SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Construction
1.3	Department	Buildings and Management
1.4	Field of study	Civil Engineering
1.5	Cycle of study	Master
1.6	Program of study/Qualification	Green buildings / Master
1.7	Form of education	Full time
1.8	Subject code	3.00

2. Data about the subject

2.1	Subject name			Waterproof and acoustic design of green buildings			
2.2	Subject area			The physics of green buildings			
2.3	Course responsible/lecturer			Associate Professor Phd. Eng. Munteanu Constantin constantin.munteanu@ccm.utcluj.ro			
2.4	Teachers in charge of seminars			Associate Professor Phd. Eng. Munteanu Constantin constantin.munteanu@ccm.utcluj.ro			
				Assistant Professor Phd. Eng. Tamas – Gavrea Daniela – Roxana roxana.tibrea@cif.utcluj.ro			
2.5 Year of study	I	2.6 Semester	1	2.7 Assessment	Exam	2.8 Subject category	DA/DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	2	3.3 applications:	1
3.4 Total hours in the curriculum	42	3.5 of which, course:	28	3.6 applications:	14
Individual study					hours
Manual, lecture material and notes, bibliography					21
Supplementary study in the library, online and in the field					10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					10
Tutoring					5
Exams and tests					12
Other activities					-

3.7	Total hours of individual study	58
3.8	Total hours per semester	100
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	Knowledge of civil engineering, construction materials, technical drawing, construction thermotechnics, architectural design
4.2	Competence	Knowledge of the 4 arithmetic operations

5. Requirements (where appropriate)

5.1	For the course	Room 207, Room CII, Room 161, str. Gh. Bariţiu no.25, Cluj-Napoca
5.2	For the applications	Room 207, Room 115, Room 161, str. Gh. Bariţiu no.25, Cluj-Napoca

6. Specific competences

Professional competences	After completing the discipline students will know:
	
	- principles of functional and constructive design of buildings;
	- the construction of structural and non-structural construction elements;
	- knowledge of the physical phenomena characteristic of the propagation of acoustic waves;
	- acoustically conforming the construction elements;
	- knowledge of the physical and mechanical characteristics of the construction materials used in the acoustics of buildings;
	- principles of waterproof insulation of the building elements;
	- exploitation and maintenance of waterproofing constructions;
	- methods of calculating the diffusion of water vapor through the construction elements.
	
	After completing the discipline students will be able to:
	
	- to make, calculate and verify from an acoustic point of view the construction elements;
	- to choose suitable solutions for acoustic insulation of the building elements regarding:
	  - the protection of the functional units in the buildings against the air noise, the impact noise and the noise and vibrations produced by the installations;
	  - acoustics of public hearing rooms;
	  - to measure the noise level in the built territory;
	  - to use high-performance acoustic measuring equipment type Brüel & Kjaer.
	- to make and verify from the hydrophobic point of view the construction elements;
	- to propose the best solutions for waterproofing the buildings so that they can be classified in the category of green buildings;
	- to evaluate qualitatively the effects of humidity on buildings.

Cross competences	- performing complex professional tasks of research - design - development, in conditions of autonomy and professional independence; - assuming roles / management positions of the activity of the groups of specialists in the field of waterproof design and architectural acoustics; - self-control of the learning process, determination of training needs, reflective analysis of one's own professional activity.

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

7.1	General objective	Development of skills in the field of water repairs design of green buildings and architectural acoustics for vocational training.
7.2	Specific objectives	1. The acquisition of theoretical and practical knowledge regarding the noise insulation and impact of the building elements of the buildings. 2. Obtaining skills regarding the use of equipment for acoustic measurements. 3. The acquisition of theoretical and practical knowledge regarding the waterproofing insulation of the building elements of the buildings so that they can be classified in the category of green buildings. 4. The acquisition of theoretical and practical knowledge regarding avoiding the danger of condensation of water vapor on the interior surface of the building elements and avoiding the occurrence of the condensation phenomenon in the structure of the construction elements.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1. General layout and classification of constructions. Technical conditions. Design of buildings. Structures for civil buildings.	Exposure	Projector
2. Construction elements - Walls.		
3. Construction elements - Roofs.		
4. The current problem of the acoustics of buildings. The object and purpose of the acoustic design of the buildings. Current technical regulations. Performance requirements and criteria in the field of acoustic design. Sound as a physical and physiological phenomenon.		
5. Noise in the air. Specific parameters for airborne noise insulation. Impact noise. Specific parameters for isolation at impact noise.		
6. Protection against noise from installations. Ventilation and air conditioning systems. Design elements. Provisions for the execution of works. Plumbing, heating, electrical and from integrated equipment (elevator / elevator installations, escalators, rolling mats, generator sets and electrical transformer stations).		
7. Acoustics of public hearing rooms. The acoustic design of an auditorium. Acoustic evaluation parameters. Acoustic treatments. Protection against interference noise inside and outside the public hearing room.		

8. Urban acoustics. Sources of noise and vibration in the urban environment. Protective measures against noise and vibration in urban areas.		
9. Waterproofing. Getting started. Principle structures in the insulation of the covers. Bituminous waterproofing for low slope roofing (terrace roofs).		
10. Other types of roof insulation for terrace roofs. Waterproofing for roof coverings with medium and large slopes.		
11. Building infrastructure. Design and technology for underground waterproofing insulation.		
12. Design and technology for underground waterproofing insulation (continued).		
13. Avoid the danger of condensation of water vapor on the interior surface of the building elements. Calculation of mass transfer (humidity) through the construction elements.		
14. Calculation of mass transfer (humidity) through construction elements (continued).		

Bibliography

1. Andreica, H.-A., Munteanu, C., Muresanu, I., Moga, L., M., Tamas-Gavrea, R. – CONSTRUCŢII CIVILE (CIVIL BUILDINGS), U.T. PRESS, Cluj-Napoca, 2009.
2. Veres, Al., Vasilache, M.: Elemente de acustica clădirilor (Elements of building acoustics), Editura CERMI, IASI, 2002.
3. Carl Q. Howard, Benjamin S. Cazzolato, Acoustic Analyses Using Matlab and Ansys, CRC Press, ISBN 9781482223255, 2014.
4. Kuttruff H., Room Acoustics, Sixth Edition, CRC Press, ISBN 9781482223255, 2014.
5. Trechsel De H. R., Bomberg M., Moisture Control in Buildings: The Key Factor in Mold Prevention, ASTM Manual Series, ISBN 0-8031-2051-6.
6. Standards, regulations, specific technical regulations.

8.2. Applications/Seminars	Teaching methods	Notes
1. Presentation of the design theme: Development of the ground floor plan and the current level of a building. Phases and stages of design. Presentation of some principles regarding the design of buildings. Wall thicknesses and types of load bearing and unimportant. Characteristic details.	Exposure, applications, individual discussions	Presentation of design regulations. Computer, software
2. Determination by calculation of the sound insulation in the air noise of a partition wall between two functional units of the projected building (apartments, hotel rooms, office rooms etc.).		
3. Determination by calculation of the sound insulation at impact noise of a floor between two floors of the projected building.		

4. Development of waterproof insulation solutions and specific technology for the roof or bridge roof.		
5. Elaboration of waterproofing solutions and of the specific construction technology for the building infrastructure.		
6. Avoid the danger of condensation of water vapor on the interior surface of the building elements. Calculation of mass transfer (humidity) through the construction elements.		
7. Calculation of mass transfer (humidity) through construction elements (continued). Final verification, delivery and rating of the project.		

Bibliography

1. Andreica, H.-A., Munteanu, C., Muresanu, I., Moga, L., M., Tamas-Gavrea, R. – CONSTRUCŢII CIVILE (CIVIL BUILDINGS), U.T. PRESS, Cluj-Napoca, 2009.
2. Carl Q. Howard, Benjamin S. Cazzolato, Acoustic Analyses Using Matlab and Ansys, CRC Press, ISBN 9781482223255, 2014.
3. Kuttruff H., Room Acoustics, Sixth Edition, CRC Press, ISBN 9781482223255, 2014.
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5. Standards, regulations, specific technical regulations.

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

The acquired skills will be needed for the employees who work in the design and research companies in the field of civil engineering in order to become specialists in the design and construction of green buildings.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Solving 5 theoretical topics or a grid test.	Written test - duration of evaluation 2 hours	66%
10.5 Applications	Evaluation of works	Support of works	33%
10.6 Minimum standard of performance			
Minimum grade on written test ≥ 5 Minimum rating for applications ≥ 5			

Date of filling in:		Title Surname Name	Signature
	Lecturer	Associate Professor Phd. Eng. Munteanu Constantin	
	Teachers in charge of application	Associate Professor Phd. Eng. Munteanu Constantin	
		Assistant Professor Phd. Eng. Tamas – Gavrea Daniela - Roxana	

Date of approval in the department ……..

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Head of department
Associate Professor Phd. Eng. Claudiu ACIU

Date of approval in the faculty ……

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Dean
Associate Professor Phd. Eng. Nicolae CHIRA
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