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	10.00

2. Data about the subject

2.1	Subject name			Building Services Retrofit Solutions			
2.2	Course responsible/lecturer			Assoc.Prof.PhD.Eng. *Octavian Pop – octavian.pop@insta.utcluj.ro*			
2.3	Teachers in charge of seminars			Assoc.Prof.PhD.Eng. *Octavian Pop – octavian.pop@insta.utcluj.ro*			
2.4 Year of study	I	2.5 Semester	II	2.6 Assessment			E
2.7 Subject category							DA
							DI

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar		3.3 Laboratory		3.3 Project	2
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar		3.6 Laboratory		3.6 Project	28

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	23
(b) Supplementary study in the library, online and in the field	9
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
(d) Tutoring	2
(e) Exams and tests	4
(f) Other activities	-

3.8 Total hours of individual study (sum (3.7(a)…3.7(f)))	58
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	Amphitheatre, B-dul 21 Decembrie Nr.128-130, Cluj-Napoca
5.2	For the applications Laboratory	Laboratory room, B-dul 21 Decembrie Nr.128-130, Cluj-Napoca

6. Specific competences

Professional competences	✓ Implementation of new design strategies in order to minimise the energy costs and to extend the life of the systems from an aging facility ✓ Conceptual framework determination in order to be able to apply the optimal retrofit and sustainable solutions for the present-day building services ✓ Dimensioning of each type of building services for establishing the optimum retrofit and sustainable solution for the existing building services ✓ Economic analysis before and after the implementation of the building services retrofit solution
Cross competences	✓ Teamwork – the ability to synthetise and clearly define every team worker's job, ensuring an efficient exchange of information, knowledge and proofing good interpersonal and networking skills. ✓ Use of the IT&C technology. ✓ Adjustment to new technologies, personal and professional development by using specialized documents and software, and electronic resources written in an international language.

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

7.1	General objective	Implementation of new design strategies in order to minimise the energy costs and to extend the life of the systems from an aging facility
7.2	Specific objectives	Conceptual framework determination in order to be able to apply the optimal retrofit and sustainable solutions for the present-day building services. Dimensioning and economic analysis for establishing the optimum retrofit and sustainable solution for the existing building services.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Essentials aspects regarding the performance evaluation of the building services.	2 hours	Presentation and discussions	Video system
Aspects regarding the building occupants' needs according to the building old or new destination.	2 hours		
New technologies for buildings water distribution systems.	2 hours		
New technologies for buildings HVAC systems.	2 hours		
New technologies for buildings electrical systems.	2 hours		
Optimal retrofit and sustainable solutions for building services.	2 hours		
Deployment of the BMS system in buildings.	2 hours		
Total	14 hours		

Bibliography

1. ASHRAE Handbook: HVAC Basics and HVAC System Efficiency Improvement, 2016
2. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality;

3. J. F. Kreider, P. Curtiss and A. Rabl, Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 2nd Ed., 2002;
4. McQuiston & Parker, Heating, Ventilating, and Air Conditioning Analysis and Design, Wiley, 6th Ed., 2005;
5. R. W. Haines and D. C. Hittle, Control Systems for Heating, Ventilating and Air Conditioning, Boston: Kluwer Academic Publishers, 6th Ed., 2003;
6. Gh. Badea, Instalaţii pentru distribuţia apei în clădiri, Risoprint, Cluj-Napoca, 2003;
7. Producers catalogues
8. GT 058 Ghidul criteriilor de performanţa pentru instalaţiile de ventilare.
9. GT 059 Ghidul criteriilor de performanţa pentru instalaţiile electrice.
10. GT 063 Ghidul criteriilor de performanţa pentru instalaţii sanitare.
11. GT 060 Ghid pentru proiectarea instalaţiilor de încălzire perimetrala la clădiri
12. I 13 Normativ pentru proiectarea şi executarea instalaţiilor de încălzire centrala
13. I 9 Normativ pentru proiectarea şi executarea instalaţiilor sanitare.
14. I 5 Normativ pentru proiectarea, şi executarea instalaţiilor de ventilare şi climatizare.
15. I 7 Normative for design, execution and exploitation of the electrical systems for buildings.
16. SR EN 12464-1:2011. Lumină şi iluminat. Iluminatul locurilor de muncă. Partea 1: Locuri de muncă interioare

8.2. Seminar / laboratory / **project**	Number of hours	Teaching methods	Notes
Project design topic presentation and assimilation. General debate on the building blueprints.	2 hours	Discussions, case study, team work.	
Performance evaluation of the effective building services: HVAC systems.	2 hours		
Performance evaluation of the effective building services: water distribution.	2 hours		
Performance evaluation of the effective building services: electrical systems.	2 hours		
Evaluation of the maintenance and operation costs for the existing building services.	2 hours		
Comfort demand of the building occupants according to the building old or new destination: HVAC systems.	2 hours		
Comfort demand of the building occupants according to the building old or new destination: water distribution and lighting.	2 hours		
Design the optimal retrofit and sustainable solution for building services: HVAC systems.	2 hours		
Design the optimal retrofit and sustainable solution for building services: water distribution.	2 hours		
Design the optimal retrofit and sustainable solution for building services: electrical systems.	2 hours		
Financial estimate after the implementation of the optimum retrofit and sustainable solutions of the building services.	2 hours		
Tutoring.	2 hours		
Oral presentation of the project.	4 hours		
Total	28 hours		

Bibliography

1. ASHRAE Handbook: HVAC Basics and HVAC System Efficiency Improvement, 2016

2. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality;
3. J. F. Kreider, P. Curtiss and A. Rabl, Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 2nd Ed., 2002;
4. McQuiston & Parker, Heating, Ventilating, and Air Conditioning Analysis and Design, Wiley, 6th Ed., 2005;
5. R. W. Haines and D. C. Hittle, Control Systems for Heating, Ventilating and Air Conditioning, Boston: Kluwer Academic Publishers, 6th Ed., 2003;
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9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The competences achieved by the alumni are necessary in the field of design, production, consulting and marketing. Thus, the demands of the employees are being satisfied.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Written exam	Test – 2 hours	50%
10.5 Seminar / laboratory / **project**	Oral presentation of the project	Oral examination	50%
10.6 Minimum standard of performance			
Students must pass the Laboratory test for the final exam. The components of the final grade are Exam (E) and Project (P). Thus, the formula for the final grade of this subject is N = 0.5xE + 0.5xP. The 4 credits are obtained only if N≥5, where both E≥5 and P≥5.			

Date of filling in:		**Title Surname Name**	**Signature**
10.06.2025	Lecturer	Assoc.Prof.PhD.Eng. Octavian Pop	
	Teachers in charge of application	Assoc.Prof.PhD.Eng. Octavian Pop	

Date of approval in the Department of Building Services Engineering 19.06.2025	Head of department Assoc.Prof.PhD.Eng. Ciprian BACOŢIU
Date of approval in the Council of the Faculty of Building Services Engineering 19.06.2025	Dean Assoc.Prof.PhD.Eng. Florin DOMNIŢA