

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	19.20

2. Data about the subject

2.1	Subject name	Control Systems for Smart Homes and Cities		
2.2	Course responsible/lecturer	Assoc. Prof. Eng. Calin Ciugudeanu, PhD		
2.3	Teachers in charge of seminars	Assoc. Prof. Eng. Calin Ciugudeanu, PhD Calin.ciugudeanu@insta.utcluj.ro		
2.4	Year of study	II	2.5 Semester	1
			2.6 Assessment	Colloquy
2.8	Subject category	Formative category		DA
		Optional		DO

3. Estimated total time

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

5. Requirements (where appropriate)

5.1	For the course	Classroom equipped with Video Projector - 21 December 1989 Blvd., no. 205.
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5.2	For the laboratory	Classroom equipped with Video Projector - 21 December 1989 Blvd., no. 108, 109.
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6. Specific competences

Professional competences	<p>Smart home control systems:</p> <ul style="list-style-type: none"> • identify the market available control systems solutions. • propose the most appropriate control gears • calculate a control system IRR internal rate of return <p>After graduating this subject, students will be able to:</p> <ul style="list-style-type: none"> • comparing different control system diagrams for smart houses • to analyze and propose the best technical and economical control system solutions for smart homes • to make an SRI - Smart Readiness Indicator assessment for a building
Cross competences	<ol style="list-style-type: none"> 1. Use of efficient and responsible work strategies, on-time, honest and personal engagement, based on principles, norms, and ethical professional values. 2. Knowledge of team efficient work, on different hierarchy stages. 3. 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	Acquiring competences in smart control systems
7.2	Specific objectives	<ul style="list-style-type: none"> • Overview of energy control systems in various infrastructures like street lighting or built environments • Knowledge of EU Directive 2018/844 of the Energy Performance of Buildings, Directive (2010/31/EU) - measures to establish an optional scheme for rating the smart readiness of buildings. • Finding the optimal control systems for smart homes and cities • The course also includes a project in which students must study an energy system of their own interest, from a systems and controls perspective.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Introduction: Concept and classification of control system	2	Video-Projector Teaching style based on the interactive teacher-student partnership; Presentation of case studies.	
2. Conventional Control Systems and Home Automation Control Systems	2		
3. Smart Control Centre	2		
4. Home Security Control Systems	2		
5. Smart lighting Management	2		
6. Room Climate Control Systems	2		
7. Shading Control Systems	2		

Bibliography

1. N C Jagan, "Control Systems", BS Publications, 1st Edition, 2007.
2. A Anand Kumar, "Control Systems", PHI Learning, 1st Edition, 2007.
3. Schneider Electric, Manualul instalațiilor electrice, 2007;
4. <https://www.se.com/ro/ro/work/products/building-automation-and-control/>
5. <https://www.researchgate.net/>
6. <https://www.electrical4u.com/>

8.2. Laboratory	Number of hours	Teaching methods	Notes
1. Understanding the Control Systems for Smart Homes	2	Modeling execution, computer exercises, group project	
2. Proposing a Smart Home Control System Concept - groups of four students	2		
3. Detailed Design and Utilisation Instructions	4		
4. Smart Readiness Indicator – SRI calculation	2		
5. Concept Presentation	4		

Bibliography

1. G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2013.
2. D. Callaway and I. Hiskens, "Achieving controllability of electric loads," Proceedings of the IEEE, vol. 99, no. 1, pp. 184 –199, jan. 2011.
3. Schneider Electric, Manualul instalațiilor electrice, 2007;
4. <https://www.se.com/ro/ro/work/products/building-automation-and-control/>
5. DialuxEvo software free download at www.dial.de

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

The competences achieved are necessary in the field of electrical design of the future urban electrical infrastructures. The demands of the energetic 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	Technical content, word count, structure and critical analysis;	Final report grade	60%
10.5 Laboratory	Technical content, presentation and communication skills;	class activity, assignments, presentation grade	40%
10.6 Minimum standard of performance			
5 points out of 10 total points (5 min/10 max)			

Date of filling in:		Title Surname Name	Signature
21.06.2024	Lecturer	Assoc. Prof. Eng. Calin Ciugudeanu, PhD	
	Teachers in charge of application	Assoc. Prof. Eng. Calin Ciugudeanu, PhD	

Date of approval in the Department of Building Services
Engineering

27.06.2024

Head of department
Assoc.Prof.PhD.Eng. Ciprian BACOȚIU

Date of approval in the Council of the Faculty of Building
Services Engineering

27.06.2024

Dean
Assoc.Prof.PhD.Eng. Florin DOMNIȚA