

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

2. Data about the subject

2.1	Subject name	Human Centric Lighting	Subject code	2.00
2.2	Course responsible/lecturer	Prof.Ph.D.Eng. Dorin Beu - <i>dorin.beu@insta.utcluj.ro</i>		
2.3	Teachers in charge of project	Prof.Ph.D.Eng. Dorin Beu - <i>dorin.beu@insta.utcluj.ro</i>		
2.4	Year of study	I	2.5 Semester	1
			2.6 Assessment	Exam
2.7	Subject category	Formative category		
		Optionality		
		DF		
		DOB		

3. Estimated total time

3.1	Number of hours per week	2	of which	3.2	1	3.3		3.3		3.3	1
				Course		Seminar		Laboratory		Project	
3.4	Total hours in the curriculum	28	of which	3.5	14	3.6		3.6		3.6	14
				Course		Seminar		Laboratory		Project	
3.7	Individual study:										
	(a) Exams and tests										3
	(b) Manual, lecture material and notes, bibliography										15
	(c) Supplementary study in the library, online and in the field										15
	(d) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										12
	(e) Tutoring										2
	(f) Other activities										
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	Physics and Architecture elements
4.2	Competence	Use of computer (MS-Office)

5. Requirements (where appropriate)

5.1	For the course	Video-projector
5.2	For the project	Lux-meter, spectral-photometer, luminance meter,

6. Specific competences

Professional competences	CP1 – perform project management CP2 – synthesizes information CP3 – promote innovative infrastructure design CP21 – combine multiple fields of knowledge CP29 – develop energy saving concepts
Cross competences	CT1 – collaborating in teams and networks CT3 – dealing with problems

7. Expected Learning Outcomes

Knowledge	CP1 – Knows project management methodologies applicable to urban infrastructure, planning tools, resource allocation techniques, and cost control specific to pipeline and urban network projects. CP2 – Knows methods of critical analysis of information sources specific to the urban domain (environmental studies, infrastructure reports, European regulations), synthesis techniques, and how to structure complex data to support decision-making in urban planning. CP3 – Knows current trends in sustainable urban design (nZEB, green infrastructure), innovative technologies (IoT sensors, smart grids, advanced materials), and concepts of urban resilience and circular economy. CP21 – Possesses integrated knowledge from diverse fields (building services engineering, architecture, urban planning, environmental sciences, circular economy, public policies, urban sociology), essential for the holistic approach to regenerative cities. CP29 – Has in-depth knowledge of energy management systems (BMS), monitoring and control technologies, energy performance indicators (EnPI), consumption reduction strategies (demand response, load shifting, energy efficiency), and building energy certification principles.
Skills	CP1 – Develops project plans for urban infrastructure, defines stages and deliverables, allocates human and material resources, monitors progress through performance indicators, manages relationships with stakeholders (authorities, developers, communities), and periodically reports project status. CP2 – Critically analyzes technical reports, impact studies, and geo-spatial data, selects relevant information for urban infrastructure projects, synthesizes and structures knowledge coherently, producing documented summaries for project teams and authorities. CP3 – Identifies and evaluates innovation opportunities in urban infrastructure projects, integrates new technologies and unconventional solutions (rainwater harvesting systems, smart pipes, multifunctional infrastructure), develops innovative project proposals, and actively promotes sustainable approaches in professional settings and before authorities. CP21 – Integrates perspectives from multiple disciplines in analyzing and solving complex urban problems, collaborates effectively with specialists from different fields (architects, urban planners, ecologists, sociologists, economists), develops interdisciplinary solutions that simultaneously address technical, social, economic, and environmental requirements. CP29 – Develops integrated concepts for saving energy resources in smart buildings, designs consumption optimization strategies (lighting, HVAC, appliances), integrates renewable sources and storage systems, evaluates energy performance through simulations and monitoring.

Responsibilities and autonomy	CP1 – Leads complex urban infrastructure and pipeline system projects autonomously, makes managerial decisions in the specific context of the urban environment, coordinates interdisciplinary teams, and is directly responsible for achieving objectives within established deadlines and budgets, in compliance with local and European regulations. CP2 – Independently evaluates information sources, forms evidence-based opinions, supports conclusions before public authorities and stakeholders, assuming responsibility for the validity of analyses in the context of regenerative urban development. CP3 – Initiates and promotes innovative solutions for urban infrastructure, assuming calculated risks in the context of sustainable development, convincingly argues benefits before decision-makers, and contributes to paradigm shifts in regenerative urban planning. CP21 – Approaches regenerative urban development challenges from a holistic and integrated perspective, assuming responsibility for solutions that harmonize the multiple dimensions of sustainability, in collaboration with all stakeholders and respecting cultural and social diversity. CP29 – Leads the development of energy resource saving concepts for smart buildings, assuming responsibility for energy performance, for integrating innovative solutions, and for compliance with sustainability standards.
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8. Discipline objectives (as results from the *key competences gained*)

8.1	General objective	Development of students' competences in the field of human centric lighting, with a holistic view on the regenerative impact of this topic. Students will learn to integrate knowledge from optics, electrical installations, architecture and biology to design interior and exterior lighting systems that respond to visual comfort, health, energy efficiency and sustainability requirements, in accordance with European standards and the principles of regenerative urban development.
8.2	Specific objectives	• Understanding the impact of daylight and electric lighting on human wellbeing and circadian rhythm (Human Centric Lighting) (CP21, CT2). • Knowledge and application of European standards in the field of lighting (EN 12464, EN 13201, EN 17037, EN 1838, SR EN 15193) (CP2, CP3). • Development of skills in using the European DIALux software and interpretation of the results obtained, including the use of BIM solutions for advanced lighting design (CP3, CP29). • Development of the ability to design interior and exterior lighting systems, in collaboration with architects, and to prepare the necessary technical documentation (material lists, control schemes, estimates) (CP1, CP21, CT1). • Understanding the impact of night lighting on the environment and identifying ways to reduce light pollution (CP3, CP21). • Finding regenerative lighting solutions for buildings and cities, including lighting waste management and application of circular economy principles (CP3, CP21, CP29). • Development of project management skills for lighting systems, including site follow-up and coordination with other building services (CP1, CT1, CT3).

9. Contents

9.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1.Lighting fundamentals	2	Video-Projector Teaching style based on the interactive teacher-student partnership; Presentation of case studies.	
2.LEDs and luminaires	2		
3.Wellbeing and health issues related to lighting	2		
4.Natural lighting. Luminaire design	2		
5.Lighting control systems	2		
6.Regenerative approach	2		
7.Lighting waste treatment: circular economy	2		
Bibliography			
1. Van Bommel, W., Interior Lighting - Fundamentals, Technology and Application, Springer, ISBN 978-3-030-17195-7, 2019			
2. Van Bommel, W., Road Lighting - Fundamentals, Technology and Application, Springer, ISBN 978-3-319-11466-8, 2015			
3. Steffy,G, Architectural Lighting Design, John Wiley & Sons, 2012, ISBN 0-471-38638-3			
4. Moran, N, Performance Lighting Design, A&C Black Publishers LTD 2007, ISBN 978-0-7136-7757-7			
1. ***, 1000 Lights, Taschen, 2004, ISBN 978-3-8228-5287-3			
2. Descottes,H, Ultimate Lighting Design, teNeues, 2008, ISBN 978-3-8327-9016-5			
9.2. Project	Number of hours	Teaching methods	Notes
1.Measuring illuminance, colour rendering and colour temperature	2	Site visits, role play during the projects, modeling execution, computer exercises, group project	
2.Using DialuxEvo	4		
3.Understanding the European lighting norms	2		
4.Interior lighting (from concept to site)	2		
5.Public lighting (from concept to site)	2		
6.Lighting future	2		
Bibliography			
1. Norms EN 12464, 1838, 13201 and 15193			
2. International journal of Sustainable Lighting – open access at www.lightingjournal.org			
3. DialuxEvo software free download at www.dial.de			
4. Lighting sustainable criteria’s at www.usgbc.org			

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

The course is supervised by ELEA – European Lighting Experts Association and Romanian Lighting Association ARI. A steering is realised by Signify Romania, Zumtobel Group Romania and Schreder Romania.

11. Evaluation

Activity type	11.1 Assessment criteria	11.2 Assessment methods (and evaluation form: continuous/summative)	11.3 Weight in the final grade
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11.4 Course	Technical content, word count, structure and critical analysis;	Mid-term exam final report grade	20% 40%
11.5 Project	Technical content, presentation and communication skills;	class activity, assignments, presentation grade	40%
11.6 Minimum standard of performance			
5 points out of 10 total points (5 min/10 max)			

Date of filling in: 14.05.2026		Title Surname Name	Signature
	Lecturer	Prof.PhD. Eng. Dorin Beu	
	Teachers in charge of application	Prof.PhD. Eng. Dorin Beu	

Date of approval in the Department of Building Services Engineering	Head of department Assoc.Prof.PhD.Eng. Ciprian BACOȚIU
09.07.2026	
Date of approval in the Council of the Faculty of Building Services Engineering	Dean Assoc.Prof.PhD.Eng. Florin DOMNIȚA
09.07.2026	