

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Building Services Engineering
1.3	Department	Building Services Engineering
1.4	Field of study	Civil Engineering and Building Services
1.5	Cycle of study	Master
1.6	Program of study/Qualification	Building Services for Regenerative Cities / MS Engineer
1.7	Form of education	Full time
1.8	Subject code	5.00

2. Data about the subject

2.1	Subject name	nZEB Buildings				
2.2	Course responsible/lecturer	Assoc.Prof.PhD.Eng. Moga Ligia Mihaela: ligia.moga@ccm.utcluj.ro Assoc.Prof.PhD.Eng.Ancuța Coca Abrudan: ancuta.abrudan@insta.utcluj.ro				
2.3	Teachers in charge of seminars	Assoc.Prof.PhD.Eng.Moga Ligia: ligia.moga@ccm.utcluj.ro Assoc.Prof.PhD.Eng.Ancuța Abrudan: ancuta.abrudan@insta.utcluj.ro				
2.4	Year of study	I	2.5 Semester	I	2.6 Assessment	Exam
2.7	Subject category	Formative category				DA
		Optional				DI

3. Estimated total time

3.1	Number of hours per week	2	of which	3.2 Course	1	3.3 Seminar		3.3 Laboratory		3.3 Project	1
3.4	Total hours in the curriculum	28	of which	3.5 Course	14	3.6 Seminar		3.6 Laboratory		3.6 Project	14
3.7 Individual study:											
(a) Manual, lecture material and notes, bibliography										10	
(b) Supplementary study in the library, online and in the field										10	
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										10	
(d) Tutoring										7	
(e) Exams and tests										4	
(f) Other activities										6	
3.8 Total hours of individual study (sum (3.7(a)...3.7(f)))					47						
3.9 Total hours per semester (3.4+3.8)					75						
3.10 Number of credit points					3						

4. Pre-requisites (where appropriate)

4.1	Curriculum	Knowledge regarding building and HVAC design, Thermotechnics of Constructions, construction materials, bachelor's degree
4.2	Competence	Thermotechnics and HVAC calculation

5. Requirements (where appropriate)

5.1	For the course	Class attendance is not mandatory, but it will be a plus for the final grade. Photography and filming are prohibited during the course
5.2	For the applications Project	Class attendance is mandatory. Photography and filming are prohibited during tutorials.

6. Specific competences

Professional competences	<p>Knowledge regarding energy performance of buildings legislation.</p> <p>Knowledge regarding general criteria for nZEB design.</p> <p>Knowledge for the identification of constructive details for building envelope components</p> <p>Knowledge regarding thermal performance design</p> <p>Knowledge regarding different parts constituting HVAC systems for energy efficient buildings;</p> <p>Knowledge for the identification of building services components</p>
Cross competences	<p>The accumulated knowledge can be used for developing technical reports for the thermal design of nZEBs.</p> <p>The students will be able to get the required technical knowledge to communicate with other stakeholders in the field of nZEBs.</p> <p>The students will be able to demonstrate a creative and enterprising spirit in solving complex problems</p>

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

7.1	General objective	Developing skills for designing high nearly Zero Energy Buildings Synthesizing, explaining and transmitting information for nearly Zero Energy Buildings
7.2	Specific objectives	<p>Acquiring knowledge regarding legislation and design norms nZEBs</p> <p>Skills development in designing nZEBs</p> <p>To know in detail the role of building services components and systems in designing nZEBs.</p> <p>Using the latest scientific and technical achievements (national and international) trends for developing design nZEBs</p>

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Overview, objectives, history. Energy efficiency at buildings. Legislation and norms regarding thermal performance of new buildings and thermal rehabilitation process at existing buildings	2	Exposure, applications	Video-projector
2. nZEBs definition. Principles and design criteria.	2		
3. Constructive solutions for nZEBs. Types of energy efficient windows.	2		
4. Evaluation methodologies for the energy performance of a building and building services.	2		

5. Use of cogeneration for nZEBs	2		
6. Use of renewable energy for buildings: wind power and geothermal energy	2		
7. Use of renewable energy for buildings: solar energy and heat pumps	2		
Bibliography <ol style="list-style-type: none"> Horia-A. Andreica, Munteanu C., Moga L. Et al, <i>Construcții Civile</i>, UTPRESS, 2009 Moga L., Optimizarea termoenergetică a elementelor vitrate, U.T.Press, 2013, ISBN 978-973-662-793-4 Popescu Razvan, Stefan: Utilizarea energiei regenerabile in cladiri, Editura MATRIX ROM, 2019, ISBN: 978-606-25-0290-4 Manualul de Instalatii – Instalatii de incalzire, Editura MATRIX ROM, 2010 *** Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings *** Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. Hendriks L.; Hens H. Building Envelopes in a Holistic Perspective, ISBN-10-9075741057, 2010. *** http://www.passivhaus.de/ *** www.usgbc.org/leed *** http://www.breeam.com/ *** http://isb.pub.ro/docs/Energii_regenerabile.pdf / *** https://www.mlpda.ro/userfiles/metodologie_calcul_performanta_energetica_iulie2014.pdf 			
8.2. Project	Number of hours	Teaching methods	Notes
1. Presentation of the project theme. Identification of required building layouts.	2	Exposure, applications	Standards and Norms, AutoCad, AllPlan, MathCad, energy modelling and design tools
2. Identification of building's envelope components. Constructive detailing design specific for nZEBs.	2		
3. Evaluation of the thermal performance of the building envelope components	2		
4. Evaluation of the global insulation coefficient of the building envelope.	1		
5. Presentation of the project theme. Description of all possible renewable energy types to be used in nZEBs.	3		
6. Calculation method using heat pumps	2		
7. Calculation method using wind power	2		
Bibliography <ol style="list-style-type: none"> Moga Ligia, Moga Ioan Punți termice specifice clădirilor cu pereți structurali din zidărie, Ed. U.T. Press, Cluj-Napoca, 2013, pp. 138, ISBN 978-973-662-799-6. Moga Ligia, Moga Ioan, "Punți termice specifice planșelor terasă, de pod, deasupra subsolului și plăcilor pe sol la clădiri cu pereți din zidărie", Ed. U.T. Press, Cluj-Napoca, 2017, pp. 164, ISBN 978-606-737-245-8. Moga L., Rusu A., Performanța termică a clădirilor din panouri mari prefabricate: îndrumător de calcul, U.T.Press, 2013 *** Thermotechnics design norms C107/0...7-2005 Manualul de Instalatii – Instalatii de incalzire, Editura MATRIX ROM, 2010 			

Software:

1. AutoCAD, Student Version
2. Allplan Inginerie, Student Version
3. Mathcad

Specialized software for the calculation of the equipment specified in the theme

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

The gained knowledge will be necessary for employees that will work in building design field and building services systems. This satisfies employers' requirements.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	20 theoretic questions	Written test of 2.0 h - on-site or 30 min online	30%
10.5 Project	Evaluation of written part, calculations and drawings	Project presentation for 40 min	70%
10.6 Minimum standard of performance			
Exam grade $E \geq 5$; Project/paper grade $A \geq 5$ $E = [0.3 (T) + 0.7 (P)]$ The final grade will take into consideration the student's involvement during the semester			
Date of filling in: 16.06.2023		Title Surname Name	Signature
	Lecturer	Assoc.Prof.PhD.Eng. Moga Ligia Mihaela Assoc.Prof.PhD.Eng. Ancuța Abrudan	
	Teachers in charge of application	Assoc.Prof.PhD.Eng. Moga Ligia Mihaela Assoc.Prof.PhD.Eng. Ancuța Abrudan	
Date of approval in the Department of Building Services Engineering 29.06.2023		Head of department Assoc.Prof.PhD.Eng. Carmen MÂRZA	
Date of approval in the Council of the Faculty of Building Services Engineering 29.06.2023		Dean Assoc.Prof.PhD.Eng. Florin DOMNIȚA	