

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	16.00

2. Data about the subject

2.1	Subject name	Energy Management Tools and Programs for Regenerative Cities					
2.2	Course responsible/lecturer	Prof. Dr. Eng. Math. Dan D. MICU					
2.3	Teachers in charge of seminars	Lecturer Dr. Eng. Andrei CECLAN					
2.4	Year of study	II	2.5 Semester	I	2.6 Assessment		C
2.7	Subject category						DS
							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											18
(d) Tutoring											6
(e) Exams and tests											3
(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, electrotechnics, thermotechnics, buildings and renewable energy sources.
4.2	Competence	Electrical, gas, thermal, water and water sewage installations.

5. Requirements (where appropriate)

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

Professional competences	The ability to use specific energy analytics instrumentation and to manage on both energy use and generation at buildings level and local regenerative communities level, on different energy users and energy carriers.
	The ability to elaborate energy efficiency action plans and programs, energy management actions to be put in practice at buildings, utilities infrastructure and local communities level.
Cross competences	The ability to have an enhanced understanding of the energy impact on the local public utility services, buildings and their interaction in the regenerative cities.
	The ability to identify and foster opportunities and detail energy efficiency and energy management solutions.

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

7.1	General objective	Evidenced based knowledge transfer and case study-based experiences regarding the energy management in both (non) regenerative cities, to empower the participants to act as local Energy Managers.
7.2	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.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
Course 1 Introduction 1. The actual local energy context of the cities 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	2	Debates on available for the students materials and contents. Sessions of questions and answers. Case studies presentations. Use of online interactive instruments –	
Course 2	2		

<p>2. Opportunities, responsibility, collaboration, vision</p> <p>2.1. Energy cooperation and energy islands</p> <p>2.2. Paradigm shift in the public utility companies – energy, water and transportation</p> <p>2.3. Financing schemes and how to access them on energy projects</p> <p>2.4. Support and regulation authorities – paradigm shift: ANRE, ANRSC, Ministry of Development, State Construction Inspectorate, Sustainable Development Department – Romanian government, Ministry of Economy, Energy and Business Environment</p> <p>2.5. The energy audit and the effective implementation of the proposed action plan</p> <p>2.6. The local energy manager role</p> <p>2.7. The ISO 50001 Energy Management system</p> <p>2.8. Measurement and verification tools and protocol</p> <p>3. Legal frame</p> <p>3.1. European and national legislation regarding energy</p> <p>3.2. Strategies, action plans and energy programs</p> <p>3.3. Design themes and procurement documentation</p> <p>3.4. Energy performance contracting</p> <p>3.5. Public-private partnership</p>		<p>mentimeter – use of power point presentations and board writing Practical examples of energy analytics tools.</p>	
<p>Course 3</p> <p>4. Instruction, education and behavioral change</p> <p>4.1. Guide for the local decision maker in the cities</p> <p>4.2. Professional uplift of the administrative staff</p> <p>4.3. Campaigns for instruction, education and behavioral change</p> <p>4.4. Updates for the professionals</p> <p>4.5. Maintenance and exploitation</p> <p>5. Energy poverty approach</p> <p>5.1. Energy poverty at the users level</p> <p>5.2. Energy poverty at the generation and district heating level</p> <p>5.3. Proposed action plan</p>	2		
<p>Course 4</p> <p>6. Technologies for energy efficiency and distributed generation</p> <p>6.1. Reduce the energy need first</p> <p>6.2. Energy efficiency of the processes</p> <p>6.3. Local distributed generation</p> <p>6.4. Energy management in both generation and use</p> <p>6.5. Buildings deep renovation</p> <p>6.6. Preparation and launch of energy efficiency projects</p>	2		
<p>Course 5</p> <p>7. Added value through research, innovation and dissemination</p> <p>7.1. Energy infrastructure development</p> <p>7.2. High energy performance and increased interactive buildings</p> <p>7.3. Digital distributed energy services</p>	2		
<p>Course 6</p> <p>8. Added value through energy efficiency investments</p>	2		

8.1. Budgets, budgeting and cost-analysis applied in energy efficiency 8.2. Free money financing schemes in energy efficiency projects 8.3. ESCO investments 8.4. Energy efficiency funds and loans 8.5. Energy coaching in local communities 8.6. Marketing and sale of energy efficiency			
Course 7 9. Transforming through energy the local communities 9.1. Proposed vision and challenges 9.2. Sustainable local communities 9.3. Multiple core cities and rapid mobility 9.4. Energy cooperation and energy islands – revisited 9.5. Intelligent and high indoor comfort buildings 9.6. Local energy policies and programs	2		
Bibliography			
<ul style="list-style-type: none"> • 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. 			
8.2. Project	Number of hours	Teaching methods	Notes
Project meeting 1 List of proposed project titles and collection of student proposals Definition of the design themes Local communities energy balance calculation Status on the project preparation.	2	Debates on available for the students materials and contents. Sessions of questions and answers. Case studies presentations. Use of online interactive instruments – mentimeter – use of power point presentations and board writing	
Project meeting 2 Apply monitoring and targeting (M&T) tools Status on the project preparation.	2		
Project meeting 3 Apply energy analytics tools Status on the project preparation.	2		
Project meeting 4 Apply measurement and verification (M&V) tools for energy savings Status on the project preparation.	2		
Project meeting 5 Elaboration of an energy efficiency program Status on the project preparation.	2		

Project meeting 6 Preparation and implementation of an energy management plan Status on the project preparation.		Practical examples of energy analytics tools.	
Project meeting 7 Results integration in the project, using all the previous tools and programs Status on the project preparation.	2		
Bibliography			
<ul style="list-style-type: none"> • 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. 			

9. 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 consider 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 energy management in local communities.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Oral and written evaluation	Individual interviews and quiz	40%
10.5 Project	Project evaluation	Team presentation of the achieved projects	60%
10.6 Minimum standard of performance			
Participation at the courses – minimum 80% of the available time and full presence in the project meeting as conditions to enter to the exam.			
Evaluation grade (G); Course (C); Project (P); Calculation formula of the grade $G = 0.4 \times C + 0.6 \times P$			
Condition for obtaining credits: $G > 5.0$; where $C > 5.0$, $P > 5.0$.			

Date of filling in:		Title Surname Name	Signature
17.06.2024	Lecturer	Prof. Dr. Eng. Math. Dan D. MICU	
	Teachers in charge of application	Lecturer Dr. Eng. Andrei CECLAN	

Date of approval in the Department of Building Services Engineering	Head of department Assoc.Prof.PhD.Eng. Ciprian BACOȚIU
27.06.2024	
Date of approval in the Council of the Faculty of Building Services Engineering	Dean Assoc.Prof.PhD.Eng. Florin DOMNIȚA
27.06.2024	