SR EN 1052-2:2001 Methods of test for masonry- Part 2: Determination of flexural strength
13. SR EN 1052-3:2003. Methods of test for masonry- Part 2: Determination of initial shear strength.
14. SR EN 998-2: 2011. Specification for mortar for masonry- Part2: Masonry mortar.
15. Indicativ CR6-2013. Cod de proiectare pentru structuri din zidărie.
16. Indicativ P 100-1/2013. Cod de proiectare seismică — Partea I — Prevederi de proiectare pentru clădiri.
17. Indicativ NE 036-2014. Cod de practica privind executarea si urmarirea executiei lucrarilor de zidarie.

8.2. Applications/Seminars		Teaching methods	Notes
1	Project theme: Block of flat having masonry wall structure, and 4, 5 number of stories.	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 and horizontal loads.		
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	Statical analysis of masonry building using different software.		
11	Verification of structural masonry walls during compression and bending in the wall plane.		
12	Verification of masonry walls to shear.		
13	Reinforcement plans for confined elements (lintel beams, tie-beams, and tie-columns).		
14	Final verification.		

Bibliography

1. Marusciac D., Dumitraș M., Andreica H.-A., Bogdanovits P., Munteanu C., *Proiectarea structurilor etajate pentru construcții civile*, Ed. Tehnică, 2000.
2. SR EN 1991-1-1:2004/AC: 2009, Eurocode 1: Actions on structures – Part 1-1: General actions, - densities, self-weight, imposed loads for buildings.
3. SR EN 1991-1-3:2005/A1:2016, Eurocode 1 – Actions on structures – Part 1-3: General actions- snow loads.
4. SR EN 1998-1:2004/A1:2014, Eurocode 8: Design of structures for earthquake resistance - Part 1: General rules, seismic actions and rules for buildings.
5. SR EN 1996-2:2006 Eurocode 6: Design of masonry structures. Part 2: Design considerations, selection of materials and execution of masonry.

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. Indicativ CR0-2012. Cod de proiectare. Bazele proiectarii constructiilor.
9. Indicativ CR 1-1-3/2012. Cod de proiectare. Evaluarea actiunii zapezii asupra constructiilor.

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
September 2017

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

Date of approval in the department
September 2017

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