

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				Energy Management Tools and Programs for Regenerative Cities	Subject code	16.00
2.2	Course responsible/lecturer				PhD. Eng. Ancuța MĂGUREAN – ancuta.magurean@termo.utcluj.ro ; ancuta.magurean@ecoverproiect.com		
2.3	Teachers in charge of laboratory				PhD. Eng. Ancuța MĂGUREAN – ancuta.magurean@termo.utcluj.ro ; ancuta.magurean@ecoverproiect.com		
2.4 Year of study	2	2.5 Semester	1	2.6 Assessment			Colloquim
2.7 Subject category		Formative category					DC
		Optionality					DOB

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) Exams and tests										3
(b) Manual, lecture material and notes, bibliography										16
(c) Supplementary study in the library, online and in the field										10
(d) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										18
(e) Tutoring										-
(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	General knowledge related to energy, thermo-technics, electrotechnics, civil engineering and renewable energy sources
4.2	Competence	Technical competences in the field of civil engineering and building services / mechanical engineering

5. Requirements (where appropriate)

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

6. Specific competences

Professional competences	CP1 – provide project management CP2 – synthesize multiple data and information CP5 – prepares the feasibility study CP21 – combines multiple areas of knowledge CP28 – promotes the use of energy from renewable sources CP29 – develops concepts for saving energy resources
Cross competences	CT1 – collaborates in teams and networks CT2 – thinks holistically CT3 – solve problems

7. Expected Learning Outcomes

Knowledge	CP1 – Knows project management methodologies applicable to urban infrastructure, planning tools, resource allocation techniques CP2 – Knows methods of critical analysis of information sources specific to the urban energetics (environmental studies, infrastructure reports, European regulations), synthesis techniques, and how to structure complex data to support decision-making in urban energetics planning CP5 – Has relevant knowledge of feasibility study methodology for urban energetics projects, financial performance indicators, multi-criteria evaluation criteria CP21 – Possesses integrated knowledge from diverse fields (building services engineering, architecture & civil engineering, urban planning, environmental sciences, public policies), essential for the holistic approach to regenerative cities CP28 – Has in-depth knowledge of renewable energy-based technologies (solar thermal, photovoltaic, wind, biomass, geothermal, hydrogen), specific regulations, support and funding schemes, circular economy principles, and their integration into urban infrastructure CP29 – Has relevant knowledge of energy management systems (BMS), monitoring and control technologies, energy performance indicators (EnPI), consumption reduction strategies, and building energy certification principles.
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Skills	CP1 – Develops project plans and programs for urban infrastructure (e.g., Program to improve Energy Efficiency (PiEE)), defines stages and deliverables, allocates human and material resources, manages relationship with stakeholders CP2 – Critically analyzes technical reports, impact studies, and geo-spatial data, selects relevant information for urban energetics assessments, synthesizes and structures knowledge coherently, producing documented summaries for project teams and authorities CP5 – Collects and analyzes technical, economic, social, and environmental data for urban infrastructure projects, develops alternative scenarios (technologies, routes, sustainable solutions), calculates performance indicators, formulates well-founded recommendations, and drafts the study according to beneficiary and funder requirements CP21 – Integrates perspectives from multiple disciplines in analyzing and solving complex urban problems, collaborates effectively with specialists from different fields (architects and engineers, urban planners, ecologists, economists), develops interdisciplinary solutions that simultaneously address technical, social, economic, and environmental requirements. CP28 – Analyzes the potential of renewable sources for various urban applications, evaluates technical and economic solutions, develops feasibility studies and cost-benefit analyses, develops promotion and training materials, provides consulting for implementation and funding access CP29 – Develops integrated concepts for saving energy resources in public infrastructure, designs consumption optimization strategies, integrates renewable sources and storage systems, evaluates energy performance through simulations and monitoring.
Responsibilities and autonomy	CP1 – Contributes to complex urban infrastructure projects autonomously, makes managerial decisions in the specific context of the urban environment, 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 urban energetics improvements CP5 – Contributes to interdisciplinary teams for developing feasibility studies for complex urban infrastructure projects, assuming responsibility for the quality, objectivity, and scientific foundation of analyses and for recommendations that influence the sustainable development of communities CP21 – Approaches regenerative urban development challenges from a holistic and integrated perspective, assuming responsibility for solutions that harmonize the multiple dimensions of urban energetics, in collaboration with all stakeholders CP28 – Actively and responsibly promotes renewable energy-based solutions, assuming responsibility for the technical and economic foundation of recommendations and for contributing to decarbonization and sustainability goals in the urban environment. CP29 – Leads the development of energy resource saving concepts for public infrastructure, assuming responsibility for energy performance, and for integrating innovative solutions.

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

8.1	General objective	Evidenced based knowledge transfer and case study-based experiences regarding the energy management in both (non) regenerative cities, so as to empower the participants to act as local Energy Managers.
8.2	Specific objectives	Integrative knowledge of the local energy generation and use in the regenerative cities. Knowledge of the legislation and authorities involved in the energy management in local communities.

		The ability to effectively use energy management tools and implement energy efficiency solutions. Financing, energy performance contracting and ESCO mechanisms.
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9. Contents

9.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Course 1 – 2. Current energy context of local communities. Urban energetics 1.1. Built environment – energy use 1.2. Local counties capitals – energy use 1.3. The other cities – energy use 1.4. Villages and counties – energy use 1.5. Public utility infrastructure companies 1.6. Mobility and the energy impact 1.7. Waste collection and energy valorization 1.8. Street lighting – energy impacts 1.9. Services and industrial sites – energy use 1.10. Energy impact in the local budgets	4	Discussions based on materials provided in advance. Question and answer sessions. Presentations of case studies and examples, from which to develop projects. Use of online tools for direct interaction, use of powerpoint materials and writing on the board ideas and calculation models.	
Course 3. Renewable Energy Communities: Towards a new sustainable model of energy production and sharing	2		
Course 4. Key-elements in promoting and implementing measures to increase energy performance in localities	2		
Course 5. Technologies and solutions for energy efficiency and distributed generation	2		
Course 6. Added value through research, innovation and dissemination	2		
Course 7. Added value through energy efficiency investments	2		
Bibliography • Guide to Energy Management, Eighth Edition 8th Edition, Barney L. Capehart, Wayne C. Turner, William J. Kennedy, The Fairmont Press, USA, 2016. • Energy Management Handbook, Wayne C. Turner and Steve Doty (Editors), The Fairmont Press, USA 2006. • Total Energy Management Handbook, Kazuhiko Yoshida (Editor), Energy Conservation Center Japan, 2005. • Energy Management in Buildings, Keith Moss, Taylor & Francis, 2006. • Building Energy Management Systems, Geoff Levermore, Taylor and Francis 2000. • Managing Indoor Environments and Energy in Buildings with Integrated, Triantafyllia Nikolaou, Dionysia Kolokotsa, George Stavrakakis, Apostolos Apostolou, Corneliu Munteanu, Springer, 2015. • Managementul energiei electrice. Aplicații, Andrei C. Cziker, Mircea Chindriș, Casa Cărții de Știință, Cluj-Napoca, 2004. • S. Ahmed and A. M. Măgurean, “Renewable Energy Communities: Towards a new sustainable model of energy production and sharing,” Energy Strategy Reviews, vol. 55, p. 101522, 2024, doi: https://doi.org/10.1016/j.esr.2024.101522. • ORDONANȚĂ DE URGENȚĂ nr. 59 din 6 noiembrie 2025 pentru modificarea și completarea unor acte normative în domeniul energiei EMITENT GUVERNUL ROMÂNIEI			

9.2. Project	Number of hours	Teaching methods	Notes
1-2. Program to improve Energy Efficiency (PiEE) template and model. Defining project themes. Achieving an energy balance at the regenerative city level	4	Use of online tools for direct interaction, use of powerpoint materials and writing on the board ideas and calculation models. Presentation of energy analytics, M&T and M&V calculation models.	
3. Building energy audits case studies and discussion. Building energy saving calculation tool. Check project preparation status	2		
4. Monitoring & Targeting (M&T) tool. Check project preparation status	2		
5. Measurement and Verification (M&V) Protocol in accordance with ISO 50001. Check project preparation status	2		
6. Calculation example IRR_NVP_DPP. Check project preparation status	2		
7. Results integration in the project, using all the previous tools and programs	2		
Bibliography • Guide to Energy Management, Eighth Edition 8th Edition, Barney L. Capehart, Wayne C. Turner, William J. Kennedy, The Fairmont Press, USA, 2016. • Energy Management Handbook, Wayne C. Turner and Steve Doty (Editors), The Fairmont Press, USA 2006. • Total Energy Management Handbook, Kazuhiko Yoshida (Editor), Energy Conservation Center Japan, 2005. • Energy Management in Buildings, Keith Moss, Taylor & Francis, 2006. • Building Energy Management Systems, Geoff Levermore, Taylor and Francis 2000. • Managing Indoor Environments and Energy in Buildings with Integrated, Triantafyllia Nikolaou, Dionysia Kolokotsa, George Stavrakakis, Apostolos Apostolou, Corneliu Munteanu, Springer, 2015. • Managementul energiei electrice. Aplicații, Andrei C. Cziker, Mircea Chindriș, Casa Cărții de Știință, Cluj-Napoca, 2004.			

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

The preparation and periodical update of the course will take into account the existent curricula at international level, the consultation of relevant professional associations and authorities, the legal frame evolution and national and international implemented projects in energy, energy efficiency and management in local communities.

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	The exam consists in verifying the theoretical and practical knowledge acquired	Oral examination	25%
11.5 Laboratory	Project evaluation	Team presentation of the achieved projects	75%
11.6 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 $G = 0.25 \times E + 0.75 \times L$ Condition for obtaining credits: $G > 5.0$; where $E > 5.0$, $L > 5.0$			

Date of filling in:		Title Surname Name	Signature
02.06.2026	Lecturer	PhD. Eng. Ancuța Maria MĂGUREAN	
	Teachers in charge of application	PhD. Eng. Ancuța Maria MĂGUREAN	

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	