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	9.00

2. Data about the subject

2.1	Subject name			Indoor environmental quality and well-being			
2.2	Course responsible/lecturer			Lect.PhD.Eng. Tania RUS - tania.rus@insta.utcluj.ro			
2.3	Teachers in charge of seminars			Lect.PhD.Eng. Tania RUS - tania.rus@insta.utcluj.ro			
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment	Exam		
2.7 Subject category	Formative category						DS
	Optional						DI

3. Estimated total time

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

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	21
(b) Supplementary study in the library, online and in the field	15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	14
(d) Tutoring	6
(e) Exams and tests	2
(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	Bachelor’s degree
4.2	Competence	Principles of heating installations; Principles of ventilation and air conditioning installations; Principles of lighting installations.

5. Requirements (where appropriate)

5.1	For the course	Classroom equipped with Video Projector - 21 December 1989 Blvd., no. 128-130
5.2	For the applications	Laboratory room I01 - 21 December 1989 Blvd., no. 128-130

	Laboratory	

6. Specific competences

Professional competences	Theoretical knowledge: - Specific notions of heating installations; - Specific notions of ventilation and air conditioning installations; - Specific notions of lighting installations. Acquired skills: - To evaluate the quality of the indoor environment depending on the destination of the building and the typology of the occupants; - To evaluate the thermal comfort of a building; - To evaluate the quality of the indoor air of a building; - To evaluate the quality of lighting. Skills acquired: - To use equipment and tools for monitoring the quality of the indoor environment; - To propose solutions of improvement of the indoor environment quality.
Cross competences	To demonstrate a creative and enterprising spirit in complex problem solving. Use of references in a foreign language, for professional and personal development, through continuous formation and efficient adaptation to new technical specifications.

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

7.1	General objective	Development of skills in the field of indoor environment quality evaluation of a building and to propose solutions of improvement with an emphasis on the needs of the occupants.
7.2	Specific objectives	To establish the parameters and calculation assumptions of imposed requirements; To identify the technical non-conformities and the needs of functional and energetic rehabilitation / modernization; To use the basic concepts and engineering calculation methods to solve the practical problems imposed using installations in constructions; To use methods and programs to transmit information.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Introduction in indoor environmental quality (IEQ)	2	Video-Projector Teaching style based on the interactive teacher-student partnership;	
2. Standards for IEQ evaluation	2		
3. Hygro-thermal environment – temperature, humidity and air velocity	2		
4. Thermal comfort assessment	2		
5. Occupant responses to thermal comfort/discomfort	2		

6. Interaction between outdoor climate and thermal comfort	2	Presentation of case studies.	
7. Indoor air quality – indoor ventilation	2		
8. Indoor air quality – contaminants	2		
9. Indoor air quality – occupant satisfaction	2		
10. Visual environment – natural/artificial lighting	2		
11. Acoustic environment	2		
12. Biophilia	2		
13. Well-being and human values	2		
14. Regenerative objectives for IEQ	2		

Bibliography

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), (2013). ANSI/ASHRAE Standard 55. Thermal Environmental Conditions for Human Occupancy. Atlanta;
2. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), (2016). ANSI/ASHRAE Standard 62-1. Ventilation for Acceptable Indoor Air Quality. Atlanta;
3. CEN, (2019). UNI EN 16798-1: Energy performance of buildings – Ventilation for buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics. Brussels, European Committee for Standardization;
4. World Health Organization – Air quality guidelines for Europe, 2000;
5. CEN, (2004). UNI EN 12464-1: Light and lighting. Lighting of workplaces. Part 1: Indoor workplaces. Brussels, European Committee for Standardization.
6. U.S. Environmental Protection Agency (1990). (EPA) (b), Facts About Formaldehyde [Online]. Retrieved from https://www.epa.gov/formaldehyde/facts-about-formaldehyde#whatisformaldehyde
7. U.S. Environmental Protection Agency. (1990). (EPA) Particulate Matter (PM) Basics. Retrieved from https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM
8. U.S. Environmental Protection Agency. (1990). (EPA) (d), Indoor Particulate Matter. Retrieved from https://www.epa.gov/indoor-air-quality-iaq/indoor-particulate-matter
9. U.S. National Institute for Occupational Safety and Health. (2018). (NIOSH), Pocket Guide to Chemical Hazards. Retrieved from https://www.cdc.gov/niosh/npg/default.html
10. U.S. Occupational Safety and Health Administration (OSHA) (2020), Code of Federal Regulations. Retrieved from https://www.graphicproducts.com/articles/osha-29-cfr-1910/
11. Naboni, E., & Havinga, L. C. (2019). Regenerative Design in Digital Practice: A Handbook for the Built Environment. EURAC Research. Retrieved from https://www.buildup.eu/en/practices/publications/regenerative-design-digital-practice-handbook-built-environment

8.2. Laboratory	Number of hours	Teaching methods	Notes
1. Assessment of the hygro-thermal environment – temperature, humidity and air velocity	2	Teaching style based on the interactive teacher-student partnership;	
2. Objective and subjective thermal comfort computation	2		
3. Indoor air-quality: measurements of the chemical and natural contaminants	2		
4. Evaluation of the visual environment	2		
5. Evaluation of the acoustic environment	2		
6. Assessment of the indoor environmental quality	2		
7. Recovery of laboratory	2		

Bibliography

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), (2013). *ANSI/ASHRAE Standard 55. Thermal Environmental Conditions for Human Occupancy*. Atlanta;

2. CEN, (2005). EN ISO 7730: *Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort*
criteria. Brussels, European Committee for Standardization;
3. CEN, (2019). UNI EN 16798-1: *Energy performance of buildings – Ventilation for buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics*. Brussels, European Committee for Standardization;
4. World Health Organization (WHO) (2000). *Air Quality Guidelines for Europe*. Second Edition
5. World Health Organization – Air quality guidelines for Europe, 2000;
6. International Well Building Institute (IWBI), (2019). *The Well Building Standard*

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

The acquired competencies will be necessary for the employees who carry out their activity in design, execution and maintenance.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The exam consists in verifying the theoretical and practical knowledge acquired	Written exam	75%
10.5 Laboratory	Completion and submission of laboratory papers conditions the entrance to the exam.	Submission of laboratory papers	25%
10.6 Minimum standard of performance			
Participation in the laboratory conditions the entrance to the exam. Exam grade components (E); Laboratory (L); Calculation formula of the grade G = 0.75 × E + 0.25 × L Condition for obtaining credits: G> 5.0; where E> 5.0, L> 5.0			

Date of filling in:		**Title Surname Name**	**Signature**
26.06.2023	Lecturer	Lect.PhD.Eng. Tania RUS	
	Teachers in charge of application	Lect.PhD.Eng. Tania RUS	

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 DOMNIŢA