

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	Professional practice 4	Subject code	22.00
2.2	Course responsible/lecturer	-		
2.3	Teachers in charge with professional practice	Scientific advisor		
2.4	Year of study	II	2.5 Semester	II
2.6	Assessment	Verification		
2.7	Subject category	Formative category	DS	
		Optional	DOB	

3. Estimated total time

3.1	Number of hours per week	14	of which	3.2 Course		3.3 Seminar		3.3 Laboratory		3.3 Project	14
3.4	Total hours in the curriculum	196	of which	3.5 Course		3.6 Seminar		3.6 Laboratory		3.6 Project	196
3.7	Individual study:										
	(a) Exams and tests										2
	(b) Manual, lecture material and notes, bibliography										28
	(c) Supplementary study in the library, online and in the field										20
	(d) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										16
	(e) Tutoring										-
	(f) Other activities										-
3.8	Total hours of individual study (sum (3.7(a)...3.7(f)))					54					
3.9	Total hours per semester (3.4+3.8)					250					
3.10	Number of credit points					10					

4. Pre-requisites (where appropriate)

4.1	Curriculum	Bachelor's degree in one of the following fields: - building services engineering; - civil engineering; - architecture; - other related specializations.
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the development of professional practice	

6. Specific competences

Professional competences	CP1 – perform project management CP2 – synthesizes information CP7 – lead a team in water management CP8 – compares contractors' offers CP9 – apply health and safety standards CP12 – use measurement instruments CP16 – measure parts of manufactured products CP18 – perform pipeline routing studies CP22 – detect flaws in pipeline infrastructure CP24 – use CAD software CP26 – manage contracts CP27 – ensure compliance with purchasing and contracting regulations
Cross competences	CT1 – collaborating in teams and networks CT2 – thinks holistically CT3 – dealing with problems CT4 – respects the diversity of values and cultural norms

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. CP7 – Has in-depth knowledge of integrated water resource management principles in the urban environment, treatment and distribution technologies, European regulations, and methodologies for coordinating interdisciplinary teams in water infrastructure projects. CP8 – Has in-depth knowledge of public and private procurement procedures, bid evaluation criteria (price, quality, deadline, experience, warranties), tender documentation (specifications, data sheets), applicable legislation (European directives), and bid comparison and analysis techniques (evaluation matrix, scoring, weighting coefficients). CP9 – Knows health and safety standards and procedures specific to urban infrastructure works (pipelines, pumping stations, urban construction sites), occupational protection norms, and emergency intervention procedures in the urban environment. CP12 – Knows measurement instruments used in urban infrastructure monitoring (flow meters, pressure sensors, water quality probes), operating principles, and calibration procedures. CP16 – Knows measurement instruments used in manufacturing and quality control of pipeline and installation components (calipers, micrometers, wall thickness gauges, hydrostatic testing equipment), tolerances, and technical specifications. CP18 – Knows route analysis methodologies for urban pipelines, decision factors (geotechnics, environment, costs, social impact, coordination with other utilities), and regulations regarding network placement in public spaces. CP22 – Knows urban pipeline failure modes (corrosion, cracks, assembly errors, settling, leaks), detection methods (visual inspection, video cameras, acoustic sensors, pressure tests), and integrity assessment procedures. CP24 – Has in-depth knowledge of CAD and BIM software used in urban infrastructure design (Revit), advanced functionalities (3D modeling), and representation standards. CP26 – Has in-depth knowledge of public and private procurement legislation, structure of design and execution contracts for urban infrastructure, specific contractual clauses, billing procedures, payment mechanisms, and claims management. CP27 – Has in-depth knowledge of the national and European legal framework for public procurement (European directives), award procedures, selection criteria, and tender documentation specific to urban infrastructure projects.
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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. CP7 – Coordinates technical teams in urban water management projects (distribution networks, sewerage systems, treatment plants, sustainable drainage solutions), sets clear objectives and tasks, monitors progress, provides constructive feedback, ensures effective communication between specialties (hydraulic engineering, environment, urban planning) and with local authorities. CP8 – Analyzes and compares bids received from contractors for urban infrastructure projects, verifies compliance with tender requirements, applies predefined evaluation criteria (price, quality, deadline, warranties), calculates final scores, develops comparative evaluation reports, and formulates award recommendations, respecting transparency and non-discrimination. CP9 – Correctly uses individual and collective protective equipment, respects safe working procedures on urban construction sites, applies accident prevention measures specific to pipeline and network works, identifies and reports dangerous situations in public spaces. CP12 – Selects the appropriate instrument for required measurements (flow rates, pressures, water quality, spatial positioning), correctly uses it in field conditions, interprets measured values, and records data in urban monitoring systems. CP16 – Correctly uses measurement instruments to verify pipeline and installation components, records values and compares with technical specifications, identifies deviations and proposes adjustments, completes quality control documents. CP18 – Collects and analyzes geotechnical, environmental, and urban planning data for pipeline routes, evaluates alternative routes for urban pipelines, identifies constraints (properties, protected sites, existing infrastructure), develops comparative studies, and recommends the optimal route from a technical, economic, and environmental perspective. CP22 – Uses visual and instrumental methods to identify defects in urban pipeline networks, locates critical points, estimates causes and severity of defects, prioritizes interventions, and develops diagnostic reports for maintenance teams. CP24 – Uses CAD/BIM software for designing urban pipeline networks, creates integrated 3D models, develops layout plans, longitudinal profiles, and cross-sections, coordinates projects with other utilities, extracts material and quantity lists, collaborates in common data environments (CDE). CP26 – Administers complex contracts for urban infrastructure projects, monitors execution of contractual obligations, manages payment certificates and invoices, records and analyzes claims, prepares periodic reports for beneficiaries and funders, manages contractual correspondence. CP27 – Ensures compliance of procurement and contracting processes with applicable regulations, develops tender documentation, participates in bid evaluation, verifies compliance with transparency and non-discrimination procedures, provides legal and administrative consulting to project teams.
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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. CP7 – Leads interdisciplinary teams in complex urban water management projects, assuming responsibility for team performance, for the quality of technical solutions, and for their integration into sustainable and regenerative urban development strategies. CP8 – Leads bid comparison processes for complex urban infrastructure projects, assuming responsibility for the correctness, objectivity, and transparency of the evaluation, for compliance with legal regulations, and for substantiating the award recommendation before the procurement committee and beneficiaries. CP9 – Assumes responsibility for personal and team safety during activities on urban construction sites, collaborates in maintaining a safe working environment and protecting the community, respecting regulations specific to works in public spaces. CP12 – Performs measurements responsibly in the urban environment, verifies instrument calibration and reports any deviations, assuming responsibility for data accuracy that underpins operation and maintenance decisions for infrastructure. CP16 – Performs measurements with precision and rigor, aware of the impact of tolerances on the quality and durability of pipeline systems, assuming responsibility for the conformity of components used in urban infrastructure. CP18 – Leads route studies for complex urban pipeline projects, assuming responsibility for choosing the optimal solution in the context of sustainable development, minimizing community impact, and integrating into regenerative urban strategies. CP22 – Performs systematic inspections of urban pipeline infrastructure, records findings, and promptly reports situations requiring urgent intervention, assuming responsibility for maintaining safety and continuity of community services. CP24 – Executes complex urban infrastructure projects using advanced CAD/BIM tools, assuming responsibility for model accuracy, coordination with other specialties, and compliance with standards and beneficiary requirements. CP26 – Autonomously manages large-scale contracts for urban infrastructure, assuming responsibility for administrative and financial correctness and compliance, for protecting the interests of the parties, and for efficient resolution of contractual issues in collaboration with technical and legal teams. CP27 – Leads procurement processes for complex urban infrastructure projects, assuming responsibility for the legality and transparency of procedures, for compliance with national and European regulations, and for protecting the beneficiary's interests against potential challenges.
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8. Discipline objectives (as results from the *key competences gained*)

8.1	General objective	Development of students' ability to apply in a practical and integrated manner the knowledge and skills acquired during the master's program, through the fourth advanced professional practice in the field of building services for regenerative cities. The practice aims to consolidate skills in project management, contract administration, technical analysis, and the use of specific tools in real professional contexts, to successfully complete the dissertation project.
8.2	Specific objectives	Consolidation of skills in planning, monitoring, and reporting the status of urban infrastructure projects, respecting deadlines and allocated budgets (CP1, CP8, CP26, CP27).

		• Refinement of the ability to critically analyze, synthesize, and structure complex information from multiple sources to support decision-making in urban planning (CP2, CP18, CP24). • Consolidation of practical skills in using measurement instruments, CAD/BIM software, and technical analysis methodologies specific to urban infrastructure (CP12, CP16, CP18, CP22, CP24). • Development of team coordination skills and compliance with health, safety, and environmental regulations during activities in the urban space (CP7, CP9, CP22). • Application of health and safety standards and procurement and contracting procedures in the context of urban infrastructure projects (CP8, CP9, CP26, CP27). • Consolidation of holistic and interdisciplinary thinking in addressing complex urban challenges, integrating knowledge from engineering, architecture, urban planning, and environmental sciences, in collaboration with all stakeholders and respecting cultural diversity (CP21, CT2, CT3, CT4). • Elaboration of the final professional practice report, demonstrating the ability to work autonomously, make responsible decisions, and present the results obtained in a coherent and well-argued manner, in view of finalizing the dissertation project (correlated with all CPs and CTs).
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9. Contents

9.1. Theme area	Number of hours	Teaching methods	Notes
Advanced building services - HVAC and water distribution			
nZeB Buildings			
Buildings and cities assessment			
Energy analysis of a building / city			
Urban network management			
Life cycle analysis			
Building services retrofit solutions			
Use of renewable energy sources			
Urban electrical infrastructure			
9.2. Applications	Number of hours	Teaching methods	Notes
Presentation of the topic of professional practice	4	Exposure, applications	
The state of knowledge at national and international level	24		
Calculation methodology used nationally and internationally	24		
Carrying out measurements, evaluations, technical analyzes, etc. using field-specific equipment and devices	70		
Preparation of the professional practice report based on the results obtained and the calculation methodology used	72		
Deliver and present the elaborated project	2		

Bibliography

1. Course notes related to the disciplines studied in the first, second and third semesters of the master's cycle.
2. Bibliographic sources specific to the project / practice topic.
3. Online and electronic documentation sources;
4. Legislation specific to each topic.

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

The gained knowledge will be necessary for employees that will work in building services engineering design, execution, project management and energy assessment of buildings / cities.

11. Evaluation

Activity type	11.1 Assessment criteria	11.2 Assessment methods (and evaluation form: continuous/summative)	11.3 Weight in the final grade
11.4 Course	-		
11.5 Applications	Knowledge of the current stage of the topic (note A); Evaluation of the practical results obtained (note B); Supporting the practice report (note C).	Verification consists of assessing theoretical and practical knowledge (2 hours)	50% project 50% verification
11.6 Minimum standard of performance			
Grade components: $G = 0.3 \cdot A + 0.5 \cdot B + 0.2 \cdot C$; Condition for obtaining credits: $G > 5$; $A > 5$; $B > 5$; $C > 5$.			
Date of filling in: 10.05.2026		Title Surname Name	Signature
	Lecturer		
	Teachers in charge of application	Assoc.Prof.PhD.Eng Calin Ciugudeanu	
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			