

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Structuri din beton armat Reinforced Concrete Structures						
2.1.2. Course code	CE401						
2.2 Lecture instructor(s)	Assoc.Prof. Petru Mihai, PhD						
2.3 Seminar/laboratory/project/practical session instructor(s)	Assist.Prof. Ion Sococol, PhD						
2.4 Year of study ²	4	2.5 Semester ³	1	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DI

3. Estimated total time (hours per semester)

3.1 Number of hours per week	5	3.2 lecture	3	3.3a seminar		3.3b laboratory		3.3c project	2	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	70	3.5 lecture	42	3.6a seminar		3.6b laboratory		3.6c project	28	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										18	
Additional research in the library, on specialised electronic platforms, and in the field										17	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										20	
Assessment ⁸										4	
Other activities:											
3.7 Total number of individual study hours ⁹	55										
3.8 Total number of hours per semester ¹⁰	125										
3.9 Number of ECTS credits	5										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	-
4.2 Learning outcomes prerequisites	-

5. Requirements

5.1 for the lecture ¹²	Video projector, blackboard, documentaries, etc. Students will comply with the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iasi.
5.2 for the seminar / laboratory / project ¹³	Computing technique, software packages, collections of standards and norms, etc. The deadline for handing over the project is set by the teacher.

6. General objective of the course

In this discipline, the main types of elements and structures made of reinforced concrete are presented, the advantages and disadvantages of each structural solution, the design principles, the design features and the way of making the execution details are detailed. After completing the course, students will be able to identify types of concrete elements and structures, choose the most rational solution for a given specific situation and design reinforced concrete elements and structures.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - identifies the types of reinforced concrete elements and structures and explains the advantages and disadvantages of each of them; - analyses the elements and structures made of reinforced concrete, using specific calculation methods and interprets the results obtained, in order to identify the optimal solution; - explains the constructive composition of the various elements and the reinforced concrete structure, in order to draw up and use the specific technical documentation.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - establishes the most rational shape of the concrete element for a given specific situation; - uses digital tools for modelling concrete elements and structures; - select and apply concepts, principles and methods for carrying out structural calculation; - dimensions and checks construction elements, in order to realize the written pieces within the technical projects; - carries out the specific execution details for the concrete elements and structures
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students on TUIASI educational platform. The presentations contain images, diagrams and movies, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modelling), as well as action-based methods, such as exercises, practical activities, problem-solving).

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Particularities of the concrete behaviour: Features of the concrete behaviour under loads; Methods to improve the concrete behaviour; Classification of the concrete elements and structures. Advantages and disadvantages of concrete structures; Conceiving and designing of structures. Basic principles.	Interactive lecture, debates, explanations	3 hours
9.1.2. Concrete linear elements. Conceiving, design, making-up details: Monolithic girders. Precast girders. Singular columns. Columns in structures. Arches; Trusses. Frame girders. Composed linear elements (mixed).		12 hours
9.1.3. Concrete surface elements. Conceiving, design, making-up details: Monolith and precast slabs. Stairs. Walls. Deep beams. Thin shells.		10 hours
9.1.4. Floors. Conceiving, design, making-up details: Girder floors. Beam girder floors. Coffered floors. Ribbed floors. Mushroom floors. Flat slab floors. Mixed floors.		5 hours
9.1.5. Concrete structures. Conceiving, design, making-up details: Ground floor frame structures. Storied frame structures. Structures with walls. Frame-structural walls mixed structures. Other structural systems (structures with flat slab floors, structures with thin		12 hours

shells, central core structures, tube in tube structures, suspended structures, mixed structures).		
Reading list for the lecture: 1. Mihai P. – Reinforced Concrete Structures – lecture notes 2025, TUIASI educational platform, https://edu.tuiasi.ro/course/view.php?id=2032 . 2. Bawden E. – Reinforced Concrete Structures: Analysis, Drawing and Design. Willford Press, 2023. 3. Robinson S. – Reinforced Concrete: Design, Performance and Applications. Nova Publishers, 2017. 4. Postelnicu T. – Proiectarea structurilor de beton armat în zone seismice, vol. I, II și III, Ed. MarLink, București, 2012. 5. Park R., Paulay, T. – Reinforced Concrete Structures, Wiley & Sons Inc., 1975. 6. Paulay T., Bachmann H., Moser K. – Proiectarea structurilor de beton armat la acțiuni seismice, Ed. Tehnică, București, 1997. 7. Nawy E.G. – Concrete Construction Engineering – CRC Press, 2008. 8. Nilson A. H., Winter G. – Design of Concrete Structures, McGraw-Hill, 1991.		
9.2 Project	Work methods ¹⁸	Time allocation
9.2.1. Table of contents and introductory elements	Teaching material, blackboard presentation, use of video projector and finite element calculation programs	1 hour
9.2.2. Preliminary design of structural elements, evaluation of gravitational and seismic loads		3 hours
9.2.3. Modelling and verification of the structural system in a specialized numerical analysis program		2 hours
9.2.4. Verification of lateral stiffness and deformation capacity of the structural system, adjusting of column and wall cross-sections, optimal plastic mechanism		1 hour
9.2.5. Design of frame beams		2 hours
9.2.6. Design of frame columns and nodes		3 hours
9.2.7. Design of coupling beams		2 hours
9.2.8. Design of coupled walls		2 hours
9.2.9. Drawings for beams, columns, coupling beams and coupled walls		8 hours
Reading list for the project: 1. Sococol I., Reinforced Concrete Structures – project notes 2025, TUIASI educational platform, https://edu.tuiasi.ro/course/view.php?id=2032 . 2. SR EN 1992-1-1/2024 – Design of concrete structures. 3. P100-1/2013 – Cod de proiectare seismică. Partea 1 – Prevederi de proiectare pentru clădiri. 4. NP 007-2025 – Cod de proiectare pentru structuri în cadre de beton armat. 5. CR 0-2012 – Cod de proiectare. Bazele proiectării construcțiilor. 6. CR 1-1-3/2012 – Cod de proiectare. Evaluarea acțiunii zăpezii asupra construcțiilor.		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	0%	50%
		- formative assessment test (tests during the semester)	0%	
		- summative assessment test (final assessment)	100%	
10.5 Project	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva		50%
10.6 Passing requirements				

Identification of the types of reinforced concrete elements and structures, designing of structural concrete elements subjected to standard loads using specialized software, establishing the constructive composition for reinforced concrete elements and structures.

The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.

Date of completion: September 2025

Lecture instructor:

Associate Professor Petru Mihai, PhD

Seminar instructor:

Assistant Professor Ion Sococol, PhD

Date of departmental approval:
September 2025

Head of Department,
Lecturer Cătălin ONUȚU, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS
Academic year 2025-2026

Dean,
Professor Andrei Burlacu, PhD

1. Programme information

1.1 Higher Education Institution	„Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Departament	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6 Study programme	Inginerie Civilă (în limba engleză) / Civil Engineering - ICE

2. Course information

2.1.1 Course title (in Romanian) (in English, according to the Diploma suppliment)	Structuri metalice Steel Structures						
2.1.2 Course code	CE402						
2.1.3 Lecture instructor(s)	Senior lecturer Georgeta Băetu, PhD						
2.1.4. Seminar / laboratory/ project/ practical session instructor(s)	Senior lecturer Georgeta Băetu, PhD						
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assesment method ⁴	E	2.7 Course type ⁵	DS

3. Estimated total time (hours per semester)

3.1 Number of hours per week	4	3.2 lectures	2	3.3a seminar		3.3b laboratory		3.3c project	2	3.3d practical sessions	
3.4 Total numbers of hours in the curriculum ⁶	56	din care 3.5 curs	28	3.6a seminar		3.6b laboratory		3.6c project	28	3.6.d	
Workload distribution ⁷									Nr. ore		
Study based on textbook, course materials, reading list and notes									24		
Additional research in the library, on specialised electronic platforms and in the field									24		
Preparation for seminars/ laboratory/ project session/ assignments/ papers / portofolios									21		
Assessment ⁸									14		
Exam ⁹									10		
3.7 Total number of individual study hours ⁹				69							
3.8 Total number of hours per semester ¹⁰				125							
3.9 Number of ECTS credits				5							

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not aplicable
4.2 Learning outcomes prerequisites	Elements of Steel Structures 1, 2; Strength of Materials 1,2; Statics of Constructions 1,2; Structural Dynamics; Theory of Elasticity and Plasticity; Descriptive Geometry; Engineering Graphics

5. Requirements

5.1 for the lecture ¹²	Blackboard, video projector, graphic tablet, specific teaching materials.
5.2 for the seminar / laboratory / project ¹³	Computer equipment, video projector, softwerw packages, graphic tablet. The deadlines for submitting the work are set by the lecturer, in the last week of the semester.

6. General objective of the course

The course will give understanding and knowledge about different types of steel structures – industrial steel buildings / multistorey steel structures, about different structural systems of steel structures and behaviour of steel structures under different types of loads. The students will be able to identify structural steel members (columns, girders, secondary beams, truss girders, purlins, wall girts, crane rails, etc.) and understand the design principles

of steel structures, according to EN 1993 – 1-1 and P100-1, for both Ultimate Limit State and Serviceability Limit State. During the project class, the students will use design codes to design the primary and secondary steel structures of a steel structure warehouse, including purlins, truss girder, columns and the bolted and welded connections of steel members.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - explains the mechanical properties, characteristics and limitations of structural steel; - describes the primary and secondary structures of a steel structure; - evaluates the loads on the transversal frame of a steel structure; - defines the types of bracing and the role they play in a single storey steel structure; - use the design codes and standards in order to design the internal steel members and to ensure the safety and performance requirements of steel structures (strength and stability); - performs gravimetric calculations and interprets complexometric titrations; - explain the advantages of using structural steel for structures built in seismic areas.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - uses design methods and softwares to sizing load-bearing elements and connections for ULS and SLS requirements; - apply the principles of strength of materials in the design of structural elements; - calculates hinged and rigid connections of steel members;
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modeling), as well as action-based methods, such as exercises, practical activities, problem-solving).

9. Content

9. 1. Lecture ¹⁵	Metode de predare ¹²	Observații
<p>9.1.1. PRINCIPLES OF GLOBAL ANALYSIS OF THE STEEL STRUCTURES Behaviour of steel structures under static loading; elastic linear and non-linear analysis, plastic analysis of frames made of steel members, rigid and braced frames, non-sway and sway frames. 1.2 Imperfections of steel elements and frames considered in the global analysis.</p>	Interactive lecture, debates, explanations, case study	2 hours
<p>9.1.2. SINGLE STOREY STEEL FRAMES – INDUSTRIAL STRUCTURES: Classification, elements of the steel industrial buildings, structural steel systems and elements; the bracing system; 8.1.2.2 Non-structural steel components, prefabricated: walling and roofing steel systems, purlins in different design versions-hot rolled, other sectional sectional (Castella beams, with brackets and hangers, lattice girders); 8.1.2.3 Design of the roof purlins: loads and combinations, static schemes, sizing and verification criteria in ultimate limit states. Role and design of sag rods. Details of fixing the purlins on the top of the roof truss or rafter; 8.1.2.4 Runways for cranes and steel crane girders. Solutions for design and specific details for different loading capacities (pay loads). Actions from crane girders and groups of actions in different design combinations. Verifications of the steel crane girders in the ultimate limit states. Particulars of design to</p>	Interactive lecture, debates, explanations, case study	12 hours

<p>fatigue of the crane girders; 8.1.2.5 Design of the transversal frame of industrial buildings made of steel truss and columns with or without cranes: loads, loading schemes and principles of simplified static computation. Column to truss connections and other important details. Columns of the industrial buildings: sections, foundations design; 8.1.2.6 Portal frames (rigid frames). Static systems, columns and rafters made of rolled sections or build up welded sections. Tapered sections and haunched structural joints. Curved structural connections: principles of design and verifications of strength and stability.</p>		
<p>9.1.3. MULTI-STOREY STEEL FRAMED STRUCTURES: Short history. Representative high structures around the world, in plan shapes and elevation, specific problems in the design of multi storey steel structures, structural solutions: frames with rigid joints, articulated joints and vertical bracing, other structural systems; Rigidity of the multi storey steel structures. Bracing systems. Imperfections of the multi-storey frames; Actions and groups of actions. Equivalent plane frames and loading schemes on plane frames. Vertical and horizontal actions. Wind and seismic actions on multi-storey structures. Internal forces and moments in the columns and girders-principles of determination for frames with rigid connections and hinged connections and vertical bracing systems; Design criteria in limit state of serviceability: maximum translations, static and dynamic, vibrations. Anti-seismic design criteria for multi-storey steel structures; Constructive solutions and details for the structural and non-structural elements: columns, girders, floors, braces; Structural beam to column connections: classification and design principles in elastic and in plastic. Columns foundations; Protection against fire of multi-storey steel structures: behaviour of the steel members to high temperatures action. Methods and systems to protect to fire action</p>	<p>Interactive lecture, debates, explanations, case study</p>	<p>8 hours</p>
<p>9.1.4. STEEL FRAMES WITH ARCHES: Destination of the steel arches, structural systems adopted for steel arched structures, sections made of hot rolled elements or laced. Details of arches: spring and apex details; Actions on arches; wind and snow action; arches instability and verifications; second order effects; Constructive details of steel arches: purlins and ribs in the roof plane. Bracing systems and design to wind action of the braces. Temperature effects on the steel arches.</p>	<p>Interactive lecture, debates, explanations, case study</p>	<p>2 hours</p>
<p>9.1.5. BUILDING THE STEEL FRAMED STRUCTURES: Assambling prefabricated elements in workshop, Mounting at site – scaffolding, erection and connecting parts of the constructions; fixing the shuttering and roofing</p>	<p>Interactive lecture, debates, explanations, case study</p>	<p>2 hours</p>
<p>Reading list for the lecture</p> <ol style="list-style-type: none"> 1. Baetu G. – Lectures notes, 2025, Google classroom platform 2. Moga C., Nagy Z., (2024) – <i>Construcții industriale – Hale multifuncționale și Construcții tehnologice</i>, Ed. UTPRESS Cluj-Napoca; 3. Moga C., Nagy Z., (2023) – <i>Construcții metalice – Structuri</i>, Ed. UTPRESS Cluj-Napoca; 4. Axinte, El., Leiba, M., Axinte, A., Rosca, V., Telesman, C., Baetu, G., (2015), <i>Coroziunea și protecția anticorozivă a structurilor metalice</i>, Editura Soc. Acad. “Matei – Teiu Botez”, Iași, 2015, ISBN 978-606-582-083-8 5. Jack, C., McCormac, Stephen, F., Cernack (2012) <i>Structural Steel Design</i>, Fifth Edition, Pearson Education Limited, Essex CM202JE, England, ISBN 10:0-273-75135-2, ISBN 13:978-0-273-751135-9 6. Charles, G., Salmon, John, E. Johnson, Faris, A., Malhas, (2012), <i>Steel Structures-Design and Behavior</i>, Pearson International Edition, New Jersey, USA, ISBN-10: 0-13-206119-8, ISBN-13: 978-0-13-206119-3 7. Subramanian, N., (2010), <i>Steel Structures-Design and Practice</i>, Oxford University Press, New Delhi, India, ISBN 10: 0-19-806881-6, ISBN 13: 978-0-19-806881-5 8. Voiculescu D. (2010) – <i>Structuri metalice înalte</i>, Ed. Matrix Rom, București; 9. Tamboli, A.R., (2010), <i>Handbook of Structural Steel Connections Design and Details</i>, Second Edition, McGrawHill New York, ISBN 978-0-07-155005-5 10. Turcanu R. C., (2008) <i>Designul seismic al structurilor înalte având structură metalică în cadre contravântuite -studiu folosind metoda spectrului de capacitate</i>, Ed. Matrix Rom, București; 11. EN 1990 -2006 Eurocode: <i>Basis of structural design</i> 12. EN 1991-1-1-2006 Eurocode 1: <i>Actions on structures- Part 1-1: General actions-Densities, self-weight, imposed loads for buildings</i> 13. P 100-2013-<i>Normativ pentru proiectarea la acțiunea seismului</i> 14. EN 1993-1-5: 2008: <i>Design of Steel Structures-Part 1-5: Plated structural elements</i> 15. EN 1991-2-2006: Eurocode 1: <i>Actions on structures-Part 1-2: Actions on structures exposed to fire</i> 16. EN 1993-1-1-2006 Eurocode 3: <i>Design of steel structures – Part 1-1: General rules and rules for buildings</i> 17. EN 1993-1-8-2006 Eurocode 3: <i>Design of steel structures-Part 1-8:Design of joints</i> 18. EN 1998-2006 Eurocode 8: <i>Design of structures for earthquake resistance</i> 		
<p>9.2c Project Design of an industrial building with steel structure</p>	<p>Work methods ¹⁸</p>	<p>Allocated time</p>

Configuration of the structure: one span steel structure, constructive solutions for the roof truss and columns, transversal section and layout of the bracing system. Personal data.	Case study, demonstration, exercise, results interpretation, individual work	28 hours
Clading system: sheeting, purlins, sag-rods. Actions and groups of actions on the purlins		
Design of purlins: sizing and verifications. Sag-rods design and layout of prefabricated units of purlins in the roof (details of supports and continuity connections).		
Actions and groups of actions on the transversal frame Load evaluation and loads combo for ULS and SLS.		
Static computation of the transversal frame Numerical analysis of the transversal frame using a FEM software		
Determination of the axial forces in the members of the truss considering the frame effect (redundant force).		
Design and verifications of the truss members. Stiffness verifications.		
Design of connections between internal members of truss girder (welded and bolted connections).		
Layout of the roof truss girder (scale 1:20, details 1:10)		
Determination of the design internal forces and bending moments in the column.		
Verifications of strength and stability of the column.		
Design of the capital and the base of the column.		
Reading list for the project: 1. E. Axinte, V.E. Roșca, E.C. Teleman, S. Melenciuc, (2012) <i>Elemente din oțel pentru construcții, vol 3</i> , Editura Societății Academice “Matei-Teiu Botez” Iași, 2012, ISBN 978-606-582-021-0, format 17/24, 174 pg. 2. V. E. Roșca, E. Axinte, E.C.Teleman, S.C. Melenciuc, G. Văsiș, (2013), <i>Elemente de calcul pentru structuri din oțel, Proiectarea unei platforme metalice după SR EN 1993</i> , Ed. Soc. Acad. “Matei Teiu Botez”, 2013, ISBN 978-606-582-026-5, format 17/24, 395 pg. 3. EN 1991-1-1-2007 Eurocode 1: Actions on structures- Part 1-1: General actions-Densities, self-weight, imposed for buildings 4. EN 1991-1-3-2007 Eurocode 1: Actions on structures- Part 1-3: Snow actions for buildings 5. EN 1991-1-4-2007 Eurocode 1: Actions on structures- Part 1-4: Wind actions for buildings 6. EN 1993-1-1-2007 Eurocode 3: Design of steel structures – Part 1–1: General rules and rules for buildings 7. EN 1993-1-8-2007 Eurocode 3: Design of steel structures-Part 1-8: Design of joints 8. EN 1991-1-3-2007 Eurocode 1: Actions on structures- Part 1-1 9. P 100-2013-Normativ pentru proiectarea la acțiunea seismului 10. Baetu G. - Project Design - Stages for design (doc) file – Google Classroom platform		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	%	60% (minim 5)
		- formative assessment test (tests during the semester)	%	
		- summative assessment test (final assessment)	% 100% (minim 5)	
10.5c Project	Participation in project activities, ability to conduct research/ documentation, and	- project work - project completion - project viva		40% (minim 5)

	application of knowledge in project work		
10.6 Passing requirements The students must be able to design steel structures and steel connections, to verify steel members to ULS and SLS according to EN 1993-1-1, to choose the most suitable solution for the bracing system of the roof. The students must be able to present a final report with written notes and drawings for a single storey steel structure based on given conditions regarding user demands.			
The final grade for course is determined by taking into account the score and weighting assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Lecture instructor(s): Senior lecturer Georgeta Băetu, PhD

Seminar/laboratory/project/practical session instructor(s): Senior lecturer Georgeta Băetu, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior lecturer Ioana Sorina ENTUC, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standardde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Industrial Buildings Construcții Industriale Industrial Constructions						
2.1.2. Course code	CE403						
2.2 Lecture instructor(s)	Associate Professor Gabriel OPRÎȘAN, PhD						
2.3 Seminar/laboratory/project/practical session instructor(s)	Associate Professor Gabriel OPRÎȘAN, PhD						
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DOB

3. Estimated total time (hours per semester)

3.1 Number of hours per week	4	3.2 lecture	2	3.3a seminar		3.3b laboratory		3.3c project	2	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	56	3.5 lecture	28	3.6a seminar		3.6b laboratory		3.6c project	28	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										14	
Additional research in the library, on specialised electronic platforms, and in the field										12	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										18	
Assessment ⁸										6	
Other activities:											
3.7 Total number of individual study hours ⁹										44	
3.8 Total number of hours per semester ¹⁰										100	
3.9 Number of ECTS credits										4	

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not required
4.2 Learning outcomes prerequisites	Algebra, Mathematical analysis, Strength of materials, Statics, Reinforced and prestressed concrete

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> • Blackboard, video projector, specific didactic materials, Google meet & Microsoft Teams transmission of courses and bibliography. • Students will comply with the Code of Student Rights and Obligations and the Regulations stipulated by the Charter of the "Gheorghe Asachi" Technical University of Iasi.
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> • Computing technique, software packages, experimental stands, models, etc. • The deadline for submitting the project for grading is set by the holder in the last week of the semester.

6. General objective of the course

In this discipline you will learn about the form in plan and in elevation of industrial constructions, the correlation of industrial constructions with the technological flow, the factors that influence the design of industrial constructions.

These aspects are the integral part of the design and execution of industrial constructions. The theoretical part of industrial construction will give you an overview of structural systems and the envelope. An important category of industrial constructions is warehouses, bunkers, silos, industrial chimneys and cooling towers. You will learn what standards underlie the design of these industrial structures and how they are designed using finite element analysis (FEA) or classical calculation methods. Visualization of industrial constructions will be done in 3D or 2D, drawing plans and details will be done with specific programs presented in the course and project.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - explain what are the structural and cladding elements of the industrial constructions; - compare the types of industrial constructions according to the materials used; - evaluates the specific loads to industrial constructions; - defines the general properties of modular coordination in industrial constructions, uses the preliminary design of the cross sections for the structural elements; - describes, calculates and details the joints between the elements; - defines the technological flow and frames it in the volumetry of the industrial construction; - uses the static and dynamic calculation of the structures for the industrial constructions with specific loads (wind, snow, cranes, trolley start/braking, temperature variations, seismic action, floods); - defines the shape in plan and in elevation of the structures for the industrial constructions; - applies structural analysis and finite element analysis (FEA) to determine the sectional efforts, to design and details the foundations.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - uses digital tools to present project stages; - plans the design of the industrial constructions and understands the stages of calculation and graphic representation of structures for industrial constructions; - operates with programs dedicated to structural design and detailing in plans and sections; - critically evaluates the processing and post-processing of the data entered in the programs, which used finite elements method.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects the principles, norms and values of ethics in the correct and on-time execution of professional tasks, by approaching a rigorous, efficient and responsible work strategy in making decisions to solve problems; - integrates into the work group and applies communication techniques and effective work in multidisciplinary teams, on various hierarchical levels; - they are permanently informed and documented in their own field of activity through the appropriate use of effective lifelong learning methods and techniques; - prepares the industrial construction project in the field of civil engineering with calculations and plans.

8. Teaching strategies

Participatory lectures and debates based on Power Point presentations made available to students in electronic format are used in the teaching activity. Presentations contain images, construction details and plans, so that the information is easy to understand and assimilate. Each course begins with a brief recapitulation of the concepts covered in the previous course.

The teaching method is also based on discovery learning models facilitated by direct and indirect exploration of reality (experiment, demonstration, modelling), but also on action-based methods, such as exercise, practical activities, case study analysis, problem solving and project stages.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Introduction <ul style="list-style-type: none"> • An overview on industrial buildings • Industrial buildings in Romania, past and present Why studying industrial buildings in a civil engineering program	Interactive lecture, debates, explanations	2 hours
9.1.2. Basics of industrial buildings <ul style="list-style-type: none"> • Factors influencing the design of industrial buildings. • Modular coordinates. 	Interactive lecture, debates, explanations	4 hours

Industrialization and prefabrication in construction industry. The exigencies of industrial construction		
9.1.3. Design of industrial buildings Ground floor industrial buildings: <ul style="list-style-type: none"> Types of structures, materials and specific elements; Partitioning of the industrial halls into transoms; Features on the relationship between structure and structural system; Actions, loads and specific grouping of structures; Highlighting the phenomenon of spatial framework; Multi-storey industrial buildings Types of structures, materials and specific elements; Features on the relationship between structure and structural system; Actions, loads and specific grouping of structures 	Interactive lecture, debates, explanations	4 hours
9.1.4. The envelope of the industrial constructions <ul style="list-style-type: none"> Industrial building walls: Concrete Walls; Autoclaved Concrete Walls; Masonry walls; Sandwich panels walls; Corrugated steel sheet walls. Industrial doors. Industrial windows. Roofs for industrial buildings. Skylights. Floors for industrial constructions 	Interactive lecture, debates, explanations	4 hours
9.1.5. Lighting and ventilation of the industrial buildings <ul style="list-style-type: none"> Natural lighting of industrial halls. Natural ventilation of industrial halls	Interactive lecture, debates, explanations	2 hours
9.1.6. Fire protection of industrial construction and security measures: Fire protection measures for reinforced concrete elements	Interactive lecture, debates, explanations	2 hours
9.1.7. Special Industrial Constructions General aspects of storage structures repositories. Deposits: Deposits for solids; Deposits for liquids and gases. Bunkers. Silos. Industrial Chimneys. Cooling towers	Interactive lecture, debates, explanations	6 hours
9.1.8. BIM for industrial construction. Parametric Design: Introduction to Computational Design and Parametric Design of Industrial Buildings, SketchUp in Building Information Modeling & Viz Pro for Parametric Modeling in SketchUp, Industrial Building Acoustics and Noise Control.	Interactive lecture, debates, explanations	4 hours
Reading list for the lecture: 1. Kiss Zoltan (2024) Structuri prefabricate de beton armat, Recomandări pentru alcătuirea constructivă și dimensionarea structurilor în cadre, Editura Abel. 2. Opreșan G., Munteanu Vl. (2023) Structuri Speciale, Editura Universității Tehnice “Gheorghe Asachi” din Iasi, ISBN 978-973-621-530-8. 3. Opreșan G., Ențuc I.S., Hudișteanu I. (2020) Clădiri cu funcțiuni speciale în mediu rural, Editura Politehniun, 2020, ISBN 978-973-621-492-9. 4. Emmitt S. (2019) Barry’s advanced construction of buildings, 4th ed. Wiley-Blackwell, 2019. 5. Allen E., Iano J. (2019) Fundamentals of building construction : materials and methods, 7th ed., Wiley, Hoboken, New Jersey. 6. Hudișteanu I., Taranu N., Isopescu D.N., Opreșan G., Entuc I.S. (2019) Structuri stratificate din lamele compozite armate cu fibre, Editura Politehniun, ISBN 978-973-621-486-8. 7. Weyer J., Baragano S. (2013) Industrial Building Planning and Design, Design Media Publishing Limited, 9789881566454. 8. Opreșan G., Entuc I., Țăranu N. (2006) Industrial Buildings, Ed. STEF, 216 p., ISBN 973-8961-71-8.2. 9. Boghian Vl. „Constructii industriale”, Vol.I , II, Ed. I.P. Iasi, 1989. 10. Stratton, M. (Ed.). (2000). Industrial Buildings: Conservation and Regeneration (1st ed.). Taylor & Francis. https://doi.org/10.4324/9780203362471 11. Serbescu C., Taranu N., Pescaru V., (1987) Alcătuirea si calculul structurilor metalice pentru hale industriale”, Ed. Tehnica, București. 12. Grănescu M. (2006) Construcții Industriale, Editura AGIR, București. 13. Fisher B. (1994) Industrial buildings, AISC, Chicago. 14. ESDEP. European Steel Design Education Program. Lecture slides and video tapes sets. Institute of Steel Construction. UK. 2000. 15. Pop M. (1985) Construcții industriale, I.P. Cluj-Napoca. 16. Popescu V. (1974) Construcții Industriale, Ed. Didactică și Pedagogică București. 17. Riley M., Cotgrave A. (2014) Industrial and commercial building”3rd Ed., Basingstoke Palgrave Macmillan. 18. Cantrell B., Mekies A. (2018), Codify Parametric and Computational Design in Landscape Architecture, Routledge, N.Y. 19. Eastman C., Teicholz P., Sacks R., Liston K. (2018), BIM handbook : a guide to building information modeling for owners, managers, designers, engineers and contractors, 3rd ed. John Wiley & Sons, Hoboken, New Jersey.		

20. Schreyer A.(2013) Architectural Design with SketchUp, John Wiley & Sons, Inc., Hoboken, New Jersey.		
21.Lee P.J. (2020) Construction Documents Using SketchUp Pro 2020: A short project-based course to increase your effectiveness at using SketchUp and give you a truly professional approach to modelling, https://viewson.ie/wp-content/uploads/2020/03/CDSP_2020.15_FREE-SAMPLE.pdf		
9.2c Project Industrial hall made of prefabricated reinforced concrete and prestressed concrete elements	Work methods ¹⁸	Allotted time
9.2.c.1. The theme of the project: Ground floor Industrial Hall, made of prefabricated elements of reinforced concrete and prestressed reinforced concrete with 2 travelling cranes, two spans and 15 bays	Discussions, explanations, case studies, resulting interpretations, individual and team work	2 hours
9.2.c.2. The geometry of the industrial hall Establishing the height of the industrial hall Calculation of the height of precast reinforced concrete columns		2 hours
9.2.c.3. Industrial construction envelope: • Choosing and checking roof elements • Evaluation of loads • Evaluation of pdesign for EPL elements • Evaluation of pdesign for EP elements • Evaluation of pdesign for cross beam The choice of elements from the catalogue of prefabricated products		2 hours
9.2.c.4. Calculation of the cross section of prefabricated reinforced concrete columns Evaluation of the maximum reaction R_{max} and the minimum reaction R_{min} from the vertical loads given by the overhead crane Evaluation of loads from bearing walls Selection of the section of marginal, central and corner RC columns		2 hours
9.2.c.5. Calculation of the length of the crane The design of the RC corbel for marginal and central columns		2 hours
9.2.c.6. Calculation of eccentricities from the positioning of loads on the structure of the industrial hall		2 hours
9.2.c.7. Establishing loads and groupings; determination of efforts • Permanent loads • Permanent loads at the roof level • Constant loads at console level • Permanent loads from the bearing walls • Variable loads • Snow loading • Loading from the action of the wind • Loads from temperature variations • Loads from overhead cranes • Seismic action • Load combinations • Determination of the spatial coworking coefficient Determination of sectional efforts using a finite element analysis (FEA)-preprocessing and postprocessing		10 hours
9.2.c.8. Graphic representation of the industrial hall • Cross section and transversal facade • Longitudinal section and longitudinal facade • Horizontal section at three predetermined levels: the level of the basement beam, the upper level of the steel rail, the level of the skylight ridge Details: foundations, joints of perimeter closures and pillars, support of the travelling girder on the RC corbel, details of windows and industrial doors, fastenings at the level of the attic		6 hours
Reading list for the project: 1.Kiss Z. (2024) Structuri prefabricate de beton armat, Recomandări pentru alcătuirea constructivă și dimensionarea structurilor în cadre, Editura Abel. 2.SR EN 1992-1-1:2024 Eurocod 2: Proiectarea structurilor de beton. Partea 1-1: Reguli generale și reguli pentru clădiri, poduri și structuri de inginerie civilă, ASRO. 3.Oprișan G., Ențuc I., Țăranu N. “Industrial Buildings”, Chapter 8, Ed. STEF, 2006, 216 p., ISBN 973-8961-71-8. 4.Draycott T., Bullman P. “Structural elements design manual working with eurocodes”, Butterworth-Heinemann, 2009. 5.CR 0-2012 Cod de Proiectare. Bazele proiectării construcțiilor, Ed. Matrix ROM, București 2012. 6.CR 1-1-3/2012 Cod de proiectare. Evaluarea acțiunii zăpezii asupra construcțiilor, Ed. Matrix ROM, București 2012. 7.CR 1-1-4/2012 Cod de proiectare. Evaluarea acțiunii vântului asupra construcțiilor, Ed. Matrix ROM, București 2012. 8.P100-1/2025, Cod de proiectare seismică – partea I –Prevederi de proiectare pentru clădiri, Ministerul Dezvoltării, Lucrărilor Publice și Administrației. 9.SR EN 13225:2005 “Produse Prefabricate de beton. Elemente liniare de structura”, ASRO, Sept. 2005. 10. SR EN 13693:2005 “Produse prefabricate de beton. Elemente speciale de acoperiș” ASRO, Sept. 2005.		

11. SR EN 1991-3 Eurocod 1: Acțiuni asupra construcțiilor – Partea 3: Acțiuni induse de poduri rulante și mașini (2007).
12. STAHL CraneSystems Catalog (2020), Crane Installations_Product Information, STAHL CraneSystems GmbH, Künzelsau, Germany. <https://www.stahlcranes.com/en/support/information-material/brochures-and-flyers.html>
13. Eurocodeexpress, <https://www.runet-software.com/>, 2025.
14. Betonexpress, <https://www.runet-software.com/>, 2025.
15. Steelexpress <https://www.runet-software.com/>, 2025.

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam/ /test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		50% (minimum)
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)	100%	
10.5c Project	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva		50% (minimum)
10.6 Passing requirements To design the structure of an industrial building starting from the shape in plan and elevation.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): Associate Professor Gabriel OPRIȘAN, PhD

Project session instructor(s): Associate Professor Gabriel OPRIȘAN, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Date of faculty council approval:

Dean,

September 2025

Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Sustenabilitatea construcțiilor Sustainable Constructions						
2.1.2. Course code	CE404						
2.2 Lecture instructor(s)	Senior lecturer Sebastian George Maxineasa, M.Sc., Dr. Eng.						
2.3 Seminar/laboratory/project/practical session instructor(s)	Senior lecturer Sebastian George Maxineasa, M.Sc., Dr. Eng.						
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DOB

3. Estimated total time (hours per semester)

3.1 Number of hours per week	2	3.2 lecture	1	3.3a seminar	1	3.3b laboratory	-	3.3c project	-	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	28	3.5 lecture	14	3.6a seminar	14	3.6b laboratory	-	3.6c project	-	3.6.d	-
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										8	
Additional research in the library, on specialised electronic platforms, and in the field										6	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										8	
Assessment ⁸										2	
Other activities:										-	
3.7 Total number of individual study hours ⁹	22										
3.8 Total number of hours per semester ¹⁰	50										
3.9 Number of ECTS credits	2										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	No prerequisites
4.2 Learning outcomes prerequisites	No prerequisites

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> • Whiteboard, video projector, specific teaching materials • Students shall comply with the Student Rights and Responsibilities Code and with the Regulations provided by the Charter of the „Gheorghe Asachi” Technical University of Iași
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> • Whiteboard, video projector, specific teaching materials, computer equipment • The deadlines for submitting the assignments are established by the seminar instructor

6. General objective of the course

In this course, you will learn about the concept of sustainability and its integration within the complexity of the construction sector. You will understand the importance of considering the three main dimensions of sustainable development in the built environment and, especially, the critically important role we have in reducing the impact of

construction. These aspects have become an integral part of Civil Engineering at the European level, being essential in achieving certain limits related to the ecological, economic and social influence we have, so you will also discover a much clearer perspective on current legislation. Through Life Cycle Assessment and Interpretation analyses, you will notice how the decisions we make as construction engineers (the construction solutions we propose, the choice of materials, execution details, etc.) decisively influence the impact that structures have on the surrounding environment.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - defines the concept of sustainability; - indicates how the construction sector fits into European policies and legislation on sustainable development; - identifies the environmental performance of the materials and products used; - distinguishes the environmental, economic, and social impacts of the built environment; - compares the environmental performance of traditional construction materials; - recognises environmental product declarations of materials; - describes the environmental impact of the selected construction solutions.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - applies the principles of sustainable development to optimize the environmental performance of constructions; - determines the environmental impact of buildings using Life Cycle Assessment (LCA) studies; - interprets the results describing the environmental performance of a construction; - adjusts construction solutions to reduce their environmental impact.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects ethical principles, norms, and values in the correct and timely fulfilment of professional tasks, by adopting a rigorous, efficient, and responsible work strategy when making decisions to solve problems; - integrates into the working group and applies communication and collaboration techniques for effective work within multidisciplinary teams at various hierarchical levels; - continuously seeks information and documentation in their professional field by adequately using effective lifelong learning methods and techniques; - develops professional projects in the field of civil engineering; - adapts to legislative changes; - ensures the correct implementation of technical projects.

8. Teaching strategies

In the teaching activity, participatory lectures and debates will be used based on Power Point presentations that will be made available to students. The presentations contain images and sketches, so that the information is easy to understand and assimilate. Each lecture will contain clear information through which the importance of the construction sector in sustainable development at the European Union level is shown. During seminars, emphasis will be placed on presenting examples with the aim of facilitating the understanding of the concept and methods for improving the ecological performance of buildings.

The teaching method is also based on learning models that include actions of discovery, calculation, analysis and interpretation of results.

9. Content

9. 1. Lecture¹⁵	Teaching strategies	Time allocation
9.1.1. Introduction and course objectives	Interactive lecture, debates, explanations	1 hour
9.1.2. Sustainability and sustainable development History and concept definition. Analysing the most important steps that were taken with the goal of providing a legislation in view of raising the awareness level at the global scale regarding the negative impact of our daily activities over the Earth's ecosystem. Presenting and analysing the three main sustainability dimensions. Describing the present global context related to the human negative influence over the natural environment and analysing the importance of considering the sustainability concept in order to create the proper development conditions for future generations.	Interactive lecture, debates, explanations	3 hours

9.1.3. Sustainable development goals Introducing the UN's 17 sustainable development goals and their influence over the construction sector.	Interactive lecture, debates, explanations	2 hours
9.1.4. Sustainability assessment methods Analysing the complete methodologies for assessing the environmental (Life Cycle Assessment), economic (Life Cycle Costing) and social (Social Life Cycle Assessment) impact.	Interactive lecture, debates, explanations	1 hour
9.1.5. Sustainability in the construction sector Assessing the impact of the built environment over the natural one (analysing the environmental impact of traditional construction materials) and analysing the importance of the construction sector in achieving a global sustainable development.	Interactive lecture, debates, explanations	4 hours
9.1.6. Reducing the environmental impact of the built environment Analysing different solutions that can be used for improving the environmental performances of the products that are specific to the construction sector (i.e.: materials, elements, buildings). New European Bauhaus. The European Renovation Wave.	Interactive lecture, debates, explanations	3 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Maxineasa SG, Course materials (distributed to students) 2. Maxineasa SG, Taranu N (2018) Life cycle analysis of strengthening concrete beams with FRP. În: Pacheco-Torgal F., Melchers R.E., Shi X., De Belie N., Van Tittelboom K., Saez A. (eds.), Eco-efficient Repair and Rehabilitation of Concrete Infrastructures. Woodhead Publishing, Duxford, pp 673-721 3. Sebastian George Maxineasa, Ioana-Sorina Entuc, Nicolae Taranu, Ion Florenta, Alexandru Secu, (2018) Environmental performances of different timber structures for pitched roofs. Journal of Cleaner Production 175: 164-175 4. SR EN 15804+A1:2014 (2014) Contribuția lucrărilor de construcție la dezvoltarea durabilă. Declarații de mediu pentru produse. Reguli de bază pentru categoria produse pentru construcții. ASRO – Organismul Național de Standardizare din România, București. 5. SR EN 15643-1:2011 (2011) Contribuția lucrărilor de construcție la dezvoltarea durabilă. Evaluarea contribuției la dezvoltarea durabilă a clădirilor. Partea 1: Cadru metodologic general. ASRO – Organismul Național de Standardizare din România, București. 6. EN 15643-2:2011 (2011) Contribuția lucrărilor de construcție la dezvoltarea durabilă. Evaluarea contribuției la dezvoltarea durabilă a clădirilor. Partea 2: Cadru pentru evaluare a performanței de mediu. ASRO – Organismul Național de Standardizare din România, București. 7. EN 15643-3:2012 (2012) Contribuția lucrărilor de construcție la dezvoltarea durabilă. Evaluarea contribuției la dezvoltarea durabilă a clădirilor. Partea 3: Cadru pentru evaluare a performanței sociale. ASRO – Organismul Național de Standardizare din România, București. 8. EN 15643-4:2012 (2012) Contribuția lucrărilor de construcție la dezvoltarea durabilă. Evaluarea contribuției la dezvoltarea durabilă a clădirilor. Partea 4: Cadru pentru evaluare a performanței economice. ASRO – Organismul Național de Standardizare din România, București. 9. Ding GKC (2014) Life cycle assessment (LCA) of sustainable building materials: an overview. În: Pacheco-Torgal F, Cabeza LF, Labrincha J, de Magalhaes A (eds) Eco-efficient construction and building materials. Life cycle assessment (LCA) eco-labelling and case studies. Woodhead Publishing Limited, Cambridge, pp 38-62 10. Hirst N (2013) Buildings and climate change. În: Yao R (ed) Design and management of sustainable built environments. Springer-Verlag, Londra, pp 23-30 11. ISO 14040:2006, Environmental management – life cycle assessment – principles and framework. The International Organization for Standardization (ISO), Geneva 12. ISO 14044:2006 (2006) Environmental management – life cycle assessment – requirements and guidelines. The International Organization for Standardization (ISO), Geneva 13. Komiyama H (2014) Beyond the limits to growth. New ideas for sustainability from Japan. Springer Open, Tokyo 14. Lambert P (2010) Sustainability of metals and alloys in construction. În: Khatib JM (ed) Sustainability of construction materials. Woodhead Publishing Limited, Cambridge, pp 148-168 15. Maxineasa SG, Taranu N, Bejan L, Isopescu D, Banu OM (2015) Environmental impact of carbon fibre-reinforced polymer flexural strengthening solutions of reinforced concrete beams. The International Journal of Life Cycle Assessment 20:1343-1358. doi: 10.1007/s11367-015-0940-5 16. JRC Technical Reports (2020) Level(s) – A common EU framework of core sustainability indicators for office and residential buildings 		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
9.2.1a Presenting the tasks that will be required to complete the final portfolio	Discussions, debates, presentation and/or analysis of works, case studies, interpretation of results from individual work	1 hour
9.2.2a Choosing a building and identifying the building elements that will be used for completing a LCA study	Discussions, debates, presentation and/or analysis of works,	3 hours

Students will be required to describe a building (structural system, envelope, materials) of their choice in order to complete the tasks. Also, the students must identify the full life cycle of the construction and describe the life cycle modules	case studies, interpretation of results from individual work	
9.2.3a Assessing the environmental impact of the building Students will choose and describe the considered functional unit and will determine from a Cradle-to-Gate perspective the environmental performances of the considered building by taking into account the impact categories specific to EPD certificates.	Discussions, debates, presentation and/or analysis of works, case studies, interpretation of results from individual work	4 hours
9.2.4a Improving the sustainability of the construction Students will present and analyse solutions for improving the environmental, economic and social performances of the assessed building.	Discussions, debates, presentation and/or analysis of works, case studies, interpretation of results from individual work	4 hours
9.2.5a Grading the portfolio Students will present and defend their portfolio.	Discussions, debates, presentation and/or analysis of works, case studies, interpretation of results from individual work	2 hours

Reading list for the seminar / laboratory / project:

1. Maxineasa SG, Seminar materials (distributed to students during seminar sessions)
2. EN 15804+A1:2012 (2012) Sustainability of construction works. Environmental product declarations. Core rules for the product category of constructions products. European Committee for Standardization, Brussels.
3. EN 15643-1:2011 (2011) Sustainability of construction works. Sustainability assessment of buildings. General framework. European Committee for Standardization, Brussels.
4. EN 15643-2:2011 (2011) Sustainability of construction works. Sustainability assessment of buildings. Framework for the assessment of environmental performance. European Committee for Standardization, Brussels.
5. EN 15643-3:2011 (2011) Sustainability of construction works. Sustainability assessment of buildings. Framework for the assessment of social performance. European Committee for Standardization, Brussels.
6. EN 15643-4:2011 (2011) Sustainability of construction works. Sustainability assessment of buildings. Framework for the assessment of economic performance. European Committee for Standardization, Brussels.
7. Pacheco-Torgal F, Cabeza LF, Labrincha J, de Magalhaes A (eds) (2014) Eco-efficient construction and building materials. Life cycle assessment (LCA) eco-labelling and case studies. Woodhead Publishing Limited, Cambridge.
8. Hirst N (2013) Buildings and climate change. In: Yao R (ed) Design and management of sustainable built environments. Springer-Verlag, Londra, pp 23-30
9. ISO 14040:2006, Environmental management – life cycle assessment – principles and framework. The International Organization for Standardization (ISO), Geneva
10. ISO 14044:2006 (2006) Environmental management – life cycle assessment – requirements and guidelines. The International Organization for Standardization (ISO), Geneva
11. JRC Technical Reports (2020) Level(s) – A common EU framework of core sustainability indicators for office and residential buildings

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Colloquium	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		50% (minimum grade 5)
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)	100%	

10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test	50% (minimum grade 5)
10.5b Laboratory	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - assessment test (laboratory colloquium)	
10.5c Project	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva	
10.6 Passing requirements Students must be familiar with: the three main dimensions of sustainable development; the methods and methodologies for quantifying sustainability; the sustainable development global goals; the environmental impact of a building's life cycle depending on the considered materials; the life-cycle modules of a construction; the identification of the environmental performance of materials; the assessment and interpretation of the environmental performance of a building over its life cycle.			
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Lecture instructor(s):

Senior lecturer Sebastian George Maxineasa, PhD

Seminar/laboratory/project/practical session instructor(s):

Senior lecturer Sebastian George Maxineasa, PhD

Date of departmental approval:

September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Date of faculty council approval:

September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor
1.6. Study programme	Civil Engineering in English Language

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Organizarea Lucrarilor de constructii Organization of Construction Works			
2.1.2. Course code				CE405			
2.2 Lecture instructor(s)				Sef lucrari univ. dr. ing. Lucian Constantin Ungureanu			
2.3 Seminar/laboratory/project/practical session instructor(s)				Sef lucrari univ. dr. ing. Lucian Constantin Ungureanu			
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DOB

3. Estimated total time (hours per semester)

3.1 Number of hours per week	5	3.2 lecture	3	3.3a seminar	2	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	70	3.5 lecture	42	3.6a seminar	28	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										8	
Additional research in the library, on specialised electronic platforms, and in the field										14	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										6	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	30										
3.8 Total number of hours per semester ¹⁰	100										
3.9 Number of ECTS credits	4										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Construction Technology 1
4.2 Learning outcomes prerequisites	

5. Requirements

5.1 for the lecture ¹²	Blackboard, video projector, specific teaching materials, etc.. Students will respect the Code of Student Rights and Obligations and the Regulations set forth in the Charter of the "Gheorghe Asachi" Technical University of Iași.
5.2 for the seminar / laboratory / project ¹³	Computing technology, software packages, technical execution documentation, technical execution details, etc.. Deadlines for submitting work are established by the instructor in agreement with the students.

6. General objective of the course

- Different methods of programming construction-assembly works are presented.
- After completing this discipline, students will be able to create an construction planning project based on the analysis of a technical project.
- Students will manage engineering projects in the construction phase, manage resources, budgets, deadlines, and human resources related to engineering projects, and plan programs and any technical activities.
- Students will assimilate the knowledge necessary for creating a site organisation project, a discipline that will be taught in master's studies.

7. Learning outcomes (*Example: Analytical Chemistry*)¹⁴

Knowledge	<p>The student/graduate:</p> <ul style="list-style-type: none"> - Ensures project management: Manages and plans various resources (human, budget, deadline, results, quality) and monitors progress to achieve specific objectives within a set time and budget. - Executes analytical mathematical calculations: Applies mathematical methods and utilizes calculation technologies to perform analyses and design solutions for specific problems. - Monitors the construction site: Maintains an overview of site activities, identifying personnel present and the construction status for each crew. - Supervises construction projects: Ensures the project is executed according to building permits, execution plans, performance/design specifications, and relevant regulations
Skills	<p>The student/graduate:</p> <ul style="list-style-type: none"> - Identifies the best method for programming construction works relative to beneficiary requirements - Uses digital tools for work programming. - Analyses and compares different planning alternatives and explains the technological and organisational structure of each option - Selects and applies concepts, principles, and methods for calculating the duration of construction activities - Implements and tracks the CPM/PERT mathematical model and Gantt chart during the construction phase
Responsibility and autonomy	<p>The student/graduate:</p> <ul style="list-style-type: none"> - Respects ethical principles, norms, and values in the correct and timely execution of professional tasks through a rigorous and responsible work strategy - Integrates into workgroups and applies techniques for efficient collaboration in multidisciplinary teams across various hierarchical levels - Continuously documents and informs themselves in their field of activity through effective lifelong learning techniques - Develops professional projects in the field of engineering

8. Teaching strategies

- Participatory lectures and debates based on PowerPoint presentations available via Google platforms.
- Presentations include sketches, images, and videos for easy assimilation.
- Each course begins with a brief review of the previous session.
- The teaching method combines the classic approach with action-based methods like exercises, practical activities, and problem-solving

9. Content

9.1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Project scope definition. Introduction & WBS Principles. Developing the WBS.	Lecture, video	6 hours
9.1.2. Fundamentals of construction project scheduling. Activities definition, activities dependencies	projector, discussions with students	12 hours

9.1.3. Scheduling methods and tools: logic diagrams, line of balance, Gantt charts, histograms, critical path method.		12 hours
9.1.4 Schedule update and control		6 hours
9.1.5 Optimisation in construction scheduling and planning		3 hours
9.1.6. Advanced Topics		3 hours
References. 1. Mubarak, S. – Construction Project Scheduling and Control, Wiley, 2019 2. Șerbanoiu, A., Șerbanoiu, B, ENGINEERING THE CONSTRUCTION WORKS 400 PAG, Editura Societatii Academice “Matei-Teiu Botez,Iasi ISBN 978-606-582-037-1, 2013 3. Șerbanoiu, A Îndrumător- Managementul Lucrărilor de Construcții 161 PAG, Editura Societatii Academice “Matei-Teiu Botez,Iasi ISBN 978-606-582-072-2, 2015 4. Șerbanoiu, A. Șerbanoiu V. Bogdan CONSTRUCTION ECONOMICS 192 PAG, Editura Societatii Academice “Matei-Teiu Botez,Iasi ISBN 978-606-582-071-5, 2015 Șerbănoiu A., Șerbănoiu I. - The organizational methods of the construction Processes,The Publishing House of the Academic Șerbănoiu I. - Management operațional în construcții, The Publishing House of the Academic Society “Matei –Teiu Botez”, Iași, 2003		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
Part 1: Project scope; WBS (Work Breakdown Structure) methodology; production process classification; calculation of duration and resources.		4 hours
Part 2: Parameters for identified processes: work quantities; identifying bill of quantities norms and calculating direct costs (materials, labor, transport, equipment).	Discussions, explanations, case studies, result interpretations	4 hours
Work 3: Graphic representation using time-space methods (cyclograms); Histograms for labor, calendar scheduling, cumulative S-curve; Critical analysis of results		6 hours
Work 4: Network graph transposition using the chain method; Arc and node representations; Calculating parameters and the critical path; Using software (MS Project or Project Libre) for Gantt charts and histograms		8 hours
Work 5: Completion of Work 4; Condensing the network graph using the Kelley-Fulkerson algorithm; Critical analysis of optimization impact		6 hours
9.2b Laboratory	Work methods ¹⁷	
.....		
9.2c Project	Work methods ¹⁸	
Reading list for the seminar / laboratory / project: 1. Șerbănoiu, I., Ungureanu, L. (2010)- Tehnici moderne pentru programarea lucrărilor de construcții, Ed. Societății Academice " Matei Teiu-Botez", Iași, Romania, 250 pagini, ISBN: 978-973-8955-79-0 2. Șerbănoiu, A ÎNDRUMĂTOR- MANAGEMENTUL LUCRĂRILOR DE CONSTRUCȚII, Editura Societatii Academice “Matei-Teiu Botez, Iasi ISBN 978-606-582-072-2, 2015 2. Șerbănoiu I. - Management operațional în construcții, The Publishing House of the Academic Society “Matei –Teiu Botez”, Iași, 2003 3. Șerbănoiu I., Antohie E. - Studiul și proiectarea procesului de construcție. “Gh. Asachi” Technical University, Iași, 1993 4. Șerbănoiu A., Șerbănoiu I. - The organizational methods of the construction Processes,The Publishing House of the Academic Society “Matei –Teiu Botez”, Iași, 2007		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade (recommended to be in agreement with the number of hours allocated)
10.4 Final exam/ /test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		

	Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- formative assessment test (tests during the semester) - summative assessment test (final assessment)	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test	20% (minimum 5)
10.5b Laboratory	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - assessment test (laboratory colloquium)	
10.5c Project	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva	
10.6 Passing requirements Knowledge of construction programming methods; calculation of execution duration; resource evaluation and cost estimation and project schedule updating.			
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Lecture instructor(s): Sef lucrari univ. dr. ing. Lucian Constantin Ungureanu

Seminar/laboratory/project/practical session instructor(s): Sef lucrari univ. dr. ing. Lucian Constantin Ungureanu

Date of departmental approval:
September 2025

Head of Department,
SI dr.ing Catalin ONUTU

Date of faculty council approval:

Dean,

Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 27 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Tehnologia lucrărilor de construcții 2 (Technology of Construction Works 2)			
2.1.2. Course code				CE406			
2.2 Lecture instructor(s)				s.l. dr. ing. Vlad Lupășteanu			
2.3 Seminar/laboratory/project/practical session instructor(s)				s.l. dr. ing. Vlad Lupășteanu, s.l. dr. ing. Ciprian-Ilie Cozmanciuc			
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DI

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										25	
Additional research in the library, on specialised electronic platforms, and in the field										8	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										25	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	58										
3.8 Total number of hours per semester ¹⁰	150										
3.9 Number of ECTS credits	4										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Technology of Construction Works 1 (CE314)
4.2 Learning outcomes prerequisites	-

5. Requirements

5.1 for the lecture ¹²	Teaching activities at the faculty: blackboard, projector, other teaching equipment Students will respect the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iași
5.2 for the seminar / laboratory / project ¹³	Teaching activities at the faculty: blackboard, projector, other teaching equipment Students will respect the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iași

6. General objective of the course

The study of technological processes and procedures with the aim of achieving quality, productivity, and economic efficiency in the execution of constructions.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Learns basic concepts regarding the technology of designing concrete mix recipes, preparing, transporting and pouring concrete; - Learns basic concepts regarding the technology of formwork for concrete elements; - Learns basic concepts regarding the reinforcement of concrete elements; - Learns basic concepts regarding the qualitative inspection of concrete elements; - Learns concepts related to technological aspects involved in executing the main types of technological processes in the construction industry
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - The student/graduate determines, uses, and compares the physical and mechanical characteristics of construction materials, for the purpose of using them in the sizing and verification of structural elements. - The student/graduate evaluates construction elements and operating conditions, for the purpose of preparing the written parts of technical projects.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects ethical principles, rules, and values in the correct and timely completion of professional tasks, by adopting a rigorous, efficient, and responsible work strategy and making informed decisions to solve problems; - integrates into the work group and applies communication and collaboration techniques for effective work within multidisciplinary teams at various hierarchical levels; - continuously seeks information and documentation in their field of activity by appropriately using effective lifelong-learning methods and techniques; - develops technological projects in the field of engineering.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images, videos and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching method is based on practical examples specific to the construction industry. During the courses, site visits to ongoing construction projects may also be organized, with the purpose of presenting the studied concepts in a practical manner.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
<p>9.1.1. Concrete Technology Introductory concepts. Properties and influence of concrete constituents (cement, water, aggregates, additives). Properties of fresh concrete. Properties of hardened concrete. Concrete durability – exposure classes. Quality control of concrete.</p>	Interactive lecture, debates, explanations	14 hours
<p>9.1.2. Technological aspects regarding the execution of monolithic concrete and reinforced concrete works Setting out concrete elements. Technological aspects related to the formwork of concrete elements. Technological aspects related to the reinforcement of concrete elements. Quality control of the execution of monolithic concrete and reinforced concrete works.</p>	Interactive lecture, debates, explanations	10 hours
<p>9.1.3. Technology of construction works execution General discussions on other categories of works specific to the construction field. Technological planning of the execution of works.</p>	Interactive lecture, debates, explanations	4 hours
<p>Reading list for the lecture: 1. Vlad Lupășteanu – Lecture Notes ”Technology of Construction Works 2” – annually updated. Electronic format is sent to students at the beginning of the semester. 2. Code for the production of concrete and the execution of concrete, reinforced concrete, and prestressed concrete works – Part 1: Concrete production, designation NE 012/1 – 2022.</p>		

<p>3. Code for the production of concrete and the execution of concrete, reinforced concrete, and prestressed concrete works – Part 2: Execution of concrete works, designation NE 012/2 – 2022.</p> <p>4. Lupășteanu V., Lupășteanu R., Cozmanciuc C.-I., Construction Technology. Concrete and reinforced concrete handbook. Editura Soc. Acad. Matei-Teiu Botez Iași, 2022.</p> <p>5. T-N. Toader, ”Adaptat după Stabilirea specificației betonului de ciment proaspăt și întărit cf. SR EN 206-1, Ed. 2”, UTPRESS, Cluj Napoca, 2023</p>		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
Assignment no. 1 Concrete specification. Designing the mix of the concrete	Discussions, explanations, case studies, interpretation of results	6 hours
Assignment no. 2 Technology of concrete placement and treatment during curing	Discussions, explanations, case studies, interpretation of results	4 hours
Assignment no. 2 Technology of reinforcing concrete elements	Discussions, explanations, case studies, interpretation of results	4 hours
<p>Reading list for the seminar:</p> <p>1. Vlad Lupășteanu – Lecture Notes ”Technology of Construction Works 2” – annually updated. Electronic format is sent to students at the beginning of the semester.</p> <p>2. Code for the production of concrete and the execution of concrete, reinforced concrete, and prestressed concrete works – Part 1: Concrete production, designation NE 012/1 – 2022.</p> <p>3. Code for the production of concrete and the execution of concrete, reinforced concrete, and prestressed concrete works – Part 2: Execution of concrete works, designation NE 012/2 – 2022.</p> <p>4. Lupășteanu V., Lupășteanu R., Cozmanciuc C.-I., Construction Technology. Concrete and reinforced concrete handbook. Editura Soc. Acad. Matei-Teiu Botez Iași, 2022.</p> <p>5. T-N. Toader, ”Adaptat după Stabilirea specificației betonului de ciment proaspăt și întărit cf. SR EN 206-1, Ed. 2”, UTPRESS, Cluj Napoca, 2023</p>		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Ability to apply acquired skills Ability to process data and stated problems. Theoretical and practical knowledge acquired (quantitative evaluation, correctness, accuracy)	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	0%	50%
		- formative assessment test (tests during the semester)	0%	
		- summative assessment test (final assessment)	100%	
10.5a Seminar	Qualitative and quantitative evaluation of the portfolio of works (assignments) prepared by the student. Evaluation based on the oral responses provided by the student during the portfolio submission stage. The aim will be to verify the extent to which the student has assimilated the knowledge resulting from the preparation of the portfolio of works.	- Portfolio Assessment - Assessment of student responses to questions based on the content of the portfolio		50%

10.6 Passing requirements

At least getting a grade of 5 in the seminar and at least getting a grade of 5 in the exam

The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.

Date of completion: September 2025

Lecture instructor(s): s.l. dr. ing. Vlad LUPĂȘTEANU

Seminar instructor(s): s.l. dr. ing. Vlad LUPĂȘTEANU, s.l. dr. ing. Ciprian-Ilie COZMANCIUC

Date of departmental approval:
September 2025

Head of Department,
s.l. dr. ing. Cătălin ONUȚU

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Civil Engineering (ICE)

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)		Construcții în mediu rural Constructions in rural zones					
2.1.2. Course code		CE407					
2.2 Lecture instructor(s)		Associate Professor Gabriel OPRÎȘAN, PhD					
2.3 Seminar/laboratory/project/practical session instructor(s)		Associate Professor Gabriel OPRÎȘAN, PhD					
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DI

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar		3.3b laboratory		3.3c project	1	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar		3.6b laboratory		3.6c project	14	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										20	
Additional research in the library, on specialised electronic platforms, and in the field										20	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										18	
Assessment ⁸										3	
Other activities:											
3.7 Total number of individual study hours ⁹		58									
3.8 Total number of hours per semester ¹⁰		100									
3.9 Number of ECTS credits		4									

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not required
4.2 Learning outcomes prerequisites	Building materials 1,2; Statics and stability of constructions; Strength of materials 1.2; Wooden constructions; Steel constructions; Reinforced concrete structures.

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> • Blackboard, video projector, specific teaching materials • Students will comply with the Code of Student Rights and Obligations and the Regulations stipulated by the Charter of the Technical University "Gheorghe Asachi" from Iasi
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> • Computing technique, video projector, software packages, graphic tablet • The deadlines for handing in the papers are set by the holder, in the last week of the semester

6. General objective of the course

In this discipline you will learn about the essential principles of designing, building and maintaining agricultural structures. The discipline covers notions about the technological dimensioning of agricultural

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constructions according to their destination, the choice of structural systems, the establishment of specific load assumptions for agricultural production storage buildings, animal breeding facilities, microclimate parameter control systems. This is important at the stage of choosing building materials, structural elements and envelope elements in the case of constructions aimed at agricultural production. The performances, advantages, disadvantages, but also the opportunities to use materials and structural systems suitable for these types of constructions are analysed. Through practical project hours, students will acquire important skills for the design of agricultural constructions and the choice of construction materials, for solving structural systems and closing elements at the level of walls and roofs to satisfy thermal comfort and the implementation of strategies to control microclimate factors through ventilation and heating installations.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - identifies the category of agricultural construction and the materials from which it is designed depending on the location; - interprets and respects the technological spaces imposed by the type of production; - explains the composition of agricultural buildings and their locations, for the purpose of drawing up and using the specific technical documentation; - evaluates the specific loads of agricultural constructions.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - proposes structural systems specific to the agricultural buildings; - preliminary design of the cross sections of the structural elements and represents them graphically in order to realize the parts drawn from the technical projects of agricultural constructions; - calculates sectional efforts in order to dimension the structural system; - critically evaluates construction materials, structural systems and building envelope used in the realization of agricultural constructions.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects the principles, norms and values of ethics in the correct and on-time execution of professional tasks, by approaching a rigorous, efficient and responsible work strategy in making decisions to solve problems; - integrates into the work group and applies communication techniques and effective work in multidisciplinary teams, on various hierarchical levels; - they are permanently informed and documented in their own field of activity through the appropriate use of effective lifelong learning methods and techniques; - develops professional engineering projects.

8. Teaching strategies

In the teaching activity, interactive lectures, debates and problems will be used based on Power Point presentations that will be made available to the students. The presentations include multimedia content (audio and/or video, animation) so that the information is easy to understand and assimilate. Each course will start with a short recap of the concepts covered in the previous course and will end with a short application to consolidate the knowledge taught.

The teaching method is also based on discovery learning models facilitated by direct and indirect exploration of reality (observation, demonstration, modelling, exercise), but also on action-based methods, such as exercises, case studies and problem solving.

9. Content

9. 1. Lecture¹⁵	Teaching strategies	Time allocation
9.1.1. 9.1.1. Introductory elements regarding agricultural constructions Agricultural constructions. Past and present. Definition and classification of constructions in rural areas.	Interactive lecture, debates, explanations	2 hours
9.1.2. Achievement of the general plan of an agricultural construction Introduction. The location of the agricultural farm. Organization of an agricultural farm. Establishing the general plan.		2 hours
9.1.3. Materials and structures for agricultural constructions Introduction. Materials for the structural systems and the envelope.		4 hours
9.1.4. Specific Actions to agricultural constructions		2 hours

Factors that influencing the design of agricultural buildings. Specific actions to agricultural constructions.		
9.1.5. The design of zootechnical constructions Dairy cattle housing. Horse Housing. Swine Housing. Sheep Housing.		4 hours
9.1.6. Poultry housing Generalities. Traditional shelters. Breeding and maintenance of birds in an industrial system.		2 hours
9.1.7. Structures for vegetable production and flower cultivation Introduction. Types of solariums and greenhouses. Materials used for greenhouses. Ventilation and heating systems.		2 hours
9.1.8. Engineering structures for the storage and maintenance of plant production. Introduction. Types of structures.		2 hours
9.1.9. Engineering structures for and agricultural sheds		2 hours
9.1.10. Advances in Greenhouse Automation and Controlled Environment Agriculture: The Transition to Plant Factories and Urban Agriculture		2 hours
Reading list for the lecture: 1. Oprisan – Course notes 2025, edu.tuiasi.ro 2. Opreșan G., Ențuc I.S., Hudișteanu I. (2020) Clădiri cu funcțiuni speciale în mediu rural, Editura Politehniun, 2020, ISBN 978-973-621-492-9. 3. Emmitt S. (2019) Barry’s advanced construction of buildings, 4th ed. Wiley-Blackwell, 2019. 4. Allen E., Iano J. (2019) Fundamentals of building construction: materials and methods, 7th ed., Wiley, Hoboken, New Jersey. 5. Buxton, P. (Ed.). (2018). Metric Handbook: Planning and Design Data (6th ed.). Routledge. 6. Hudișteanu I., Taranu N., Isopescu D.N., Opreșan G., Entuc I.S. (2019) Structuri stratificate din lamele compozite armate cu fibre, Editura Politehniun, ISBN 978-973-621-486-8 7. Ențuc I, Opreșan G. (2006) Construcții în zone rurale, Ed. Ștef. 8. Lindley J., Whitaker J. (1996), "Agricultural Buildings and Structures" Pamela DeVore-Hansen Ltd., The Society for engineering in agricultural, food, and biological systems, USA. 9. Shamshiri R R, Kalantari F, Ting K C, Thorp K R, Hameed I A, Weltzien C, et al. Advances in greenhouse automation and controlled environment agriculture: A transition to plant factories and urban agriculture. Int J Agric & Biol Eng, 2018; 11(1): 1–22. 10. Hassanien R.H.E., Li M., Lin W.D., “Advanced applications of solar energy in agricultural greenhouses”, Renewable and Sustainable Energy Reviews 54 (2016) 989–1001. 11. SR EN 1991-4:2006, Eurocod 1: Acțiuni asupra structurilor. Partea 4: Silozuri și rezervoare. 12. SR EN 1993-4-1:2007/AC:2009, Eurocod 3: Proiectarea structurilor de oțel. Partea 4-1: Silozuri. 13. SR EN 1993-4-1:2007/NA:2012, Eurocod 3: Proiectarea structurilor de oțel. Partea 4-1: Silozuri. Anexa națională. 14. SR EN 617+A1:2011 Mijloace și sisteme de transport continuu. Cerințe de securitate și CEM pentru echipamente de depozitare a produselor în vrac în silozuri, buncăre, rezervoare și recipiente de alimentare. 15. SR EN 13207:2018 Materiale plastice. Folii și tuburi de materiale termoplastice pentru silozuri cu utilizare în agricultură.		
9.2c Project The design of an agro-zootechnical complex	Work methods 18	Allotted time
9.2.1. Solving functional requirements Location of buildings within the complex.	Discussions, explanations, case studies, resulting interpretations, individual work	2 hours
9.2.2 Designing a silo for vegetable production Establishing the geometry of the silo and identifying the structural elements Evaluation of loads and loading schemes on elements Preliminary design of the structural elements		4 hours
9.2.3 Designing a cattle shelter Technological dimensioning of a shelter. Shelter plan, sections. Constructive composition of the shelter. Specific equipment and installations. Establishing loading and calculation of the structural systems.		6 hours
9.2.4 Designing a greenhouse for vegetable production Technological dimensioning of the greenhouse. Constructive composition of the greenhouse. Greenhouse plan, sections. Specific equipment and installations. Establishing loading and calculation schemes for the chosen structural systems.		2 hours
Reading list for the project: 1. Oprisan (2025) – Project stages, edu.tuiasi.ro 2. NP 005-2022 Normativ privind proiectarea și verificarea construcțiilor din lemn 3. Opreșan G., Ențuc I.S., Hudișteanu I. (2020) Clădiri cu funcțiuni speciale în mediu rural, Editura Politehniun, 2020, ISBN 978-973-621-492-9. 4. Entuc I., Oprisan G., (2006), Constructii in zone rurale, Ed. Ștef, ISBN 973-8961-76-9 5. Indicativ GP081-Q3, (2003), Ghid pentru proiectarea și execuția rezervoarelor mici din elemente prefabricate în zone rurale, 6. SR EN 1995-1-2:2004 Eurocode 5: Proiectarea structurilor de lemn. 7. SR EN 1996-3:2006/NB:2008 Eurocode 6: Proiectarea structurilor din zidărie. Partea 3: Metode de calcul simplificate pentru construcții de zidărie nearmată. Anexa națională 8. SR EN ISO 13793:2002 Performanța termică a clădirilor. Proiectarea din punct de vedere termic a fundațiilor pentru evitarea umflării din cauza înghețului.		

9.SR EN 1998-5:2004 Eurocod 8: Proiectarea structurilor pentru rezistența la cutremur. Partea 5: Fundații, structuri de susținere și aspecte geotehnice.

10.SR EN 1991-4 (2006), Eurocod 1: Acțiuni asupra structurilor. Partea 4: Silozuri și rezervoare.

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		50% (minimum 5)
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)	100%	
10.5c Project	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva		50% (minimum 5)
10.6 Passing requirements				
To determine the optimal solution for an agricultural construction with imposed parameters.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): Associate Professor Gabriel OPRIȘAN, PhD

Project session instructors: Associate Professor Gabriel OPRIȘAN, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Instalații pentru construcții Building Services in Constructions						
2.1.2. Course code	CC408						
2.2 Lecture instructor(s)	Șef lucr. univ. dr. ing. Ștefănică-Eliza TANSANU						
2.3 Seminar/laboratory/project/practical session instructor(s)	Șef lucr. univ. dr. ing. Ștefănică-Eliza TANSANU						
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DI

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										8	
Additional research in the library, on specialised electronic platforms, and in the field										11	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										14	
Assessment ⁸										3	
Other activities:											
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	
4.2 Learning outcomes prerequisites	

5. Requirements

5.1 for the lecture ¹²	Blackboard, Computing equipment, video-projector, specific teaching materials, internet connection, etc.
5.2 for the seminar / laboratory / project ¹³	Computing equipment, software packages, internet connection, etc.

6. General objective of the course

In this course, you will learn about the essential role that building services systems play in the operation, performance, and functionality of civil and industrial buildings. The discipline provides a solid foundation of knowledge regarding the operating principles, constructive solutions, and integration requirements of the main categories of building services: heating, sanitary installations, ventilation and air conditioning, electrical systems, and fire safety installations. The course highlights how these systems interact with the architectural and structural components of a building, contributing to safety, comfort, and energy efficiency. You will learn to interpret technical schemes and documentation, identify the spaces, openings, and routes needed for the installation of equipment, and recognize common constructive solutions. Through practical examples and applied analyses, the course aims to develop the competencies required for the preliminary evaluation of building services and for effective collaboration with specialists during design and execution processes. The general objective of the discipline is to build an integrated understanding of building services systems, providing students with the fundamental skills necessary for interdisciplinary coordination and sound technical decision-making in the field of civil and industrial construction.

7. Learning outcomes

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - defines the fundamental concepts related to building services systems (heat carrier, flow rate, pressure, design temperatures, ventilation, drainage, comfort, safety, etc.); - describes the operating principles of heating, sanitary, ventilation/air-conditioning, and fire safety systems at a level appropriate for understanding their role within a building; - identifies and describes the main components of building service systems and their role in building operation; - reads and conceptually interprets technical schemes and drawings, understanding general routes and technical spaces; - explains the minimum requirements that building services must meet in terms of comfort, efficiency, and safety.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - uses technical information from schemes, drawings, and diagrams to identify routes, distributions, openings, technical spaces, equipment positions, and potential conflict zones within a project; - interprets interdisciplinary drawings (architecture–structure–building services) and identifies spatial or technical incompatibilities (penetrations, elevations, interferences with beams, walls, openings); - evaluates typical constructive solutions for building services in relation to building requirements and general operating parameters; - selects appropriate standard technical solutions for a design scenario and justifies the choice using technical arguments.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects professional principles and regulations regarding the safety, functionality, and efficiency of building technical systems; - demonstrates responsibility in using and interpreting technical information relevant to coordinating building services within a construction; - responsibly selects and analyzes bibliographic sources and technical documentation required to substantiate design solutions; - collaborates effectively with specialists in building services, architecture, and structural engineering to ensure interdisciplinary project coordination; - demonstrates autonomy in the learning process and in documenting preliminary technical solutions; - formulates coherent and professional explanations regarding the adopted building services integration solutions within construction projects.

8. Teaching strategies

Teaching is based on active methods, through lectures and explanatory discussions that facilitate the understanding of the technical principles of building service systems. The visual support includes PowerPoint presentations with diagrams, constructive details, technical images, and examples from real practice. These are complemented by visual demonstrations and multimedia materials (animations, on-site recordings, explanatory videos) used to illustrate system operation and their integration within buildings. Students are engaged in applied discussions, in interpreting drawings and schematic layouts, and in identifying general routes, technical spaces, and installation zones. Applied exercises aim to develop the ability to recognize system components and to evaluate their compatibility with the architecture and structure of the building. Each lecture concludes with a recap of the essential concepts and

clarification of the technical notions discussed. Course materials and supplementary resources are available electronically through the Google Classroom platform, supporting individual study and the gradual understanding of the content.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Introduction to building services. The role of building service systems in the operation of buildings. Classification of building services. Performance requirements and design criteria. Basic legislative and normative framework applicable to building service systems.	Interactive lecture, debates, explanations, video-projector	2 hours
9.1.2. Heating systems. Constructive solutions and operating principles. Classification of heating systems. Schematic layouts: types of distributions and circuits. Main equipment and its positioning. Basic sizing elements. Specific parameters and characteristic quantities of heating systems. Considerations regarding integration into buildings.		6 hours
9.1.3. Radiant heating systems, embedded in construction elements. Radiant systems (floor, wall, ceiling). Constructive solutions and integration examples. Equipment and materials used. Placement rules and compatibility with structural elements.		2 hours
9.1.4. Plumbing systems. Cold water supply, domestic hot water and recirculation. Schematic layouts. Main components (pipes, pumps, fittings/valves). Specific parameters and characteristic quantities. Placement rules within buildings. Vertical distribution and connection of sanitary fixtures.		3 hours
9.1.5. Drainage Systems / Wastewater & Stormwater Drainage. Constructive solutions for domestic wastewater drainage. Component elements (traps, branches, stacks, ventilation). Stormwater drainage: solutions for roofs and terraces. Typical slopes and routing. Introductory sizing criteria. Coordination of drainage routes with building elements.		3 hours
9.1.6. Ventilation and air-conditioning systems (HVAC). Classification and constructive solutions. Schematic layouts. Specific parameters and characteristic quantities (airflow, temperatures, humidity). Integration of HVAC systems in buildings. Heat-recovery ventilation. Considerations regarding the placement of indoor and outdoor units.		4 hours
9.1.7. Fire protection systems. Classification of fire protection systems. Constructive solutions and schematic layouts. Equipment and materials. Coordination considerations. Placement requirements.		2 hours
9.1.8. Electrical and automation systems. Main elements: panels, circuits, protections. Electrical power distribution within the building.		2 hours
9.1.9. Renewable energy systems and hybrid systems for buildings. Classification of renewable energy sources used in buildings. Constructive solutions and schematic layouts. Equipment and materials.		2 hours
9.1.10. Principles of sustainability in building services. Energy efficiency and optimization of system performance. Reducing energy consumption through high-efficiency solutions and equipment. Selection of materials and components with low environmental impact. Introductory notions on building energy performance indicators. The impact of building service systems on carbon footprint and overall building performance.		2 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Cătălin George Popovici - Instalații pentru Construcții: Instalații de încălzire, Instalații ventilare și climatizare - vol. 1, Editura Matei Teiu Botez, Iași, 2017 2. Cătălin George Popovici - Instalații pentru Construcții: Instalații tehnico-sanitare, Instalații electrice, Instalații Frigorifice, vol. 2, Editura Matei Teiu Botez, Iași, 2017 3. Theodor Mateescu, Instalații tehnico-sanitare pentru clădiri: apa, canal, gaze, Editura Matrix Rom, 2018 4. Verdeș M., Ciocan V., Instalații funcționale în clădiri, Ed. Venus, Iași, 1998 5. Manualul de Instalații în Construcții, ediția II, redenumită Enciclopedia Tehnica de Instalații: INCALZIRE, VENTILARE&CLIMATIZARE, SANITARE, ELECTRICE, Editura ARTENCO București, 2010. 6. Victor Emil Lucia, Utilități din resurse regenerabile. Ghid de procurare a utilităților pentru o gospodărie din resurse regenerabile, locale, nepoluante, Editura: Universitara, 2017 7. Adrian Badea, Horia Necula, Surse regenerabile de energie, Seria: Energii neconvenționale, Editura: A.G.I.R., 2013 8. Victor Emil Lucian, Resurse energetice regenerabile. Ghid practic de proiectare, montaj, exploatare și întreținere a sistemelor de conversie care folosesc resurse regenerabile, Editura Universitară, 2011 		

9. Victor Emil Lucian, Apă - viață și energie. Ghid de documentare și execuție a instalațiilor de producere a energiei electrice, Editură: Universitară, 2015		
10. Lou Wei , Analiza teoretică a orașelor cu energie regenerabilă, Editura Creator , 2023.		
11. Corneliu Bob, Durabilitatea și sustenabilitatea construcțiilor, Editura Politehnica, 2020.		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
9.2.1. Presentation of the seminar project requirements. Establishing the building type (single-family house / apartment building), the climatic zone and the design parameters. Analysis of the architectural plan and presentation of the workflow stages.	Discussions and debates, staged analysis of the work, presentation and explanation of the seminar stages, and applied activities for routing and configuring building service systems, carried out according to the seminar assignment.	2 hours
9.2.2. Heating Systems. Selecting the heating solution. Determining the conventional indoor design temperatures. Calculating the heating load. Selecting and sizing the radiators. Choosing the heating unit (boiler/heat source). Analysing the placement of equipment. Drawing the main distribution routes and positioning the heating terminals.		4 hours
9.2.3. Plumbing and Drainage Systems. Identifying plumbing fixtures. Drawing vertical stacks, distribution lines and service connections. Positioning domestic hot water preparation equipment. Drawing drainage branches and stacks, determining minimum slopes. Analysing solutions for roof and terrace water drainage.		2 hours
9.2.4. Electrical Systems. Positioning the main electrical panel and any secondary panels. Selecting and placing lighting fixtures. Establishing the location of sockets and switches. Schematic routing of circuits (lighting, sockets, power supply for technical equipment) and centralizing them in the electrical panel.		4 hours
9.2.5. Ventilation and Air-Conditioning (HVAC) Systems. Identifying rooms requiring ventilation and analysing fresh-air requirements. Positioning indoor and outdoor units. Drawing the conceptual schemes for the ventilation and air-conditioning systems.		2 hours
Reading list for the seminar / laboratory / project: 1. Normativ pentru proiectarea, executarea și exploatarea instalațiilor de ventilare și climatizare - indicativ I5-2022 2. Normativ privind proiectarea, execuția și exploatarea instalațiilor electrice aferente clădirilor – Indicativ I7-2011 (modificare 2023) 3. Normativ privind proiectarea, execuția și exploatarea instalațiilor sanitare aferente clădirilor - Indicativ I 9-2022 4. Normativ pentru proiectarea, executarea și exploatarea instalațiilor de încălzire centrală – I13-2015 (revizuit și modificat, 2023) 5. Mihai Iliina, Cătălin Lungu, 100 de probleme practice de instalații de încălzire, MatrixRom, 2005.		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation and assessment of participation during the course (where applicable: interpretation of diagrams, technical analyses, applied discussions);	20%	50%
		- formative assessment test (tests during the semester)	20%	
		- summative assessment test (final exam grade)	60%	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in activities; - correct completion of the work stages included in the assignment; - routing and configuring the building service systems according to the technical requirements; - accurate verification of placements, routes, and system coordination;		50%

		- compliance of all stages with the technical rules presented during the course and seminar.	
<p>10.6 Passing requirements</p> <p>Passing the course requires the student to demonstrate the achievement of the minimum expected learning outcomes. Regarding knowledge, the student must show an understanding of the operating principles of building service systems, recognize the main system components, and correctly interpret technical schemes and drawings at the level required to identify general routes and technical areas. Regarding skills, the student must be able to use technical information to identify routes, clearances, and equipment locations, to evaluate common constructive solutions in relation to the building's requirements, and to select simple technical options while providing coherent justification for their choices.</p> <p>The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.</p>			

Date of completion: September 2025

Lecture instructor(s): Șef lucr. univ.dr.ing. Ștefănică-Eliza TANSANU

Seminar/laboratory/project/practical session instructor(s): Șef lucr. univ.dr.ing. Ștefănică-Eliza TANSANU

Date of departmental approval:
September 2025

Head of Department,
Conf.univ.dr.ing. Marina VERDEȘ

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta-aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	BMTM
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Communication			
2.1.2. Course code				CE409			
2.2 Lecture instructor(s)				Lecturer Phd. Claudia-Ioana Ciobanu			
2.3 Seminar/laboratory/project/practical session instructor(s)							
2.4 Year of study ²	4	2.5 Semester ³	2	2.6 Assessment method ⁴	Vp	2.7 Course type ⁵	DI

3. Estimated total time (hours per semester)

3.1 Number of hours per week	1	3.2 lecture	1	3.3a seminar		3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	14	3.5 lecture	14	3.6a seminar		3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										4	
Additional research in the library, on specialised electronic platforms, and in the field										4	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios											
Assessment ⁸										3	
Other activities:											
3.7 Total number of individual study hours ⁹	11										
3.8 Total number of hours per semester ¹⁰	25										
3.9 Number of ECTS credits	1										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	
4.2 Learning outcomes prerequisites	

5. Requirements

5.1 for the lecture ¹²	
5.2 for the seminar / laboratory / project ¹³	

6. General objective of the course

The general objective of this course is to develop social and interpersonal skills useful in business debates and negotiations. The theoretical elements specific to this discipline aim at understanding the theories, concepts, and principles related to communication and interaction within business negotiations, preparing students in accordance with the requirements of the Romanian economic and engineering environment, as well as practicing critical and speculative thinking to improve relational abilities in various social contexts.

7. Learning outcomes ¹⁴

Knowledge	<p>The student:</p> <ul style="list-style-type: none"> - Demonstrates understanding of key theories, concepts and principles of interpersonal and organizational communication. - Explains the processes and dynamics of business debates and negotiations. - Recognizes and interprets verbal, non-verbal, and paraverbal elements of communication. - Identifies factors that influence communication effectiveness in professional and multicultural environments. - Analyzes communication models and strategies relevant to business and social interactions.
Skills	<p>The student:</p> <ul style="list-style-type: none"> - Applies appropriate communication strategies in debates, meetings and negotiation contexts. - Uses persuasive and argumentative techniques to support viewpoints in business situations. - Practices active listening and provides constructive feedback to improve dialogue. - Adapts communication style to diverse social, cultural, and professional settings. - Employs critical and analytical thinking to evaluate communication scenarios and make informed decisions.
Responsibility and autonomy	<p>The student:</p> <ul style="list-style-type: none"> - Takes responsibility for his or her own communication performance in professional interactions. - Works independently or in teams to plan and conduct negotiation processes. - Maintains ethical and respectful communication in diverse social and cultural contexts. - Shows initiative in improving personal communication skills through continuous self-evaluation. - Facilitates cooperation, dialogue, and problem-solving within groups.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modeling), as well as action-based methods, such as exercises, practical activities, problem-solving).

9. Content

9.1. Lecture¹⁵	Teaching strategies	Time allocation
9.1.1. Human communication: general notions, concepts, theories	Interactive lecture, debates, explanations	2 hours
9.1.2. Social Phobia. Interpersonal Communication	Interactive lecture, debates, explanations	2 hours
9.1.3. Business Negotiation Training	Interactive lecture, debates, explanations	2 hours
9.1.4. Transactional Analysis	Interactive lecture, debates, explanations	2 hours

9.1.5. Elements of Proxemics in Business	Interactive lecture, debates, explanations	2 hours
9.1.6. Written Communication	Interactive lecture, debates, explanations	2 hours
9.1.7. Elements of Visual Identity in Business	Interactive lecture, debates, explanations	2 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Bonniwell Haslett, B. (2024). <i>Communicating and Organizing in Context: The Theory of Structural Interaction</i>. Routledge. 2. DeVito, J. A., <i>Interpersonnal Communication Book, Thirteenth Edition</i>, Pearson, 2013 3. McQuail, D., <i>Mass Communication Theory</i>, SAGE Publications Ltd, 2010 4. Miller, K., <i>Organizational Communication. Approaches and processes</i>, Wadsworth, Belmont, 2000 5. O’Keefe, D. J., <i>Conviction, Persuasion, and Argumentation: Untangling the Ends and Means of Influence</i>, Argumentation, Springer Science+Business Media, 2012 6. Unnamed Author, et al. <i>Business Communication for Success: GVSU Edition</i>. Grand Valley State University Libraries, 2017. http://scholarworks.gvsu.edu/books/13 7. Thill, J. V., Bovee, C.L., <i>Excellence in Business Communication</i>, Global edition, Pearson, 2016 8. Tracy, S. J. (2024, 3rd ed.). <i>Qualitative Research Methods: Collecting Evidence, Crafting Analysis, Communicating Impact</i>. Wiley 9. Schwarz, A., Seeger, M. W., & Kim, S. (Eds.) (2025, 2nd ed.). <i>The Handbook of International Crisis and Risk Communication Research</i>. Wiley 10. Williams, C., Horodnic, AV, Ciobanu, C.I. <i>The Informal Economy Exploring Drivers and Practices</i>, Routledge, Taylor & Francis Group, New York, 2017, Capitolul 5, pp 73-88. 11. <i>Communication, suport curs online</i>: https://classroom.google.com/c/ODMwNjgwNTM0NDYy 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam/test	<p>Completeness and accuracy of knowledge</p> <p>Logical coherence, fluency, and strength of argumentation</p> <p>Capacity for analysis, personal interpretation, originality, and creativity</p> <p>Level of command of specialised terminology and communication skills</p> <p>Ability to apply acquired skills</p> <p>Ability to process data and solve the problems presented</p>	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		100%
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)		
10.6 Passing requirements				
Minimum grade of 5				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): Lecturer Phd. Claudia-Ioana Ciobanu

Date of departmental approval:
September 2025

Head of Department,
Sef Lucr. Dr.ing Cătălin Onuțu

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta-aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)		Materiale și Elemente de Construcții Compozite Composite Construction Materials and Elements					
2.1.2. Course code		CE410					
2.2 Lecture instructor(s)		Șef lucr. dr. ing. Iuliana Hudișteanu					
2.3 Seminar/laboratory/project/practical session instructor(s)		Șef lucr. dr. ing. Iuliana Hudișteanu					
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DI

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar		3.3b laboratory	1	3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar		3.6b laboratory	14	3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										22	
Additional research in the library, on specialised electronic platforms, and in the field										14	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										22	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹		58									
3.8 Total number of hours per semester ¹⁰		100									
3.9 Number of ECTS credits		4									

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not applicable.
4.2 Learning outcomes prerequisites	Building Materials 1 – CE104; Strength of Materials 1 – CE116; Theory of Elasticity and Plasticity – CE211

5. Requirements

5.1 for the lecture ¹²	Blackboard, video projector, specific teaching materials.
5.2 for the seminar / laboratory / project ¹³	Blackboard, video projector, specific teaching materials.

6. General objective of the course

Composite Construction Materials and Elements. In this course, you will learn about the concept of composite materials, the main constituent materials used, manufacturing methods, advantages and disadvantages, as well as their domains of use in construction. An initial laboratory visit will allow you to identify the main constituent materials used in the fabrication of composite materials—based on their colour, shape and material nature.

The theoretical and practical components will help you characterize the structural response of various types of composite materials and sandwich structures subjected to different loads, starting from the micromechanics of a unidirectionally reinforced composite lamina, to the macromechanics of the composite lamina, and up to the macromechanics of composite laminates, evaluating their mechanical properties.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - defines the concept of a composite material - identifies the advantages and disadvantages of using composite materials in civil engineering - lists the main domains of use for composite materials in construction - recognizes the constituent materials presented in the laboratory based on their nature and their physical and mechanical properties - explains the physical meaning of the calculation relations for volume fractions and mass fractions - performs the analytical evaluation of the elastic and strength characteristics for various polymer composite materials reinforced with unidirectional fibres - uses the calculation relations for analysing the stress and strain state of a composite lamina - recognizes the constitutive equations for a specially orthotropic lamina / generally orthotropic lamina / composite laminate - associates the configuration of a composite laminate (using the existing notation system) with its geometry or graphical representation - represents graphically the distribution of normal and shear stresses through the thickness of a sandwich beam.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - uses digital tools for the realization of the graphs showing the variation of mechanical properties of the unidirectional continuous fibres reinforced polymeric composites, as a function of the volume fractions of the constituent materials - analyses the mechanical properties of composite materials depending on the nature and orientation of the fibres, the loading direction and the volume fraction of the constituent materials; compares the obtained results - critically evaluates the appropriate selection of composite materials based on the nature and the physical and mechanical properties of their constituents, for rigorous and sustainable design - critically selects suitable situations for using fibre-reinforced polymeric composite materials, as well as associated sandwich structures
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects principles, norms and ethical values in the correct and timely completion of professional tasks, by adopting a rigorous, efficient, and responsible work strategy in decision-making for problem-solving - participates actively in learning, takes part in discussions and asks questions - continually seeks information and updates knowledge in their field of activity by appropriately using effective lifelong learning methods and techniques - prepares the laboratory reports specific to the course - responds to the questions asked during the submission of the laboratory work.

8. Teaching strategies

In the teaching activity, participatory lectures and debates based on PowerPoint presentations will be used, which will be available for the students. The presentations contain images, sketches, and calculation formulas so that the information is easy to understand and assimilate. Each lecture will begin with a brief recall of the concepts covered in the previous session.

The teaching method is also based on discovery-learning models, facilitated by the direct and indirect exploration of reality (laboratory visits, demonstrations), as well as on action-based methods such as exercises, practical activities, and problem-solving.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
I.1. Introduction: Definition. Domains of use. The functions of the materials constituents. Classification. Advantages and disadvantages of composite materials. Volume fractions. Mass fractions	Interactive lecture, debates, explanations	3 hours
I.2. Constituent materials and Manufacturing Processes: Fibres. Matrix. Interface. Manufacturing processes	Interactive lecture, debates, explanations	2 hours
II.1. Micromechanics of unidirectional orthotropic lamina. Stiffness characteristics: Unidirectional composite lamina – the elementary unit. Micromechanics. The principal system of axes of the orthotropic lamina. Elastic behaviour of the unidirectional lamina: longitudinal modulus, transverse modulus, shear modulus, Poisson's ratios.	Interactive lecture, debates, explanations	4 hours
II.2. Micromechanics of unidirectional orthotropic lamina. Strength characteristics: Lamina in-plane loading schemes for basic strength parameters. Longitudinal tensile strength; Longitudinal compressive strength; Transverse tensile strength; Transverse compressive strength; In-plane shear strength. Failure modes.	Interactive lecture, debates, explanations	6 hours
III.1. Macromechanics of unidirectional composite lamina: Specially orthotropic lamina. Plane stress and strain state. Constitutive equations; Generally orthotropic lamina. Plane stress and strain state. Constitutive equations; Off-axes engineering constants.	Interactive lecture, debates, explanations	4 hours
III.2. Macromechanics of composite laminates: Laminated theory. The coordinate system and the geometry of a composite laminate. Notation system. The constitutive equations for composite laminates. The internal efforts per unit width of the composite laminates. Determination of the extensional stiffness matrix for symmetric composite laminates.	Interactive lecture, debates, explanations	4 hours
IV. Sandwich structures: Concept. Classification. Function of the individual layers. Advantages and domains of use. Sandwich beams with thin exterior layers: flexural rigidity, normal and shear stress distribution on the cross-section of the sandwich beam.	Interactive lecture, debates, explanations	3 hours
V. Sustainable use of composite materials in construction sector. Challenges and opportunities: Actual context. The necessity of using composite materials in construction sector: use of renewable and recyclable resources; durability and structural efficiency; reduction of carbon footprint; energy efficiency; environmental impact – Brainstorming with students, teamwork.	Interactive lecture, debates, explanations, brainstorming	2 hours
Reading list for the lecture:		
<ol style="list-style-type: none"> 1. Hudişteanu I. (2025) – Lectures notes, Google Classroom 2. Hudişteanu I., Ţăranu N., Isopescu D., Ungureanu D., Axinte A., Ghiga D.A. (2020), The influence of fibre orientation and of the adjacent layers on the delamination of laminated composites, International Conference ModTech 2020, IOP Conference Series: Materials Science and Engineering, 916, 012045, WOS:000625330000045. 3. Hudişteanu I., Ţăranu N., Isopescu D.N., Oprişan G., Enţuc I.S. (2019), "Structuri Stratificate din Lamele Compozite Armate cu Fibre", Editura Politehniun, Iaşi, 2019; 4. Hudişteanu I., Ţăranu N., Isopescu D.N., Munteanu V., Ungureanu D., Scutaru M. (2019), Interlaminar failure investigations on delamination growth of composite laminates, International Conference ModTech 2019, IOP Conference Series: Materials Science and Engineering, 591, 012038, WOS:000562929900038. 5. Hudişteanu I., Ţăranu N., Isopescu D.N., Munteanu V., Neculai O., Ungureanu D. (2019), Interlaminar damage numerical modelling based on delamination growth of multi-layered composites, Computational Civil Engineering Conference (CCE2019), IOP Conference Series: Materials Science and Engineering, 586, 012028, doi:10.1088/1757-899X/586/1/012028. 6. Hudişteanu I., Ţăranu N., Isopescu D.N., Enţuc I.S., Oprişan G., Ungureanu D. (2018), Numerical analysis of intralaminar damage evolution on various composite laminates, International Conference ModTech 2018, IOP Conference Series: Materials Science and Engineering, 400, 042031, WOS:000461147400103. 7. Hudişteanu I., Ţăranu N., Isopescu D.N., Bejan L., Axinte A., Ungureanu D. (2017), Improving the mechanical properties of composite laminates through the suitable selection of the corresponding materials and configurations, Revista Română de Materiale / Romanian Journal of Materials, Vol. 47 (2), pag. 252-266, WOS:000404823800019. 8. Hudişteanu I., Ţăranu N., Enţuc I.-S., Maxineasa S.G. (2016), Comparative analysis of the engineering constants of composite laminates, Revista Română de Materiale / Romanian Journal of Materials, Vol. 46 (2), pag. 232-241, WOS:000378101800014. 9. Ţăranu N. (2015), Polymeric composites in construction, University of Sheffield Printing Office, course notes. 10. Taranu N., Bejan L., Cozmanciuc R., Hohan R. (2013), Materiale și elemente compozite, Ed. Politehniun, Iaşi. 10. Barbero E. J. (2011), Introduction to composite materials design, Second Edition, CRC Press, Taylor & Francis, Boca Raton. 11. Hollaway L. C., Teng J. G. (2008), Strengthening and rehabilitation of civil infrastructures using fibre-reinforced polymer (FRP) composites, CRC Press, Woodhead Publishing Limited, Cambridge. 12. ACI 440.2R (2008), Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures. Reported by ACI Committee 440, American Concrete Institute. 13. GangaRao H.V.S., Taly N., Vijay P.V. (2007), Reinforced concrete design with FRP composites, CRC Press, Boca Raton. 14. Federation Internationale du Beton (fib) (2007), Fibre Reinforced Polymer Reinforcement for Reinforced Concrete Structures, Sprint-Digital-Druck, Stuttgart, Chapter 2 by Nicolae Taranu. 		

15. Federation Internationale du Beton (fib) (2006), Retrofitting of concrete structures by externally bonded FRPS, with emphasis on seismic applications, Technical Report, Lausanne.
16. Țăranu N., Oprișan G., Isopescu D., Entuc I., Munteanu V. (2006), Soluții compozite de reabilitare a structurilor ingineresti, Ed. STEF, ISBN 973-8961-71-4.
17. Bank, L.C. (2006), Composites for Construction. Structural Design with FRP Materials, John Wiley & Sons, Inc., Hoboken, New Jersey.
18. Eds Țăranu N., Oprișan G., Ențuc, I. (2006), Proceedings of the International Symposium on Structural Rehabilitation Solutions and Systems Utilizing Fiber Reinforced Polymer Composites, Iași, 18-19 May, ISBN 978-973-7962-88.
19. CNR-DT 201/2005 Guidelines for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures-Timber Structures, Consiglio Nazionale Delle Ricerche, Rome, Italy.
20. CNR-DT 202/2005 Guidelines for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures-Metallic Structures, Consiglio Nazionale Delle Ricerche, Rome, Italy.
21. MTCT (2005), Normativ privind consolidarea cu fibre a elementelor structurale de beton, Monitorul Oficial nr.132 bis/11 februarie 2005, Bucuresti.
22. Concrete Society (2004), Design guidance for strengthening concrete structures using fibre composite materials, Technical Report 55, Second Edition, The Concrete Society, Camberley.
23. Canadian Standards Association, CSA S806-02 (2004), Design and construction of building components with fibre-reinforced polymers, Canadian Standards Association, Toronto.
24. Stoian V., Tamas N. G., Dan D., Gergely J., Daescu, C. (2004), Materiale compozite pentru constructii, Ed. Politehnica, Timișoara.
25. Budescu M., Țăranu N., Lungu I. (2003), Building Rehabilitation, Ed. Societatii Academice "Matei-Teiu Botez" Iasi, ISBN 973-7962-26-5
26. Țăranu N., Isopescu D. (1996), Structures made of composite materials, Ed. VESPER, Iasi, ISBN 973 96589-3-88.

9.2b Laboratory	Work methods ¹⁷	Observations, allotted time
<p>Laboratory work 1. Laboratory visit. Volume fractions. Mass fractions: Presentation in the laboratory of the main materials constituents used in composite materials – identification of constituent materials based on color, shape, nature of the material; classification. Presentation in the laboratory of the technical solutions for strengthening structural elements made of traditional materials using fiber-reinforced polymer composite materials (FRP). Laboratory presentation of pultruded composite products. Calculation of volume fractions. Calculation of mass fractions.</p>	Practical demonstration, explanations, applications, discussions	2 hours
<p>Laboratory work 2. Micromechanics of unidirectional composite lamina. Elastic constants and strength properties: Evaluation of the elastic constants and of the strength properties for the unidirectional composite lamina (E_L, E_T, G_{LT}, ν_{LT}, ν_{TL}, f_{LT}, f_{LC}, f_{TC}, f_{LTC}).</p>	Interactive explanations, applications, discussions, individual work	4 hours
<p>Laboratory work 3. Macromechanics of unidirectional composite lamina and macromechanics of composite laminate: Specially orthotropic lamina. Plane stress state Generally orthotropic lamina. Plane stress state Macromechanics of composite laminates.</p>	Interactive explanations, applications, discussions, individual work, oral evaluation	4 hours
<p>Laboratory work 4. Sandwich beams. Evaluation of the flexural rigidity, evaluation and distribution of the normal and shear stresses on the cross section of a sandwich beam subjected to bending. Evaluation of the laboratory works.</p>	Interactive explanations, applications, discussions, individual work, oral evaluation	4 hours

- Reading list for the laboratory:
1. Hudișteanu I. (2025) – Laboratory works, Google Classroom
 2. Hudișteanu I., Țăranu N., Isopescu D., Ungureanu D., Axinte A., Ghiga D.A. (2020), The influence of fibre orientation and of the adjacent layers on the delamination of laminated composites, International Conference ModTech 2020, IOP Conference Series: Materials Science and Engineering, 916, 012045, WOS:000625330000045.
 3. Hudișteanu I., Țăranu N., Isopescu D.N., Oprișan G., Ențuc I.S. (2019), "Structuri Stratificate din Lamele Compozite Armate cu Fibre", Editura Politehnicum, Iași, 2019;
 4. Hudișteanu I., Țăranu N., Isopescu D.N., Munteanu V., Ungureanu D., Scutaru M. (2019), Interlaminar failure investigations on delamination growth of composite laminates, International Conference ModTech 2019, IOP Conference Series: Materials Science and Engineering, 591, 012038, WOS:000562929900038.
 5. Hudișteanu I., Țăranu N., Isopescu D.N., Munteanu V., Neculai O., Ungureanu D. (2019), Interlaminar damage numerical modelling based on delamination growth of multi-layered composites, Computational Civil Engineering Conference (CCE2019), IOP Conference Series: Materials Science and Engineering, 586, 012028, doi:10.1088/1757-899X/586/1/012028.
 6. Hudișteanu I., Țăranu N., Isopescu D.N., Ențuc I.S., Oprișan G., Ungureanu D. (2018), Numerical analysis of intralaminar damage evolution on various composite laminates, International Conference ModTech 2018, IOP Conference Series: Materials Science and Engineering, 400, 042031, WOS:000461147400103.

7. Hudișteanu I., Țăranu N., Isopescu D.N., Bejan L., Axinte A., Ungureanu D. (2017), Improving the mechanical properties of composite laminates through the suitable selection of the corresponding materials and configurations, *Revista Română de Materiale / Romanian Journal of Materials*, Vol. 47 (2), pag. 252-266, WOS:000404823800019.
8. Hudișteanu I., Țăranu N., Ențuc I.-S., Maxineasa S.G. (2016), Comparative analysis of the engineering constants of composite laminates, *Revista Română de Materiale / Romanian Journal of Materials*, Vol. 46 (2), pag. 232-241, WOS:000378101800014.
9. Țăranu N. (2015), *Polymeric composites in construction*, University of Sheffield Printing Office, course notes.
10. Taranu N., Bejan L., Cozmanciuc R., Hohan R. (2013), *Materiale și elemente compozite*, Ed. Politehniun, Iași.
10. Barbero E. J. (2011), *Introduction to composite materials design*, Second Edition, CRC Press, Taylor & Francis, Boca Raton.
11. Hollaway L. C., Teng J. G. (2008), *Strengthening and rehabilitation of civil infrastructures using fibre-reinforced polymer (FRP) composites*, CRC Press, Woodhead Publishing Limited, Cambridge.
12. ACI 440.2R (2008), *Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures*. Reported by ACI Committee 440, American Concrete Institute.
13. GangaRao H.V.S., Taly N., Vijay P.V. (2007), *Reinforced concrete design with FRP composites*, CRC Press, Boca Raton.
14. Federation Internationale du Beton (fib) (2007), *Fibre Reinforced Polymer Reinforcement for Reinforced Concrete Structures*, Sprint-Digital-Druck, Stuttgart, Chapter 2 by Nicolae Taranu.
15. Federation Internationale du Beton (fib) (2006), *Retrofitting of concrete structures by externally bonded FRPS, with emphasis on seismic applications*, Technical Report, Lausanne.
16. Țăranu N., Opreșan G., Isopescu D., Entuc I., Munteanu V. (2006), *Soluții compozite de reabilitare a structurilor inginerești*, Ed. STEF, ISBN 973-8961-71-4.
17. Bank, L.C. (2006), *Composites for Construction. Structural Design with FRP Materials*, John Wiley & Sons, Inc., Hoboken, New Jersey.
18. Eds Țăranu N., Opreșan G., Ențuc, I. (2006), *Proceedings of the International Symposium on Structural Rehabilitation Solutions and Systems Utilizing Fiber Reinforced Polymer Composites*, Iași, 18-19 May, ISBN 978-973-7962-88.
19. CNR-DT 201/2005 *Guidelines for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures-Timber Structures*, Consiglio Nazionale Delle Ricerche, Rome, Italy.
20. CNR-DT 202/2005 *Guidelines for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures-Metallic Structures*, Consiglio Nazionale Delle Ricerche, Rome, Italy.
21. MTCT (2005), *Normativ privind consolidarea cu fibre a elementelor structurale de beton*, Monitorul Oficial nr.132 bis/11 februarie 2005, Bucuresti.
22. Concrete Society (2004), *Design guidance for strengthening concrete structures using fibre composite materials*, Technical Report 55, Second Edition, The Concrete Society, Camberley.
23. Canadian Standards Association, CSA S806-02 (2004), *Design and construction of building components with fibre-reinforced polymers*, Canadian Standards Association, Toronto.
24. Stoian V., Tamas N. G., Dan D., Gergely J., Daescu, C. (2004), *Materiale compozite pentru constructii*, Ed. Politehnica, Timișoara.
25. Budescu M., Țăranu N., Lungu I. (2003), *Building Rehabilitation*, Ed. Societatii Academice "Matei-Teiu Botez" Iasi, ISBN 973-7962-26-5
26. Țăranu N., Isopescu D. (1996), *Structures made of composite materials*, Ed. VESPER, Iasi, ISBN 973 96589-3-88.

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	-	50% (minim 5)
		- formative assessment test (tests during the semester)	-	
		- summative assessment test (final assessment)	100%	
10.5b Laboratory	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - oral evaluation for the Laboratory Worksheets		50% (minim 5)

10.6 Passing requirements

The student must be able to define the concept of a composite material and recognizes its constituent materials based on their nature and their physical and mechanical properties.

The student must be able to analytically evaluate the elastic and strength characteristics of various fibres reinforced polymeric composites.

The student must be able to analyse the structural response of laminated composites and sandwich elements under different types of loading.

The student must be able to establish, through critical thinking, the suitable situations for using fibre reinforced polymeric composite materials, as well as sandwich elements.

The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.

Date of completion: September 2025

Lecture instructor: Lecturer Iuliana Hudişteanu, PhD

Seminar/laboratory/project/practical session instructor(s): Lecturer Iuliana Hudişteanu, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Enţuc, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Masonry mechanics / Mecanica zidărilor						
2.1.2. Course code	CE411						
2.2 Lecture instructor(s)	Conf. univ. dr. ing. Radu-Aurel Pescaru						
2.3 Seminar/laboratory/project/practical session instructor(s)	Conf. univ. dr. ing. Radu-Aurel Pescaru						
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DO/DS

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										10	
Additional research in the library, on specialised electronic platforms, and in the field										10	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										13	
Assessment ⁸										4	
Other activities:											
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not the case.
4.2 Learning outcomes prerequisites	Physics, Mathematics

5. Requirements

5.1 for the lecture ¹²	- Video projector, blackboard, documentary films, - Online: TUIASI's (http://edu.tuiasi.ro) or Google meet platform - Students will respect the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iași.
5.2 for the seminar / laboratory / project ¹³	- Computing technology, software packages, experimental stands, - The deadlines for submitting the papers are established by the lecturer in agreement with the students.

6. General objective of the course

The “Masonry Mechanics” course aims to develop advanced competencies in the analysis, design, and verification of masonry structures, with a focus on their behaviour under seismic and gravitational actions. The course seeks to enhance students’ ability to apply modern methods of structural calculation, modelling, and verification, in

accordance with European technical regulations (Eurocode 6 and Eurocode 8) and national standards (P100). Additionally, the course aims to cultivate an integrated and responsible perspective on the safety, durability, and sustainability of masonry buildings, promoting innovative and efficient construction solutions from structural, economic, and energy-performance standpoints.

7. Learning outcomes ¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Identify the types of masonry structures used in civil constructions. - Describe the properties of the component materials and their role in structural behaviour. - Explain the essential performance requirements for masonry buildings. - Interpret the principles of architectural-structural design and the criteria of regularity. - Explain the methods for verifying the strength and stability of structural walls. - Recognize the effects of gravitational and seismic actions on masonry elements. - Understand the principles of verification at the ultimate limit state and at the serviceability limit state.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Apply calculation methods to evaluate the strength of walls under compression, bending, and shear. - Analyse the seismic behaviour of structures with masonry walls. - Assess gravitational and horizontal loads and their effects on the structure. - Develop calculation models and stress diagrams for load-bearing elements. - Verify structural safety and stability in accordance with current regulations. - Use structural analysis software and interpret the results. - Prepare technical documentation and structural verification reports
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Adhere to the principles of professional ethics in structural design activities. - Critically evaluate existing structural solutions and propose optimized alternatives. - Justify design decisions in relation to structural safety and performance. - Collaborate effectively within multidisciplinary design teams. - Integrate sustainability and energy efficiency criteria into construction solutions. - Communicate technical results clearly and professionally to clients and authorities. - Continuously update knowledge through individual study and ongoing training.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, numerical modelling), as well as action-based methods, such as exercises, case study, problem-solving.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. I. Masonry (constructions) buildings: General introduction. Classification. Structural systems used for civil buildings. Buildings with structural masonry walls	Interactive lecture, debates, discusses - explanations on case study	4 hours
II. Materials used in masonry: Introduction. Classification of masonry. Materials for masonry: masonry, mortar, concrete, steel for re-bars (reinforcement), anchorage. Mechanical and deformation properties of masonry.		4 hours
9.1.3. III. Performance requirement = essential requirements: Mechanical strength and stability. Safety in operation. Fire hazard security. Hygiene, health and the environment Thermal insulation, waterproofing and energy saving. Protection against noise. Rational use of natural resources. Durability of masonry.		2 hours
9.1.4. IV. The design of structures with active masonry walls. Preliminary design of buildings with masonry structural walls. Constructive measures for the overall compliance of the structure: Generalities. Preliminary architectural- structural design. Principles of architectural - structural composition. Building composition in plan and elevation. Criteria for structural regularity. Types of structures on structural masonry walls.		6 hours

9.1.5. V. Design resistance evaluation: Adoption of the calculation model. Calculation of the design resistance of structural walls. Assumptions for calculation.	Interactive lecture, debates, discusses - explanations on case study	4 hours
9.1.6. VI. Stress assessment under seismic load combination design situation: General principles computation. Design checking of the structures for vertical actions. The model of computation. Methods of calculation. Eccentricities of vertical loads. Design of structures with masonry walls for horizontal forces. The model of computation. Methods of calculating the horizontal seismic forces. Calculation of stresses in structural walls. Design checks of laterally loaded masonry walls. Models and methods of calculation		2 hours
9.1.7. VII. Checking the structural safety: Resistance checks. Structural regularity and irregularity. Design of simple buildings. Checking the masonry wall members subjected to bending and axial forces. Checking the masonry wall members subjected to lateral forces. Checking the coupling members.		6 hours
<p><i>Reading list for the lecture:</i></p> <ol style="list-style-type: none"> 1. R.A. Pescaru - <i>Masonry Constructions – Lecture Notes 2025/ on web-</i> (https://edu.tuiasi.ro/course/view.php?id=2367#section-1); 2. R.A. Pescaru - <i>Civil Constructions * Building Elements, Ed. Soc. Acad. "Matei-Teiu Botez"- Iasi, ISBN 973-7962-62-1, 2005;</i> 3. R.A. Pescaru - <i>Clădiri 1 - Elemente de teoria, tehnica și fizica construcțiilor - Editura PIM, ISBN 978-606-13-1716-5, ISBN 978-606-13-1615-8, 2013;</i> 4. J. S. Foster, R. Harington - <i>Structure and fabric, Essex Longman 2007, 1996.</i> 5. John Ochsendorf - <i>Basic Structural Design, MIT Course , 2009, https://ocw.mit.edu/courses/architecture/4-440-basic-structural-design-spring-2009;</i> 6. J. C. Huang - <i>Masonry Structural Design for Buildings, 2012 / https://pdhonline.com/courses/s145/s145.pdf.</i> 		
9.2a Seminar Design of a civil building (UG+G +4 Fl ... UG+G +8 Fl) with semi-rigid structure (shear walls + lamellar frames) of monolith or prefab reinforced concrete.	Work methods ¹⁶	Observations, allotted time
I. Structural conception (design) of the building. The current floor Plan, , Constructive details (walls, floors, basement wall).	“Discussions, explanations, case studies, demonstration of solution variants, individual work, modelling exercises, verification calculations, interpretation of results, error analysis, etc.”	4 hours
II. Preliminary design requirements, shear walls (diaphragms) geometric characteristics – Cross section.		2 hours
III. Loads evaluation: permanent loads (self-weight), variable loads (live loads, snow load, dividing walls) and accidental actions (seismic loading). Combination the actions effects on the structure.		3 hours
IV. Building structure sectional characteristics. Shear walls rigidity estimation. Equivalent moments of Inertia		5 hours
V. Distribution of the vertical and horizontal loads to the vertical structural elements. Load effect diagrams on the elements (M, N, T for walls and connecting beam) calculation.		5 hours
VI. Evaluation of the strength design conditions in the analyzed building elements. Shear-wall and connecting beam reinforcement design and stress condition checking (for eccentric compression and shear).		7 hours
VII. Plans with diaphragms reinforcement and characteristic details.Final evaluation of the project.		2 hours
<p><i>Reading list for the seminar / laboratory / project:</i></p> <ol style="list-style-type: none"> 1. R. A. Pescaru – <i>Civil Constructions * Building Elements, Ed. Soc. Acad. "Matei-Teiu Botez"-Iasi, ISBN 973-7962-62-1,2005;</i> 2. R.A. Pescaru - <i>Masonry Constructions – Laboratory Guide / Indrumar de laborator pe web și suport printat</i> (https://edu.tuiasi.ro/course/view.php?id=2367#section-2); 3. Pescaru R.-A. (2015), <i>Clădiri : îndrumar de proiectare , Ed. Soc. Academice "Matei - Teiu Botez", ISBN 978-606-582-081-4</i> 4. <i>Eurocode - BS EN 1990:2002 - Basis of structural design;</i> 5. <i>BS EN 1996-1-1:2005 Design of masonry structures. General rules for reinforced and unreinforced masonry structures;</i> 6. <i>BS EN 1996-3:2006 Design of masonry structures. Simplified calculation methods for unreinforced masonry structures;</i> 7. <i>Eurocode - Eurocode - BS EN 1992-1-1:2004 - Design of concrete structures. General rules and rules for buildings;</i> 8. <i>P100/1 – 2025 -2019 - 2013 Cod de proiect. seismică. Prevederi de proiectare pt. clădiri.</i> 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final assessment: colloquium	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation	- systematic observation of students (individual or group assignments – which must be completed during the week between	20%	50% (minim 5)

	Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	lectures, preparation of a report, case study) - formative assessment test (tests during the semester) - summative assessment test (final assessment): multiple choice test , solving a given problem or subject and discussions	- 80%	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test		50% (minim 5)
10.6 Passing requirements Students must be able to describe the mechanical characteristics of brickwork masonry structural walls, understand their functional and structural requirements and the connections between them and other structural elements of the entire building structure. Also, must be able to design a building with brickwork masonry structural/shear walls, to present a report with written notes and drawings for a building structure based on given requirements.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): Associate Professor Radu-Aurel Pescaru, PhD

Seminar/laboratory/project/practical session instructor(s): Associate Professor Radu-Aurel Pescaru, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Reabilitarea termofizică a construcțiilor Thermophysical Rehabilitation of Buildings						
2.1.2. Course code	CE411						
2.2 Lecture instructor(s)	Senior Lecturer Laura Dumitrescu, PhD						
2.3 Seminar/laboratory/project/practical session instructor(s)	Senior Lecturer Laura Dumitrescu, PhD						
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										8	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										10	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹		33									
3.8 Total number of hours per semester ¹⁰		75									
3.9 Number of ECTS credits		3									

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not applicable
4.2 Learning outcomes prerequisites	Building Materials, Physics, Civil Buildings, Environmental Engineering, Civil Constructions

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> • Computer, video projector, blackboard, specific teaching materials • Students will respect the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iași
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> • Equipment, computing technology, software packages, video projector

6. General objective of the course

The course **Thermophysical Rehabilitation of Building** has the general objective of developing the knowledge and skills necessary for evaluating, designing, and implementing solutions to improve the energy performance of

existing buildings, in accordance with current technical, legislative, and environmental protection requirements. The course aims to develop students' ability to analyse the energy efficiency of a building, to select appropriate rehabilitation materials and systems, and to apply modern principles and methods for increasing energy efficiency. It takes into account the correlation of technical, economic, comfort, and environmental aspects, promoting professional attitudes oriented toward quality, sustainability, and engineering responsibility.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Recognizes the main concepts regarding the energy performance of buildings and the thermal performance of envelope components; - Defines the concepts of thermal rehabilitation and energy efficiency; - Identifies the key factors involved in the rehabilitation of the built environment; - Lists the types of thermal insulation materials used in rehabilitation works and explains the criteria for selecting insulation materials; - Applies regulations and execution principles to ensure the quality of works; - Uses standards and dedicated software in the analysis of insulation solutions; - Performs comparative analyses of different thermal rehabilitation solutions based on performance and cost; - Critiques common design or execution errors in rehabilitation works.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Identifies degradations and damages that affect the energy efficiency of buildings; - Makes simple observations regarding the thermal performance of envelope elements; - Practices using dedicated applications for determining the energy efficiency of buildings; - Performs precise calculations of indoor comfort temperature, heated volume, corrected thermal resistance, and energy consumption for a building; - Generates the building's energy performance certificate using dedicated applications; - Evaluates the impact of rehabilitation measures on energy consumption.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Shows attention and interest toward issues of energy efficiency and the rehabilitation of the built environment; - Recognizes the importance of regulations regarding energy performance and environmental protection; - Participates actively in discussions and responds to challenges related to technical rehabilitation solutions; - Demonstrates willingness to learn modern methods of energy analysis; - Collaborates effectively in teams for developing case studies; - Demonstrates professional responsibility and respects engineering ethics in rehabilitation activities; - Proposes solutions for optimizing the energy performance of existing buildings.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modeling), as well as action-based methods, such as exercises, practical activities, problem-solving.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Introduction: Principles of thermo-energetic rehabilitation of buildings. Performance criteria and requirements. Technical expertise and energy audit. Functional, structural, and thermal rehabilitation. Assessment of rehabilitation possibilities. Major renovation.	Interactive lecture, debates, explanations	4 hours
9.1.2. Insulating materials: Physical characteristics. Classification. Presenting materials. Criteria for use. Choosing materials.		4 hours
9.1.3. Solutions for thermal rehabilitation of facades: Constructive solutions for walls. Application of thermal insulation to the outside/inside. Thermal bridging influence. Energy rehabilitation solutions for glazed surfaces.		4 hours

9.1.4. Thermal rehabilitation solutions at the roof level: Terraces. Cold pitched roofs. Warm pitched roofs.		4 hours
9.1.5. Thermal rehabilitation solutions at the ground level: Slabs over the basement. Slabs on the soil.		4 hours
9.1.6. Technical conditions for execution		4 hours
9.1.7. Case studies. Exemplary solutions for thermophysical rehabilitation.		4 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Velicu, C., Romila, C., Pristav, C. (2013). Design and execution of thermal rehabilitation works on buildings, Ed. Societății Academice “Matei-Teiu Botez”, Iași, ISBN 9786065820241, 253 pp. (in Romanian) 2. Velicu, C. (2007). Thermo-physical Rehabilitation of Buildings, Ed. Experților Tehnici, Iași, ISBN 978-973-87988-2-3, 187 pp. (in Romanian) 3. Moss, K.J. (2007). Heat and Mass Transfer in Buildings, 2nd ed., Ed. Taylor and Francis, NY, ISBN 978-0-415-40908-7, 307 pp. 4. xxx SC 007-2013: Soluții cadru privind reabilitarea termo-higro-energetică a anvelopei clădirilor de locuit existente 5. xxx EU Renovation Wave Strategy (2020), https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf 6. xxx ISO 7345:2018 - Thermal performance of buildings and building components — Physical quantities and definitions 7. xxx ISO 6946:2017 - Building components and building elements - Thermal resistance and thermal transmittance - Calculation method 8. xxx ISO 10077-1:2017 -2:2017 - Thermal performance of windows, doors, and shutters - Calculation of thermal transmittance. Part 1: General. Part 2: Numerical method for frames 9. xxx ISO 14683:2017 - Thermal bridges in building constructions - Linear thermal transmittance - Simplified methods and default values 10. xxx ISO 13370:2017 - Thermal performance of buildings - Heat transfer via the ground - Calculation method 11. xxx ISO 13789:2017 - Thermal performance of buildings - Transmission and ventilation heat transfer coefficients - Calculation method 12. xxx ISO 52016:2017 – Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures 		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
9.2.1. Selecting an existing public building to be analysed and collecting the data and documents required for the analysis	Discussions, explanations, modeling, analysis, interpretation of results	2 hours
9.2.2. Determining the characteristics of the envelope elements and the heated volume		2 hours
9.2.3. Analysing the current situation using dedicated calculation software		2 hours
9.2.4. Preparing the energy performance certificate and interpreting the results		2 hours
9.2.5. Proposing thermal rehabilitation solutions to reduce energy consumption		2 hours
9.2.6. Modeling the proposed rehabilitation solutions using dedicated software		2 hours
9.2.7. Comparative analyses. Conclusions		2 hours
<p>Reading list for the seminar / laboratory / project:</p> <ol style="list-style-type: none"> 1. Velicu, C., Romila, C., Pristav, C. (2013). Design and execution of thermal rehabilitation works on buildings, Ed. Societății Academice “Matei-Teiu Botez”, Iași, ISBN 9786065820241, 253 pp. (in Romanian) 2. xxx C107- 2005 (cu modificările și completările ulterioare): Normativ privind calculul termotehnic al elementelor de construcție ale clădirilor 3. xxx Mc 001-2022: Metodologie de calcul a performanței energetice a clădirilor 4. xxx SC 007-2013: Soluții cadru privind reabilitarea termo-higro-energetică a anvelopei clădirilor de locuit existente 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Colloquium	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		50% (min. 5)
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)	100%	

10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test	50% (min. 5)
10.6 Passing requirements The student must demonstrate the ability to assess the energy efficiency of existing buildings using dedicated software and to select appropriate materials and thermal rehabilitation solutions, considering technical, economic, comfort, and environmental criteria.			
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Lecture instructor(s): Senior Lecturer Laura Dumitrescu, PhD

Seminar/laboratory/project/practical session instructor(s): Senior Lecturer Laura Dumitrescu, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Concrete Structures, Building Materials, Technology and Management (BMTM)
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)			Tehnologii performante pentru lucrările de construcții (Advanced Technologies for Construction Works)				
2.1.2. Course code			CE412				
2.2 Lecture instructor(s)			Șef lucr. dr. ing. Ciprian-Ilie COZMANCIUC				
2.3 Seminar/laboratory/project/practical session instructor(s)			Șef lucr. dr. ing. Ciprian-Ilie COZMANCIUC				
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	Vp	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	2	3.2 lecture	2	3.3a seminar		3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	28	3.5 lecture	28	3.6a seminar		3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										20	
Additional research in the library, on specialised electronic platforms, and in the field										7	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										20	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	47										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	• Not required
4.2 Learning outcomes prerequisites	• Not required

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> Teaching activities at the faculty premises: blackboard, video projector, specific teaching materials, etc.; Students will comply with the Student Rights and Obligations Code and the regulations provided in the Charter of the “Gheorghe Asachi” Technical University of Iași.
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> Teaching activities at the faculty premises: blackboard, video projector, specific teaching materials, etc.; Students will comply with the Student Rights and Obligations Code and the regulations provided in the Charter of the “Gheorghe Asachi” Technical University of Iași.

6. General objective of the course

Study of advanced technological processes and procedures aimed at achieving quality, productivity, and economic efficiency in construction execution.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Assimilates basic concepts regarding special technologies for plain and reinforced concrete works; - Assimilates basic concepts regarding special technologies for precast and prestressed concrete works; - Assimilates basic concepts regarding assembly technologies for precast concrete structures; - Assimilates basic concepts regarding special technologies for earthworks; - Assimilates basic concepts regarding special technologies for masonry and timber works.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - The student/graduate determines, utilizes, and compares the physical and mechanical characteristics of construction materials for their use in the sizing and verification of structural elements; - The student/graduate evaluates construction elements and operating conditions for the purpose of completing written components within technical projects..
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Respects the principles, norms, and ethical values in the correct and timely execution of professional tasks, by adopting a rigorous, efficient, and responsible work strategy in decision-making for problem-solving; - Integrates into the workgroup and applies interpersonal and effective teamwork techniques within multidisciplinary teams across various hierarchical levels; - Continuously seeks information and documentation in their field of activity through the appropriate use of effective lifelong learning methods and techniques; - Develops technological projects in the field of engineering.

8. Teaching strategies

The teaching activities will include participative lectures and discussions based on PowerPoint presentations made available to students. The presentations contain images, video materials, and sketches to ensure that the information is easily understood and assimilated. Each class will begin with a brief recap of the concepts covered in the previous session. The teaching method is based on practical examples specific to the construction industry. Classes may also include visits to active construction sites to present the studied concepts in a practical, hands-on manner..

9. Content

9. 1. Lecture¹⁵	Teaching strategies	Time allocation
9.1.1. Special Technologies for Plain and Reinforced Concrete Works Technology of shotcrete works and other special technologies for concrete works. Equipment and machinery used. Inspection and acceptance of shotcrete works.	Interactive lecture, Use of video projector, Discussions, Explanations	10 hours
9.1.2. Execution Technology of Prefabricated and Prestressed Elements Technology for producing prefabricated elements. Technology for producing prestressed elements. Equipment and machinery used. Inspection and acceptance of prefabrication and prestressing works.	Interactive lecture, Use of video projector, Discussions, Explanations	4 hours
9.1.3. Technology for the Assembly of Prefabricated and Prestressed Elements Transport, storage, handling, and assembly. Execution of joints and connections. Equipment and machinery used. Inspection and acceptance of the assembly of prefabricated elements.	Interactive lecture, Use of video projector, Discussions, Explanations	4 hours
9.1.4. Special Earthworks Technology Execution of special earthworks. High-performance equipment and machinery used. Technology for supporting deep excavations.	Interactive lecture, Use of video projector, Discussions, Explanations	4 hours
9.1.5. Masonry and Timber Works Technology Technology for masonry and timber works. Materials, products, and equipment used during execution. Quality assurance and verification criteria for the works.	Interactive lecture, Use of video projector,	6 hours

	Discussions, Explanations	
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Radu Lupășteanu – Course Notes “Advanced Construction Technologies” – updated annually and distributed to students at the beginning of the semester in electronic format 2. Standard for the production of concrete and execution of works in concrete, reinforced concrete, and prestressed concrete – Part 1: Concrete Production, NE 012/1 – 2022 3. Standard for the production of concrete and execution of works in concrete, reinforced concrete, and prestressed concrete – Part 2: Execution of Concrete Works, NE 012/2 – 2022 4. Code of Practice for the Execution of Prefabricated Elements in Concrete, Reinforced Concrete, and Prestressed Concrete, NE 013/2002, INCERC Bucharest, 2002 5. Suman R., Ghibu M., Gheorghiu N., Oară C., Oțel A., Modern Construction Technologies, Tehnică Publishing, Bucharest, 1987 6. Tologea, S., Pop, S., Execution of Construction Works – Guide, Tehnică Publishing, Bucharest, 1987 7. Trelea, A., et al., Construction Technology, Vol. 1, Dacia Publishing, Cluj-Napoca, 1997. 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Test	<p>Completeness and accuracy of knowledge</p> <p>Logical coherence, fluency, and strength of argumentation</p> <p>Capacity for analysis, personal interpretation, originality, and creativity</p> <p>Level of command of specialised terminology and communication skills</p> <p>Ability to apply acquired skills</p> <p>Ability to process data and solve the problems presented</p>	<p>- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)</p>	0%	100%
		<p>- formative assessment test (tests during the semester)</p>	100%	
		<p>- summative assessment test (final assessment)</p>	0%	
10.6 Passing requirements				
At least achieving a grade of 5 in the tests.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): s.l. dr. ing. Ciprian-Ilie COZMANCIUC

Date of departmental approval:
September 2025

Head of Department,
s.l. dr. ing. Cătălin ONUȚU

Date of faculty council approval:

Dean,

September 2025

Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Concrete Structures, Building Materials, Technology and Management (BMTM)
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Structuri Prefabricate pentru Construcții Civile și Industriale (Precast Structures for Civil and Industrial Buildings)			
2.1.2. Course code				CE412			
2.2 Lecture instructor(s)				Șef lucr. dr. ing. Ciprian-Ilie COZMANCIUC			
2.3 Seminar/laboratory/project/practical session instructor(s)							
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	Vp	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	2	3.2 lecture	2	3.3a seminar		3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	28	3.5 lecture	28	3.6a seminar		3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										20	
Additional research in the library, on specialised electronic platforms, and in the field										7	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										20	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	47										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	• Not required
4.2 Learning outcomes prerequisites	• Not required

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> Teaching activities at the faculty premises: blackboard, video projector, specific teaching materials, etc.; Students will comply with the Student Rights and Obligations Code and the regulations provided in the Charter of the “Gheorghe Asachi” Technical University of Iași.
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> Teaching activities at the faculty premises: blackboard, video projector, specific teaching materials, etc.; Students will comply with the Student Rights and Obligations Code and the regulations provided in the Charter of the “Gheorghe Asachi” Technical University of Iași.

6. General objective of the course

Study of advanced technological processes and procedures aimed at achieving quality, productivity, and economic efficiency in construction execution.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Understands the characteristics and advantages of prefabricated structures compared to monolithic structures; - Knows the principles of layout, design, and sizing of prefabricated elements: slabs, beams, columns, and walls; - Identifies technological solutions for the transport, handling, and assembly of prefabricated elements; - Understands the types of joints and connections used in prefabricated structures and the criteria for their implementation; - Knows the standards, norms, and regulations applicable to the execution and inspection of prefabricated works; - Understands the correlation between structural design and the technological requirements for the execution of prefabricated elements.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Applies the principles of design and configuration for prefabricated elements according to structural and technological requirements; - Analyzes and selects optimal execution, transport, and assembly solutions for prefabricated elements; - Evaluates the techniques for creating joints and connections to ensure structural continuity and stability; - Uses technical documentation and specific standards for planning and verifying the execution process of prefabricated elements; - Identifies potential nonconformities and proposes technical solutions for their remediation.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Demonstrates responsible behavior in applying health and safety regulations on the construction site; - Makes well-founded technical decisions regarding the execution, transport, and assembly of prefabricated elements within the limits of their competencies; - Independently manages practical tasks and technological projects specific to prefabricated elements; - Collaborates effectively in multidisciplinary teams, taking on roles and responsibilities within the execution process; - Adheres to ethical principles and professional values in performing tasks and reporting practical results; - Continuously researches and improves knowledge in the field of prefabricated elements, integrating theoretical information with practical experience; - Develops technological projects in the field of engineering

8. Teaching strategies

The teaching activities will include participative lectures and discussions based on PowerPoint presentations made available to students. The presentations contain images, video materials, and sketches to ensure that the information is easily understood and assimilated. Each class will begin with a brief recap of the concepts covered in the previous session. The teaching method is based on practical examples specific to the construction industry. Classes may also include visits to active construction sites to present the studied concepts in a practical, hands-on manner..

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
I. Introduction: Particularities of precast structures. Advantages and disadvantages. Solutions and design principles.	Interactive lecture, Use of video	10 hours

	projector, Discussions, Explanations	
II. Precast floors: Solutions and construction methods. Design, execution, transport and assembly.	Interactive lecture, Use of video projector, Discussions, Explanations	4 hours
III. Precast girders: Solutions and construction methods. Design, execution, transport and assembly.	Interactive lecture, Use of video projector, Discussions, Explanations	4 hours
IV. Precast columns and structural walls: Solutions and construction methods. Design, execution, transport and assembly.	Interactive lecture, Use of video projector, Discussions, Explanations	4 hours
V. Nodes and joints: Solutions and technologies for making nodes and joints at precast concrete structures.	Interactive lecture, Use of video projector, Discussions, Explanations	6 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> Code of Practice for the Execution of Prefabricated Concrete Elements, Reinforced and Prestressed Concrete, NE 013/2002, INCERC Bucharest, 2002. Standard for the Production of Concrete and Execution of Works in Concrete, Reinforced and Prestressed Concrete – Part 1: Concrete Production, NE 012/1 – 2022, INCERC Bucharest, 2022. Standard for the Production of Concrete and Execution of Works in Concrete, Reinforced and Prestressed Concrete – Part 2: Execution of Concrete Works, NE 012/2 – 2022, INCERC Bucharest, 2022. Kim S. Elliott – Precast Concrete Structures, CRC Press, June 2019. Alfred Steinle, Hubert Bachmann, Mathias Tillmann – Precast Concrete Structures, Wiley, 2019. PCI Design Handbook: Precast and Prestressed Concrete, 7th edition, 2014. Mihai P. – Prefabricated Structures for Civil and Industrial Buildings – Lecture Notes, 2022. 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	0%	100%
		- formative assessment test (tests during the semester)	100%	
		- summative assessment test (final assessment)	0%	
10.6 Passing requirements At least achieving a grade of 5 in the tests.				

The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.

Date of completion: September 2025

Lecture instructor(s): s.l. dr. ing. Ciprian-Ilie COZMANCIUC

Date of departmental approval:
September 2025

Head of Department,
s.l. dr. ing. Cătălin ONUȚU

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Concrete Materials Technology and Management
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Durabilitatea Construcțiilor (Durability of constructions)			
2.1.2. Course code				CE413			
2.2 Lecture instructor(s)				Lecturer dr. ing. Bogdan ROȘCA			
2.3 Seminar/laboratory/project/practical session instructor(s)				Lecturer dr. ing. Bogdan ROȘCA			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										3	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										5	
Assessment ⁸										7	
Other activities:										3	
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	None
4.2 Learning outcomes prerequisites	None

5. Requirements

5.1 for the lecture ¹²	Table handwriting, video-projector
5.2 for the seminar / laboratory / project ¹³	Table handwriting, video-projector, nondestructive devices for concrete and masonry

6. General objective of the course

This course aims with presenting area of durability of constructions made of concrete and masonry and the assesment methods of the main mechanical properties and damage state of the constitutive members.

7. Learning outcomes ¹⁴

Knowledge	The student / graduate: <ul style="list-style-type: none"> - identifies the aggressive agents causing the deterioration of concrete and structural members - identifies, evaluates and explains the durability properties of concrete and reinforcing steel for the purpose of using these properties to assess the deterioration stage of the reinforced concrete members - understands how concrete is deteriorated in concrete elements; deterioration mechanisms - receives basic knowledge regarding assesment of the deterioration state for a concrete structure
Skills	The student / graduate: <ul style="list-style-type: none"> - determines, uses and compares the mechanical characteristics of concrete obtained through nondistructive test - it uses and become customized with the European standards regarding non-destructive tests on concrete and the provided abbreviation within - become customized with the devices and procedures of nondistructive testing of concrete and concrete members.
Responsibility and autonomy	The student / graduate: <ul style="list-style-type: none"> - respects the principles, norms and values of ethics in the correct execution and on time of the tasks established by the received theme - approaches a rigorous, efficient and responsible work strategy in making decisions to solve the received theme - integrates into the work group and applies effective communication and teamwork techniques - is informed and documented in the field of activity of the discipline through the appropriate use of effective learning methods and techniques.

8. Teaching strategies

Participatory lectures and debates will be used in the teaching activity based on slide presentations that will be made available to the students accompanied by the explanation of certain concepts through writing explanations on the blackboard. The presentations contain images and sketches so that the information is easy to understand and assimilate. Each course will begin with a brief review of the concepts covered in the previous course.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Constructions degradation general types. Introduction. Classification of actions generating detrimental aggressive agents. Actions induced by the member itself and due to constituents of concrete. Shrinkage	Interactive lecture, debates, explanations	2 hours
9.1.2. Actions induced by the member itself and due to constituents of concrete (continuation). Creep of concrete. Alkali-aggregate reaction.	Interactive lecture, debates, explanations	2 hours
9.1.3. Actions from natural environment. Carbonation	Interactive lecture, debates, explanations	2 hours
9.1.4. Actions from natural environment. Corrosion of reinforcing steel in concrete. Chloride attack. Sea water attack	Interactive lecture, debates, explanations	2 hours
9.1.5. Actions from natural environment. Freeze and thaw attack on concrete	Interactive lecture, debates, explanations	2 hours
9.1.6. Actions from natural environment. Wear of concrete	Interactive lecture, debates, explanations	2 hours
9.1.7. Actions from natural environment. Chemical attack	Interactive lecture, debates, explanations	2 hours
9.1.8. Investigation methods of concrete and steel from concrete structures Introduction. Importance and need for nondistructive tests. Classification of testing methods for concrete structures.	Interactive lecture, debates, explanations	2 hours
9.1.9. Investigation methods of concrete and steel from concrete structures Investigation methods for the concrete structures – Visual inspection, Inspection by acoustic impact, Impact echo method, Radar method	Interactive lecture, debates, explanations	2 hours
9.1.10. Methods determining the quality and corrosion of concrete Ultrasonic pulse method, Surface hardness method, Concrete drilled cores method	Interactive lecture, debates, explanations	2 hours
9.1.11. Methods determining the quality and corrosion of concrete (continuation) Penetration probe test (Windsor method), Pull-out test, Pull-off method,	Interactive lecture, debates, explanations	2 hours

9.1.12. Methods determining the quality and corrosion of concrete (continuation) Break-off test, The confidence level of the in-situ test methods	Interactive lecture, debates, explanations	2 hours
9.1.13. Investigation methods of reinforcement from structural members Electro-magnetic induction method, Eddy's currents method, Applications of the electro-magnetic induction method	Interactive lecture, debates, explanations	2 hours
9.1.14. Investigation methods of reinforcement from structural members (continuation) Half-cell potential method, Concrete electrical resistivity method	Interactive lecture, debates, explanations	2 hours s
Reading list for the lecture: 1. Gosav I., Durabilitatea elementelor si structurilor din beton – note de curs 2. Gosav I., Durabilitatea construcțiilor, Editura Societății Academice “Matei-Teiu Botez” Iași, 2008 3. T. Onet, Durabilitatea betonului armat, Ed. Tehnica, 1991 4. B. Roșca, Lecture notes. https://edu.tuiasi.ro/course/view.php?id=2379		
9.2b Laboratory	Work methods ¹⁸	
Laboratory work 1: Concrete cover to reinforced concrete members based on the European standards – Case of study	Discussion about the subject; Test and results	
Laboratory work 2: Nondistructive tests on concrete. Surface hardness method on concrete– Case of study	Discussion about the subject; Test and results	
Laboratory work 3: Nondistructive tests on masonry. Surface hardness method on masonry– Case of study	Discussion about the subject; Test and results	
Laboratory work 4: Nondistructive tests on concrete. Ultrasonic pulse method on concrete– Case of study	Discussion about the subject; Test and results	
Laboratory work 5: Nondistructive tests on concrete. Method of combining results from surface hardness method with ultrasonic pulse method	Discussion about the subject; Test and results	
Laboratory work 6: Nondistructive tests on concrete. Electro-magnetic induction methods	Discussion about the subject; Test and results	
Laboratory work7: Delivery of the assignment and release the scores	Discussion about the subject; Test and results	
Reading list for the seminar / laboratory / project: 1. B. Roșca – Laboratory works (pdf files) 2. NP 137-2014, Normativ pt. evaluarea in-situ a rezistentei betonului din constructiile existente 3. SR EN 12504-2:2004 – Încercări pe beton în structuri–Încercări nedistructive-Partea 2. Determinarea indicelui de recul 4. SR EN 12504-4:2004 – Încercări pe beton Partea 4. Determinarea vitezei de propagare a ultrasunetelor; 5. SR EN 13791 - Evaluarea in-situ a rezistentei betonului din structuri si elemente prefabricate		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam/ /test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		60% (min 5)
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)	Final exam (min 5)	

10.5b Laboratory	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - assessment test (laboratory colloquium)	40% (min 5)
10.6 Passing requirements The exam can be met whether the laboratory activity was passed.			
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Lecture instructor(s): s.l. Bogdan-Gheorghe ROȘCA

Seminar/laboratory/project/practical session instructor(s): s.l. Bogdan-Gheorghe ROȘCA

Date of departmental approval:
September 2025

Head of Department,
s.l. Cătălin ONUȚU

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Concrete Materials Technology and Management
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Beton și composite de înaltă performanță (High Performance Concrete and Composites)			
2.1.2. Course code				CE413			
2.2 Lecture instructor(s)				Lecturer dr. ing. Bogdan ROȘCA			
2.3 Seminar/laboratory/project/practical session instructor(s)				Lecturer dr. ing. Bogdan ROȘCA			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	E	2.7 Course type ⁵	DS

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										3	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										5	
Assessment ⁸										7	
Other activities:										3	
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	None
4.2 Learning outcomes prerequisites	None

5. Requirements

5.1 for the lecture ¹²	Table handwriting, video-projector
5.2 for the seminar / laboratory / project ¹³	Table handwriting, video-projector,

6. General objective of the course

This course aims to present the field of high-performance concrete and high-performance composites as well as their applications to building structures.

7. Learning outcomes ¹⁴

Knowledge	The student / graduate: <ul style="list-style-type: none"> - receive information about the component materials of high performance concrete and their proportions in order to obtain such concrete - understands which are particularities of structure and behaviour comparing to normal strength concrete - receive information about the existent high performance composites which are present into the building material market and their applications to structural elements.
Skills	The student / graduate: <ul style="list-style-type: none"> - determines, uses and compares the mechanical characteristics of high performance concrete - it uses and become customized with the European standards regarding tests on concrete specimens and the provided abbreviation within - become customized with the devices and procedures of testing of concrete of high performance.
Responsibility and autonomy	The student / graduate: <ul style="list-style-type: none"> - respects the principles, norms and values of ethics in the correct execution and on time of the tasks established by the received theme - approaches a rigorous, efficient and responsible work strategy in making decisions to solve the received theme - integrates into the work group and applies effective communication and teamwork techniques - is informed and documented in the field of activity of the discipline through the appropriate use of effective learning methods and techniques.

8. Teaching strategies

Participatory lectures and debates will be used in the teaching activity based on slide presentations that will be made available to the students accompanied by the explanation of certain concepts through writing explanations on the blackboard. The presentations contain images and sketches so that the information is easy to understand and assimilate. Each course will begin with a brief review of the concepts covered in the previous course.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. High-performance concrete – Definitions. Rationality of selecting high performance concrete	Interactive lecture, debates, explanations	2 hours
9.1.2. High-performance concrete - Component materials and its properties and selecting.	Interactive lecture, debates, explanations	2 hours
9.1.3. High-performance concrete - Proportioning the component materials	Interactive lecture, debates, explanations	2 hours
9.1.4. High-performance concrete - Quality control and testing of high performance concrete	Interactive lecture, debates, explanations	2 hours
9.1.5. High-performance concrete - Fabrication, delivering and placing	Interactive lecture, debates, explanations	2 hours
9.1.6. High-performance concrete - Curing high performance concrete	Interactive lecture, debates, explanations	2 hours
9.1.7. High-performance concrete - Mechanical properties under short-term loading	Interactive lecture, debates, explanations	2 hours
9.1.8. High-performance concrete - Durability	Interactive lecture, debates, explanations	2 hours
9.1.9. Special high-performance concretes - Air entrained high-performance concrete	Interactive lecture, debates, explanations	2 hours
9.1.10. Special high-performance concretes - Lightweight high-performance concrete	Interactive lecture, debates, explanations	2 hours
9.1.11. Cement Based Composites - Materials	Interactive lecture, debates, explanations	2 hours
9.1.12. Cement Based Composites – Mechanical Properties	Interactive lecture, debates, explanations	2 hours
9.1.13. Cement Based Composites – Performance	Interactive lecture, debates, explanations	2 hours

9.1.14. Ultra high-strength cement based materials - Introduction, Examples of ultra high-strength cement based materials	Interactive lecture, debates, explanations	2 hours s
Reading list for the lecture: 1. CAMELIA NEGRUȚIU, CORNELIA MĂGUREANU – Betonul de înaltă rezistență. Durabilitate, Editura U.T.PRES, ISBN: 978-973-662-559-6, 2010 2. Aitcin P. C., High Performance Concrete, E & FN SPON, 2004 3. Brandt A.M. Cement-based Composites: Materials, Mechanical Properties and Performance		
9.2b Laboratory	Work methods ¹⁸	
Laboratory work 1: High performance concrete - Design of the mixture	Discussion about the subject;	
Laboratory work 2: High performance concrete – Making and curing test specimens	Discussion about the subject;	
Laboratory work 3: High performance concrete - Compressive and split-tensile strength of high performance concrete on test specimens	Discussion about the subject; Test and results	
Laboratory work 4: High performance concrete – Nondestructive test – Ultrasonic pulse method for determination of the mechanical properties	Discussion about the subject; Test and results	
Laboratory work 5: High performance concrete – Test for modulus of elasticity on test specimen	Discussion about the subject; Test and results	
Laboratory work 6: Fiber-Reinforced concrete	Discussion about the subject;	
Laboratory work7: Delivery of the assignment and release the scores	Discussion about the subject;	
Reading list for the seminar / laboratory / project: 1. NE 012-1: 2022 Standard for the production and execution of concrete, reinforced concrete and prestressed concrete works Part 1 Production of concrete 2. EN 12390 - 3, Testing hardened concrete - Part 3: Compressive strength of test specimens 3. EN 12390 – 6, Testing hardened concrete - Part 6: Tensile splitting strength of test specimens 4. EN 12390-13, Testing hardened concrete Part 13: Determination of secant modulus of elasticity in compression		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam/ /test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study) - formative assessment test (tests during the semester) - summative assessment test (final assessment)	Final exam (min 5)	60% (min 5)
10.5b Laboratory	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - assessment test (laboratory colloquium)		40% (min 5)
10.6 Passing requirements The exam can be met whether the laboratory activity was passed.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): s.l. Bogdan-Gheorghe ROȘCA

Seminar/laboratory/project/practical session instructor(s): s.l. Bogdan-Gheorghe ROȘCA

Date of departmental approval:
September 2025

Head of Department,
s.l. Cătălin ONUȚU

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Structuri metalice speciale Special Steel Structures			
2.1.2. Course code				CE414			
2.2 Lecture instructor(s)				Ș.l.univ.dr.ing. Vlad MUNTEANU			
2.3 Seminar/laboratory/project/practical session instructor(s)				Ș.l.dr.univ.ing. Vlad MUNTEANU Ș.l.dr.univ.ing. Victoria Elena ROȘCA Ș.l.dr.univ.ing. Georgeta BĂETU Ș.l.dr.univ.ing. Andrei Octav AXINTE			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	E	2.7 Course type ⁵	

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										10	
Additional research in the library, on specialised electronic platforms, and in the field										10	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										10	
Assessment ⁸										3	
Other activities:										6	
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	
4.2 Learning outcomes prerequisites	Steel Constructions 1,2; Steel structures; Structural Statics and Stability 1,2;

5. Requirements

5.1 for the lecture ¹²	Blackboard, video projector, graphic tablet, specific teaching materials.
5.2 for the seminar / laboratory / project ¹³	Computer equipment, video projector, software packages, graphic tablet. The deadlines for submitting the work are set by the lecturer, in the last week of the semester.

6. General objective of the course

The general objective of the course is to provide students with the knowledge and skills necessary in the conceptual design, analysis and detailing of special steel structures/ non-building structures. The course expands the

range of knowledge and skills transferred within the Steel Structures course, aiming at understanding the required interdisciplinary/ transdisciplinary approach in designing non-building structures such as space lattice towers, space frame structures, cable suspended and structures steel storage structures.

7. Learning outcomes ¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - possesses the basic knowledge of mathematics, science and engineering required to articulate complex problems; - defines the sources of data needed in formulating the civil engineering problem related to non-building steel structures; - identifies the load transfer mechanisms specific to related to non-building steel structures; - explains the roles of critical structural members and joints; - compares qualitative and quantitative analyses;
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - can identify, formulate, and solve the complex engineering problems related to non-building steel structures; - actively participates in designing systems, components, or processes specific to non-building steel structures to meet normative requirements; - uses modern tools and techniques to complete and run civil engineering projects in the field of non-building steel structures; - can communicate effectively with professionals in other fields of engineering; - critically reviews published literature regarding the civil engineering and other disciplines;
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - is aware of the high environmental, societal, and economic impact of the projects involving non-building steel structures; - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - recognizes the need for, and could effectively engage in, life-long learning; - actively participates in developing professional projects in the field of civil engineering; - broadens self-education necessary to understand the impact of engineering solutions in a global and societal context; - engages in leading multidisciplinary teams manifesting sound leadership principles and attitudes

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modelling), as well as action-based methods, such as exercises, practical activities, problem-solving).

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
<p>9.1.1. SPACE LATTICE TOWERS: <i>High towers for broadcasting</i>: particularities of analysis and design, detailing aspects. Actions, combinations and grouping of actions, principles for design. Particularities of wind action evaluation. Design of tower members; verifications. Erection of high towers for broadcasting. <i>Guyed masts</i>: general features (one level and multi-level guyed mast), design principles: role and concept of the guying cables, actions, and combinations of actions, braking of the cables. Verification of stresses in the cables and of the stiffness of the mast, mast, and cables vibrations, mounting of the masts. Erection of guyed masts. <i>Power supply line towers</i>: power supply line systems, conductors and wires, classification of the towers, geometrical elements of the power supply line: Basic concepts in overhead line designs; Design situations for the conductor, sag-tension calculations; Specific Limit States for power supply line towers, Tower structural analysis; Internal forces in the tower members, steel sections, and tower detailing. Erection of the towers and lines.</p>	<p>Interactive lecture, debates, explanations</p>	<p>12 hours</p>

9.1.2. SPACE FRAME STRUCTURES: Space grid types and detailing aspects, structural shapes, principles of design. Planar grids: types, design concepts, geometrical elements, actions and combinations, groups of actions, internal forces in the members, structural connections, examples. Erection of space frame structures.	Interactive lecture, debates, explanations	5 hours
9.1.3. CABLE SUSPENDED STRUCTURES: Suspended roofs: advantages and disadvantages compared to other structural systems, actions on the structural elements, deformability, stabilizing methods, cables, and equilibrium equation in the cable. Classification of the suspended roofs: mono-layer, double-layer lattice systems, rigid wires, and tensioned wires; columns and elements transmitting the horizontal thrust	Interactive lecture, debates, explanations	6 hours
9.1.4. STEEL STORAGE STRUCTURES: Tanks: types of tanks, general features of vertical cylindrical tanks and spherical and geodesic tanks. Basic concepts in the design of tanks; Analysis and design of storage steel tanks constructive solutions, particularities for the design of cylindrical tanks with vertical axis. Silos: components, types; actions and design situations, Structural members and detailing of silos.	Interactive lecture, debates, explanations	5 hours
<p>Reading list for the lecture:</p> <ul style="list-style-type: none"> • Munteanu, V. (2022), Special Steel Structures – Course Support (electronic); • Ziemian, R. D., (2010), Guide to stability design criteria for metal structures, 6th Edition, John Wiley and Sons, New Jersey, SUA; • da Silva, L. S., Simoes, R., Gervasio, (2010), Design of steel structures, ECCS – Ernst & Sons, Berlin; • Axinte, E., Roșca, V., Teleman, C. (2010)- Elemente din oțel pentru construcții, vol. 2, Editura Societății Academice “Matei-Teiu Botez” Iași; • Axinte, E., Roșca, V., Teleman, C., Melenciuc S.C. (2012), Elemente din oțel pentru construcții, vol 3, Editura Societății Academice “Matei-Teiu Botez” Iași; • Șerbescu, C., Mühlbacher, R., Amariei, C., Pescaru, V., (1984), Probleme speciale în construcții metalice, Editura Tehnică București; • Dalban, C., Juncan, N., Șerbescu, C., Varga, Al., Dima, Șt., (1983), Construcții metalice, Ed. Didactică și Pedagogică București; • Șerbescu, C., Axinte, E., (1985), Structuri metalice speciale, vol.1, IP Iași; • Șerbescu, C., Axinte, E., Străteanu, P.(1986), Structuri metalice speciale, vol.2, IP Iași; • Cosmulescu, P., (1991), Structuri metalice spațiale, Editura Junimea, Iași; • EN 1993-1-1:2005 Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings • EN 1993-1-5:2006 Eurocode 3: Design of steel structures - Part 1-5: General rules - Plated structural elements • EN 1993-1-8:2005 Eurocode 3: Design of steel structures - Part 1-8: Design of joints • EN 1993-3-1:2006 Eurocode 3: Design of steel structures - Part 3-1: Towers, masts, and chimneys – Towers and masts • EN 1993-4-1:2007 Eurocode 3: Design of steel structures - Part 4-1: Silos • EN 1993-4-2:2007 Eurocode 3: Design of steel structures - Part 4-2: Tanks 		
9.2a Seminar	Work methods ¹⁶	Time allotted
<p>Problem statement: Design and detail of structural members and joints that are characteristic to space lattice towers for broadcasting</p> <p>Practical work No 1: 1.1. Establish the general configuration of the space lattice tower; structural members. Selection of the lattice system and tower sectioning. Draw the selected structural solution. 1.2. Establish the load combinations using the partial safety factors in accordance to the importance class of the tower. Determine the normal load factor. Determine the global wind load acting at different tower levels, using the standard provisions. Establish the equivalent gust load using the equivalent static load method.</p>	Exercises and problem-solving	6 hours
<p>Practical work No 2: 2.1. Determine the internal forces for the tower lattices. Design a current lattice joint for shop conditions assembly. 2.2. Design the current welded connection between diagonals and struts. Design of the on-site erection joint between transportation tower base sections. Make up detailing drawings for the designed connections.</p>	Exercises and problem-solving	8 hours
<p>Reading list for the seminar / laboratory / project:</p> <ul style="list-style-type: none"> • da Silva, L. S., Simoes, R., Gervasio, (2010), Design of steel structures, ECCS – Ernst & Sons, Berlin • Dalban, C., Juncan, N., Șerbescu, C., Varga, Al., Dima, Șt., (1983), Construcții metalice, Ed. Didactică și Pedagogică București • Șerbescu, C., Axinte, E., (1985), Structuri metalice speciale, vol.1, IP Iași • EN 1993-1-1:2005 Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings • EN 1993-1-5:2006 Eurocode 3: Design of steel structures - Part 1-5: General rules - Plated structural elements • EN 1993-1-8:2005 Eurocode 3: Design of steel structures - Part 1-8: Design of joints • EN 1993-3-1:2006 Eurocode 3: Design of steel structures - Part 3-1: Towers, masts, and chimneys – Towers and masts • EN 1993-4-1:2007 Eurocode 3: Design of steel structures - Part 4-1: Silos • EN 1993-4-2:2007 Eurocode 3: Design of steel structures - Part 4-2: Tanks 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Final exam	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- summative assessment test – quiz test (final assessment)	70%	60% (min. 5)
		- summative assessment test – written paper (final assessment)	30%	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - defend the practical works		40% (min. 5)
10.6 Passing requirements				
The student identifies the sources of data needed for the conceptual design, can produce the structural model for performing the analysis, interprets the results according to the normative documents and prepares the deliverables for the on-site execution.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor: Ş.l.univ.dr.ing. Vlad MUNTEANU

Seminar/laboratory/project/practical session instructor: Ş.l.dr.univ.ing. Vlad MUNTEANU

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina ENȚUC, PhD

Date of faculty council approval:
September 2025

Dean,
Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta-aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

FIȘA DISCIPLINEI
Anul universitar 2025-2026

Decan,
Prof.univ.dr.ing. Andrei Burlacu

1. Date despre program

1.1 Instituția de învățământ superior	Universitatea Tehnică „Gheorghe Asachi” din Iași
1.2 Facultatea	Construcții și Instalații
1.3 Departamentul	Mecanica Structurilor (MS)
1.4 Domeniul de studii	Inginerie Civilă
1.5 Ciclu de studii ¹	Licență
1.6 Programul de studii	Construcții Civile, Industriale și Agricole (CCIA)

2. Date despre disciplină

2.1.1 Denumirea disciplinei	Construcții din bare cu pereți subțiri Light steel structures						
2.1.2. Codul disciplinei	CC414						
2.2 Titularul activităților de curs	Șef lucr.dr.ing. Georgeta BĂETU						
2.3 Titularul activităților de aplicații	Șef lucr.dr.ing. Georgeta BĂETU						
2.4 Anul de studii ²	4	2.5 Semestrul ³	8	2.6 Tipul de evaluare ⁴	E	2.7 Tipul disciplinei ⁵	DS

3. Timpul total estimat al activităților zilnice(ore pe semestru)

3.1 Număr de ore pe săptămână	3	3.2 curs	2	3.3a sem.	1	3.3b laborator		3.3c proiect	
3.4 Total ore din planul de învățământ ⁶	42	3.5 curs	28	3.6a sem.	14	3.6b laborator		3.6c proiect	
Distribuția fondului de timp ⁷									Nr. ore
Studiul după manual, suport de curs, bibliografie și notițe									15
Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate și pe teren									13
Pregătire seminarii/laboratoare/proiecte, teme, referate și portofolii									5
Tutoriat ⁸									10
Examinări ⁹									3
Alte activități:									
3.7 Total ore studiu individual ¹⁰	33								
3.8 Total ore pe semestru ¹¹	75								
3.9 Numărul de credite	3								

4. Precondiții (acolo unde este cazul)

4.1 de curriculum ¹²	• Nu este cazul
4.2 de competențe	• Rezistența materialelor, Statica construcțiilor, Teoria elasticității și plasticității, Mecanică, Construcții Civile 1, Elemente de construcții metalice 1 și 2, Structuri metalice, Proiectarea asistată de calculator

5. Condiții (acolo unde este cazul)

5.1 de desfășurare a cursului ¹³	<ul style="list-style-type: none"> • Videoproiector, tablă, suport didactic specific și complementar • Studenții vor respecta „Codul drepturilor și obligațiilor studentului” și „Reglementările prevăzute de Carta Universității Tehnice Gheorghe Asachi din Iași”
5.2 de desfășurare a seminarului / laboratorului / proiectului ¹⁴	<ul style="list-style-type: none"> • Tehnica de calcul și pachet software adecvat, material didactic specific și complementar, tabletă grafică • Termenele predării lucrărilor se stabilesc de titular, în ultima săptămână a semestrului

6. Obiectiv general al disciplinei

Curricula acestei discipline cuprinde informații generale precum și principiile esențiale privind proiectarea, elementelor și structurilor confecționate din profile metalice formate la rece, încadrate în clasa 4 de secțiune. Disciplina acoperă informații despre tipul și destinația în exploatare a structurilor metalice ușoare precum și principii de proiectare (evaluare încărcări, calcul static în programe specializate tip FEM a structurilor 3D, dimensionarea și verificarea elementelor structurale) corelate cu normele tehnice în vigoare. Pentru diferitele tipuri de secțiuni transversale ale profilelor și tablelor formate la rece, sunt prezentate principalele tipuri de pierdere de stabilitate locală și generală. De asemenea, sunt prezentate tipurile de alcătuiți constructive ale diferitelor tipuri de structuri, avantajele și dezavantajele, principalele provocări în proiectarea structurii în ansamblul ei și a elementelor structurale componente, principalele tipuri de avarii la care a aceste structuri sunt susceptibile, tehnologia de montaj specifică fiecărui tip de structură, precum și măsuri de mentenanță respectiv de urmărire și control în exploatare.

7. Rezultatele învățării¹⁴

Cunoștințe	<p>Studentul/ Absolventul:</p> <ul style="list-style-type: none"> - identifică tipul de elemente structurale confecționate din profile și table formate la rece; - interpretează și respectă modul de alcătuire constructivă al structurii din elemente structurale confecționate din bare cu pereți subțiri, impus de destinația în exploatare și geometria acestora; - explică alcătuirea construcțiilor metalice din bare cu pereți subțiri, în scopul întocmirii și utilizării documentației tehnice specifice; - evaluează încărcările specifice tipului de construcție metalică realizată din bare cu pereți subțiri.
Aptitudini	<p>Studentul/ Absolventul:</p> <ul style="list-style-type: none"> - propune sisteme structurale specifice construcțiilor concepute din profile formate la rece; - proiectează secțiuni ale elementelor structurale și le reprezintă grafic în scopul realizării pieselor desenate din cadrul proiectelor tehnice ale structurilor metalice speciale; - calculează eforturi secționale în scopul dimensionării elementelor structurii de rezistență din bare cu pereți subțiri, încadrate în clasa 4 de secțiune; - evaluează critic materialele de construcții, sistemele structurale, tipurile de îmbinări structurale și închiderile perimetrice utilizate la realizarea construcțiilor metalice speciale.
Responsabilitate și autonomie	<p>Studentul/ Absolventul:</p> <ul style="list-style-type: none"> - respectă principiile, normele și valorile de etică în executarea corectă și la termen a sarcinilor profesionale, prin abordarea unei strategii de muncă riguroase, eficiente și responsabile în luarea deciziilor pentru rezolvarea problemelor; - se integrează în grupul de lucru și aplică tehnici de relaționare și muncă eficientă în echipe multidisciplinare, pe diverse paliere ierarhice; - se informează și se documentează permanent în domeniul propriu de activitate prin utilizarea adecvată a metodelor și tehnicilor eficiente de învățare pe durata întregii vieți; - elaborează proiecte profesionale din domeniul ingineriei.

8. Metode de predare

În activitatea de predare vor fi utilizate prelegeri interactive, dezbateri și problematizări pe baza unor prezentări Power Point care vor fi puse la dispoziția studenților. Prezentările includ conținut multimedia (audio și/sau video, animație), astfel încât informațiile să fie ușor de înțeles și asimilat. Fiecare curs va debuta cu o scurtă recapitulare a noțiunilor parcurse la cursul anterior și se va finaliza cu o aplicație scurtă pentru fixarea cunoștințelor predate.

Metoda de predare este bazată și pe modele de învățare prin descoperire, facilitate de explorare directă și indirectă a realității (observație, demonstrație, modelare, exercițiu), dar și pe metode bazate pe acțiune, precum exerciții, studii de caz și problematizare.

9. Conținuturi

9.1 Curs ¹⁵	Metode de predare ¹⁶	Observații
<p>9.1.1 Profile formate la rece utilizate la clădiri industriale Învelitori, pane de acoperiș; elementele cadrului transversal, îmbinări ale elementelor structurale, grinzi cu zăbrele din profile cu pereți subțiri, contravântuiri</p>	Prelegere interactivă, explicații și demonstrații pe studii de caz, exemple de proiectare	4 ore
<p>9.1.2. Concepții de calcul a elementelor din profile cu pereți subțiri formate la rece Uzinarea profilelor cu pereți subțiri, oțeluri utilizate și rezistența secțiunilor, voalarea pereților elementelor cu secțiuni în clasa 4, tensiuni critice de voalare, forme de instabilitate a profilelor alcătuite din pereți subțiri comprimați, determinarea secțiunilor eficiente a elementelor comprimate respectiv încovoiate</p>	Prelegere interactivă, explicații și demonstrații pe studii de caz, exemple de proiectare	6 ore
<p>9.1.3. Verificarea elementelor supuse la solicitări simple Verificarea de întindere, secțiuni nete, verificarea la compresiune cu flambaj combinat din încovoiere, încovoiere-răsucire și răsucire împiedecată (distorsiunea pe secțiune), verificarea la forfecare și instabilitatea sub sarcini locale, fenomenul de „shear lag”</p>	Prelegere interactivă, explicații pe studii de caz	6 ore
<p>9.1.4 Verificarea elementelor supuse la solicitări combinate Verificări de rezistență și stabilitate la elemente solicitate la compresiune, respectiv întindere cu încovoiere după una sau două direcții, cu forfecare.</p>	Prelegere interactivă,	8 ore

Calculul panelor de acoperiș din profile cu pereți subțiri	explicații și demonstrații pe studii de caz, exemple de proiectare, exemple experimentale	
9.1.5 Îmbinările și înădirile elementelor din profile cu pereți subțiri Îmbinări cu șuruburi și îmbinări sudate	Prelegere interactivă, explicații și demonstrații pe studii de caz	4 ore
Bibliografie curs: 1. Băetu Georgeta - note de curs 2025, Google classroom 2. Moga C., Nagy Z., (2024) – <i>Construcții industriale – Hale multifuncționale și Construcții tehnologice</i> , Ed. UTPRESS Cluj-Napoca; 3. Moga C., Nagy Z., (2023) – <i>Construcții metalice – Structuri</i> , Ed. UTPRESS Cluj-Napoca; 4. Axinte, E., Roșca, V., Teleman, C., Melenciuc S.C. (2012), <i>Elemente din oțel pentru construcții, vol 3</i> , Editura Societății Academice “Matei-Teiu Botez” Iași ; 5. Voiculescu D. (2010) – <i>Structuri metalice înalte</i> , Ed. Ed. Matrix Rom, București; 6. Axinte, E., Roșca, V., Teleman, C. (2010)- <i>Elemente din oțel pentru construcții, vol. 2</i> , Ed. Soc. Acad. Matei-Teiu Botez Iași; 7. SR EN 1993-1-1/2006 <i>Eurocod 3: Proiectarea structurilor din oțel. Partea 1-1: Reguli generale și reguli pentru clădiri</i> ; 8. SR EN 1993-1-3/2006 <i>Eurocod 3: Proiectarea structurilor din oțel. Partea 1-3: Reguli generale și reguli suplimentare pentru elementele structurale și table formate la rece</i> ; 9. Axinte, E., (2001), <i>Elemente metalice din profile cu pereți subțiri formate la rece</i> , Editura Cermi, Iași; 10. Dalban, D., Dima, S., Chesaru, E., Șerbescu, C., <i>Construcții cu structură metalică</i> (1997), EDP, Bucuresti;		
9.2a Seminar Calculul barelor cu pereți subțiri conform SR EN 1993-1-3/2006 Determinarea caracteristicilor eficiente ale profilelor cu pereți subțiri supuse la compresiune centrică și la încoviere pură. Calculul învelitorii și panelor de acoperiș alcătuite din profile cu pereți subțiri și prinderile acestora de structură	Metode de predare ¹⁷	Observații
9.2.1 Determinarea caracteristicilor eficiente ale profilelor cu pereți subțiri supuse la compresiune centrică și la încoviere pură.	Material didactic, prezentare la tablă, utilizare videoproiector, programe de calcul specializat de tip FEM	6
9.2.2. Calculul învelitorii și panelor de acoperiș alcătuite din profile cu pereți subțiri și prinderile acestora de structură		8
Bibliografie aplicații (seminar / laborator / proiect): 1. Băetu Georgeta – Note de curs 2025, Google Classroom 2. SR EN 1993-1-1/2006 <i>Eurocod 3: Proiectarea structurilor din oțel. Partea 1-1: Reguli generale și reguli pentru clădiri</i> ; 3. SR EN 1993-1-3/2006 <i>Eurocod 3: Proiectarea structurilor din oțel. Partea 1-3: Reguli generale și reguli suplimentare pentru elementele structurale și table formate la rece</i> ; 4. Axinte, E., Roșca, V., Teleman, C., Melenciuc S.C. (2012), <i>Elemente din oțel pentru construcții, vol 3</i> , Editura Societății Academice “Matei-Teiu Botez” Iași ;		

10. Evaluare

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare		10.3 Pondere din nota finală
10.4 Examen	Completitudinea și corectitudinea cunoștințelor. Coerența logică, fluența, forța de argumentare. Capacitatea de analiză, de interpretare personală, originalitatea, creativitatea. Gradul de asimilare a limbajului de specialitate și capacitatea de comunicare. Capacitatea de a valorifica abilitățile dobândite. Capacitatea de a prelucra datele și problemele enunțate.	- observarea sistematică a studenților (teme individuale/ de echipă - temele trebuie efectuate în săptămâna dintre cursuri, pregătirea unui referat - studiu de caz). - test de evaluare formativ (verificări pe parcursul semestrului). - test de evaluare sumativ (verificare finală).	- - 100%	70% (minim 5)

10.5a Seminar	Participarea la activitatea de proiectare, capacitatea de documentare, aplicarea cunoștințelor în activitatea de proiectare.	- efectuarea activității de proiectare; - finalizarea proiectului; - susținerea proiectului.	30% (minim 5)
10.6 Condiții de promovare Calculul elementelor structurale din bare cu pereți subțiri.			
Rezultatul evaluării finale la o disciplină rezultă prin considerarea punctajelor și ponderilor alocate fiecărei activități din cadrul disciplinei. Se vor acorda note întregi de la 10 la 1, nota 5 certificând dobândirea rezultatelor învățării minimale aferente unei discipline și acordarea creditelor de studii aferente acesteia.			

Data completării: Septembrie 2025

Titular/ titulari de curs: Șef lucr.dr.ing. Georgeta BĂETU

Titular/ titulari de aplicații: Șef lucr.dr.ing. Georgeta BĂETU

Data avizării în departament:

Septembrie 2025

Data aprobării în Consiliul Facultății:

Septembrie 2025

Director de departament
Șef lucr.univ. dr.ing. Ioana-Sorina Ențuc
Decan,
Prof.univ.dr.ing. Andrei BURLACU

¹ Licență/ Masterat.

² 1-4 pentru licență, 1-2 pentru masterat.

³ 1-8 pentru licență, 1-4 pentru masterat.

⁴ Examen (E), verificare (V) – din planul de învățământ.

⁵ DOB – disciplină obligatorie, DOP – disciplină opțională, DFA – disciplină facultativă;

⁶ Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.5, 3.6abc).

⁷ Liniile de mai jos se referă la studiul individual; totalul se completează la punctul 3.7.

⁸ Între 2 și 6 ore. Acestea reprezintă ore didactice și nu se includ în studiul individual.

⁹ Suma valorilor de pe liniile anterioare, care se referă la studiul individual.

¹⁰ Suma dintre numărul de ore de activitate didactică directă (3.4) și numărul de ore de studiu individual (3.7); trebuie să fie egală cu numărul de credite alocate disciplinei (punctul 3.9) x 25 de ore pe credit.

¹¹ Se menționează disciplinele obligatoriu a fi promovate anterior sau echivalente.

¹² Tablă, vidoproiector, flipchart, materiale didactice specifice etc.

¹³ Tehnică de calcul, pachete software, standuri experimentale, etc.

¹⁴ Rezultatele învățării prezentate sub formă de cunoștințe, aptitudini, responsabilitate și autonomie specifice disciplinei. Acestea vor fi corelate cu rezultatele învățării pe domenii fundamentale și domenii de licență (Anexa 2 din Standarde specifice ARACIS, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). Pentru programele de masterat, rezultatele învățări sunt aferente nivelului 7 din CNC.

¹⁵ Titluri de capitole și paragrafe.

¹⁶ Discuții, dezbateri, prezentare și/sau analiză de lucrări, rezolvare de exerciții și probleme.

¹⁷ Demonstrație practică, exercițiu, experiment.

¹⁸ Studiu de caz, demonstrație, exercițiu, analiza erorilor etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6 Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Reabilitarea Structurilor Building Rehabilitation			
2.1.2 Course code				CE.415			
2.2 Lecture instructor				Ș.l.univ.dr.ing. Vasile-Mircea VENGGHIAC			
2.3 Seminar instructor				Ș.l.univ.dr.ing. Vasile-Mircea VENGGHIAC			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										10	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										8	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	-
4.2 Learning outcomes prerequisites	-

5. Requirements

5.1 for the lecture ¹²	Blackboard, projector, flipchart, documentary clips, animations
5.2 for the seminar ¹³	Computing equipment, software packages

6. General objective of the course

This course introduces the concept, principles, construction materials and technical solutions regarding the rehabilitation of buildings. It introduces knowledge about the causes and types of degradation which are important when

designing and building new constructions, in order to avoid their subsequent degradation as much as possible. Historical monuments require specific knowledge of material compatibilities and specific technologies for the construction engineer so that the necessary skills are acquired through this course.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - describes the state of degradation of buildings in correlation with the load state; - defines the technical report and its content; - assesses the safety of buildings using the 1st and 2nd level methodologies and establishes the seismic risk class; - describes consolidation measures for the infrastructure of buildings and for the superstructure (reinforced concrete, masonry, wood and steel structures); - describes earthquake protection solutions (base isolation, seismic dampers); - uses calculations to establish consolidation solutions for degraded reinforced concrete structural elements; - applies modern consolidation solutions using composite materials.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - operates with non-destructive diagnosis equipment (pachometer, sclerometer, ultrasound); - plans and solves, working in teams, the stages of a project for the safety assessment of a brick masonry structure and establishes the seismic risk class; - uses computational techniques to solve problems for the assessment and design of consolidation solutions.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

The teaching activity is based on Power Point presentations including pictures, animations, diagrams and short clips in order to transmit the information as easily and clearly as possible. The lectures are linked with a short recap from previous lectures. All presentations are made available to students at the beginning of the semester.

The teaching techniques mentioned above are the basis of discovery-based learning models facilitated by direct and indirect exploration of real phenomena through practical demonstrations completed by problems solving at the seminar.

9. Content

9.1. Lecture¹⁵	Teaching strategies	Time allocation
9.1.1. Generalities: Definition of terms, case studies, new devices used in structural rehabilitation	Interactive lecture, debates, explanations	4 hours
9.1.2. Structural assessment of buildings: The need for assessment, methods of assessing the condition of existing buildings, qualitative evaluation, analytical evaluation, assessment report	Interactive lecture, debates, explanations	2 hours
9.1.3. Systems and equipment for structure diagnosis: Ultrasonic diagnosis, determining the concrete strength by mechanical methods, by destructive tests on core samples, vibration measuring methods	Interactive lecture, debates, explanations	2 hours
9.1.4. Advanced polymeric composites for rehabilitation of buildings: Fiber reinforced polymeric composites, micromechanical models to predict their behavior, manufacturing procedures of polymeric composites, strengthening systems	Interactive lecture, debates, explanations	2 hours
9.1.5. Infrastructure consolidation: Types of foundation degradations, consolidation of natural rock foundations, of reinforced concrete foundations, types of piles for infrastructure consolidation, foundation soil consolidation	Interactive lecture, debates, explanations	4 hours
9.1.6. Brick and stone masonry structure consolidation: General consolidation principles, intervention measures for brick structures	Interactive lecture, debates, explanations	4 hours

9.1.7. Rehabilitation of reinforced concrete structures: General rehabilitation principles, intervention measures for reinforced concrete structures	Interactive lecture, debates, explanations	2 hours
9.1.8. New systems of structural rehabilitation to earthquakes. Base isolation, increase of energy dissipation capacity	Interactive lecture, debates, explanations	2 hours
9.1.9. Reinforced concrete structure rehabilitation with polymeric composites: Adhesive materials for structural rehabilitation of reinforced concrete elements, flexural strengthening of beams, shear strengthening of beams, strengthening of slabs and columns	Interactive lecture, debates, explanations	2 hours
9.1.10. Rehabilitation of timber structures: Inspection and evaluation, principles for preservation of historic timber structures, examples of deterioration, repair and strengthening methods	Interactive lecture, debates, explanations	2 hours
9.1.11. Hygrothermal rehabilitation of buildings: The need for thermo-physical rehabilitation, principles of rehabilitation for increasing the insulation capacity, insulation materials, intervention measures	Interactive lecture, debates, explanations	2 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Budescu M., Țăranu N., Lungu I., eds (2003). <i>Building Rehabilitation</i>, Ed. Soc. Acad. "Matei Teiu Botez", Iași 2. Budescu M., Taranu N., Lungu I. (2014). Note de curs 3. Delgado J.M.P.Q. (2023). <i>Building Rehabilitation and Sustainable Construction</i>, Springer Cham, ISBN 978-3-030-95489-5. 4. Delgado J.M.P.Q. (2022). <i>Masonry: Building Pathologies and Design</i>, Springer Cham, ISBN 978-3-030-80498-5. 5. Delgado J.M.P.Q. (2021). <i>Case Studies in Building Rehabilitation</i>, Springer Cham, ISBN 978-3-030-49204-4. 6. Popa A. și Ilieș N. (2009), <i>Consolidarea fundațiilor</i>, UT Press, Cluj Napoca. 7. Farcaș V. (2013). <i>Reabilitarea fundațiilor construcțiilor social culturale și industriale</i>, UT Press, Cluj Napoca. 		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
1. Activities presentation. Necessary materials, teams establishment and activity calendar.	Interactive lecture, explanations	2 hours
2. Bearing capacity reserve of the foundation soil when introducing one more floor to the existing building: Acceptable pressures given the initial and the new soil data, loads evaluation, checking the bearing capacity restrictions, concluding remarks.	Presentation and analysis of works, exercises and problem solving, discussions	2 hours
3. The safety level evaluation of a simple masonry structure with reinforced concrete floors using the 1 st level methodology according to P100-3/2019.	Presentation and analysis of works, exercises and problem solving, discussions	2 hours
4. Rehabilitation solution of a reinforced concrete beam: Capable bending moment and shear force based on the initial blueprints and then according to a 20% loss of concrete strength, concluding remarks and intervention solutions.	Presentation and analysis of works, exercises and problem solving, discussions	2 hours
5. Structural diagnosis: Strength evaluation of brick and reinforced concrete elements with in situ equipment, concluding remarks.	Presentation and analysis of works, discussions	2 hours
6. Case studies of industrial reinforced concrete structures: Assessment reports and intervention measures.	Presentation and analysis of works, exercises and problem solving, discussions	2 hours
7. Structural rehabilitation of historic brick masonry structures: Case studies and site visits.	Presentation and analysis of works, discussions	2 hours
<p>Reading list for the seminar:</p> <ol style="list-style-type: none"> 1. Delgado J.M.P.Q. (2022). <i>Masonry: Building Pathologies and Design</i>, Springer Cham, ISBN 978-3-030-80498-5. 2. P100-3/2019: Cod de proiectare seismică, Partea a III-a, Prevederi pentru evaluarea seismică a clădirilor existente. 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Colloquium	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	10%	50%
		- formative assessment test (tests during the semester)	0%	
		- summative assessment test (final assessment)	90%	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test		50%
10.6 Passing requirements				
<ul style="list-style-type: none"> - to describe the state of degradation of buildings in correlation with the load state, to define the technical report and its content, to describe consolidation measures for the infrastructure of buildings and for the superstructure (reinforced concrete, masonry, wood and steel structures), to describe earthquake protection solutions (base isolation, seismic dampers); - to deliver all complete technical reports for the seminar activities according to the schedule; - to obtain a minimum 5 (five) mark for the final exam and for the seminar. 				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor: Ș.I.univ.dr.ing. Vasile-Mircea VENGGHIAC

Seminar instructor: Ș.I.univ.dr.ing. Vasile-Mircea VENGGHIAC

Date of departmental approval:
September 2025

Head of Department,
Ș.I.univ.dr.ing. Vasile-Mircea VENGGHIAC

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ *Case study, demonstration, exercise, error analysis, etc.*

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6 Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Elemente de calcul neliniar în construcții Elements of Non-Linear Computation in Civil Engineering			
2.1.2 Course code				CE.415			
2.2 Lecture instructor				Ș.l.univ.dr.ing. Vasile-Mircea VENGGHIAC			
2.3 Seminar instructor				Ș.l.univ.dr.ing. Vasile-Mircea VENGGHIAC			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										10	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										8	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	-
4.2 Learning outcomes prerequisites	-

5. Requirements

5.1 for the lecture ¹²	Blackboard, projector, flipchart, documentary clips, animations
5.2 for the seminar ¹³	Computing equipment, software packages

6. General objective of the course

The content of the course is correlated with the needs of employers in the construction field. In order to identify the needs and expectations of employers in the field, this course was established. By mastering the theoretical and

methodological concepts and addressing the practical aspects included in this course, students acquire a consistent knowledge base, in accordance with the skills required for a structural engineer. The content and complexity of the concepts taught are permanently correlated with those of related courses in the curriculum and adapt to the evolution of the knowledge necessary for the field of Bachelor studies in Civil Engineering.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - defines the first and second order analyses of structures; - defines the non-linear elastic and inelastic analyses of structures; - describes the structural non-linear behaviour; - compares the results obtained by using different structural design methods in the non-linear domain.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - uses different non-linear design methods for obtaining the internal forces, stresses, displacements and deformation state of structural elements subjected to different types of actions using the second order analysis; - uses computational techniques for the second order analysis of frame structures; - performs the critical evaluation of differences between results obtained by using different analysis types (non-linear first and second order analysis).
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

The teaching activity is based on Power Point presentations including pictures, animations, diagrams and short clips in order to transmit the information as easily and clearly as possible. The lectures are linked with a short recap from previous lectures. All presentations are made available to students at the beginning of the semester.

The teaching techniques mentioned above are the basis of discovery-based learning models facilitated by direct and indirect exploration of real phenomena through practical demonstrations completed by problems solving at the seminar.

9. Content

9.1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Introductory notions: The structure model and the main principles. Classification of analysis types: - first order analysis (linear elastic, non-linear-elastic, inelastic);- second order analysis (linear elastic and geometrical non-linear, elastic and geometrical non-linear, inelastic and geometrical non-linear)	Interactive lecture, debates, explanations	3 hours
9.1.2. Second order geometrical non-linear analysis: Hypotheses. Characteristic elements of the second order analysis. Effects superposition in the second order analysis. The displacement method in the second order analysis	Interactive lecture, debates, explanations	6 hours
9.1.3. Non-linear elastic analysis: Basic notions. First order, non-linear elastic analysis. Second order, non-linear elastic analysis	Interactive lecture, debates, explanations	6 hours
9.1.4. Non-linear inelastic analysis: Basic notions. First order inelastic analysis. The simple plastic method. The direct assessment of the ultimate load. The method of mechanisms combination. Considerations about the structure behaviour in the inelastic range	Interactive lecture, debates, explanations	7 hours
9.1.5. Second order inelastic analysis: Basic notions. Hypotheses. Second order practical design. Stability loss by continuous deformation. Stability loss by continuous bifurcation. The compared analysis of the obtained results by using different studied methods for the non-linear design	Interactive lecture, debates, explanations	6 hours
Reading list for the lecture:		

<ol style="list-style-type: none"> 1. Amariei C., Aanicăi C., Jerca Șt., Chițan V.E. (2013). <i>Analiza neliniară a structurilor</i>, Editura Politehniun, Iași, ISBN 978-973-621-409-7; 2. Tuma J.J. (1969). <i>Theory and Problems of Structural Analysis</i>, McGraw-Hill, ISBN 0-07-065422-0; 3. Timoshenko S.P., Gere J.M. (2009). <i>Theory of Elastic Stability – 2nd Ed.</i>, Dover Publications, ISBN-13 978-0-486-47207-2; 4. Bazant Z.P., Cedolin L. (2010). <i>Stability of Structures – Elastic, Inelastic, Fracture and Damage Theories</i>, World Scientific Publishing, ISBN-13 978-981-4317-09-0. 		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
1. Second order geometrical non-linear analysis: Second order geometrical non-linear analysis of a frame by using: a) the displacements method; b) a specialized computer program; c) the comparison between the results obtained by using these two methods.	Interactive lecture, explanations	4 hours
2. Non-linear elastic analysis of a two-dimensional frame: Computer aided first order non-linear elastic analysis; Computer aided second order non-linear elastic analysis; Comparison between the results.	Presentation and analysis of works, exercises and problem solving, discussions	4 hours
3. Ultimate load assessment for a two-dimensional structure: By using the theory of maximum; By using the theory of minimum; By using the method of mechanisms combination; Comparison between the results.	Presentation and analysis of works, exercises and problem solving, discussions	6 hours
Reading list for the seminar: <ol style="list-style-type: none"> 1. Amariei C., Aanicăi C., Jerca Șt., Chițan V.E. (2013). <i>Analiza neliniară a structurilor</i>, Editura Politehniun, Iași, ISBN 978-973-621-409-7. 2. Bazant Z.P., Cedolin L. (2010). <i>Stability of Structures – Elastic, Inelastic, Fracture and Damage Theories</i>, World Scientific Publishing, ISBN-13 978-981-4317-09-0. 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Colloquium	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	10%	50%
		- formative assessment test (tests during the semester)	0%	
		- summative assessment test (final assessment)	90%	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test		50%
10.6 Passing requirements <ul style="list-style-type: none"> - to define the first and second order analyses of structures, to define the non-linear elastic and inelastic analyses of structures, to describe the structural non-linear behaviour and to compare the results obtained by using different structural design methods in the non-linear domain; - to deliver all complete technical reports for the seminar activities according to the schedule; - to obtain a minimum 5 (five) mark for the final exam and for the seminar. 				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Formular PO.DID.04 L-F2 E3R0

Lecture instructor: Ş.I.univ.dr.ing. Vasile-Mircea VENGHIAC

Seminar instructor: Ş.I.univ.dr.ing. Vasile-Mircea VENGHIAC

Date of departmental approval:
September 2025

Head of Department,
Ş.I.univ.dr.ing. Vasile-Mircea VENGHIAC

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Construcții subterane / Underground civil engineering works			
2.1.2. Course code				CE416			
2.2 Lecture instructor(s)				Șef lucr.univ.dr.ing. Mircea ANICULĂESI			
2.3 Seminar/laboratory/project/practical session instructor(s)				Șef lucr.univ.dr.ing. Mircea ANICULĂESI			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	Vp	2.7 Course type ⁵	DO

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory		3.6c project		3.6.d
Workload distribution ⁷										No. of hours
Study based on textbook, course material, reading list and notes										15
Additional research in the library, on specialised electronic platforms, and in the field										10
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										8
Assessment ⁸										3
Other activities:										0
3.7 Total number of individual study hours ⁹	33									
3.8 Total number of hours per semester ¹⁰	75									
3.9 Number of ECTS credits	3									

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	It is not the case
4.2 Learning outcomes prerequisites	Geotechnics – CE306, Foundations – CE312

5. Requirements

5.1 for the lecture ¹²	Teaching activities in physical format at the faculty headquarters: board, video projector, specific didactic materials, etc
5.2 for the seminar / laboratory / project ¹³	Board, Video projector, experimental stands in specialized laboratories

6. General objective of the course

The formation of fundamental engineering competencies necessary for the understanding, preliminary design, and supervision of the execution of different types of underground works (excavations, supporting structures, tunnels, galleries), emphasizing the structure-rock/soil mass interaction, modern execution methods, and ensuring their stability and safety throughout the entire lifecycle

7. Learning outcomes ¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Defines and classifies underground works, and tunnels according to purpose, section, material, and execution method. - Explains the principles of rock and soil mechanics in the context of designing and executing underground works. - Identifies and evaluates the types of loads (geostatic, hydraulic, seismic) acting on underground works. - Defines and explains the methods of geotechnical and geological investigation of the rock/soil mass for design. - Understands and explains the main stages of a project, from study to execution and exploitation. - Defines and analyzes the specific safety requirements for underground works
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Utilizes knowledge of geotechnics and rock mechanics to determine the mass class and specific loads for underground works. - Evaluates by calculation the state of stresses and strains in the resistance structure of underground works using analytical and/or simple numerical methods. - Develops typical cross and longitudinal sections for different types of tunnels and execution methods. - Interprets the results of structural calculations to verify the stability and safety of the tunnel. - Utilizes standards, technical guides, and specialized software (at a basic level) for the design of supporting elements and the resistance structure of underground works.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Respects professional ethics and current legislation in the design and execution of underground works, focusing on public and environmental safety. - Integrates into multidisciplinary teams (geotechnical, structural, hydraulic engineers) and applies effective communication techniques to solve complex problems specific to tunnels. - Continuously seeks information and documentation regarding new technologies and regulations in the field of underground construction. - Develops preliminary parts of projects or feasibility studies for underground works, demonstrating a rigorous and responsible approach. - Assumes responsibility for the quality of the technical documentation prepared, including aspects related to environmental impact and sustainability

8. Teaching strategies

The lecture activity is based on interactive lectures, supported by the video projector and deepened through relevant case studies. The presentations contain images and sketches to make the information easy to understand and assimilate. Each lecture will begin with a short recapitulation of the concepts covered in the previous lecture. During the project, the working methods combine an explanatory component with an applied one, giving the student the opportunity to work in the classroom in the presence of the lecturer, thus ensuring interaction and coordination. Both the course activities and the project activities are complemented by interactive discussions to clarify concepts and ensure a deep understanding of the subject matter.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
1. Excavation Support: Introduction; Earth Pressures; Stability of Walls; Reinforced Concrete Walls	Interactive lecture, use of video projector, case studies	4 ore
2. Concrete Basements: Introduction; Geotechnical and structural design; Case studies		6 ore
2. Deep Excavations: Needs for Deep Excavations; Excavation methods; Types of earth lateral support; Stability analysis; Case studies		8 ore

3. Soil drainage and dewatering: Construction dewatering; Permanent ground water control; Dewatering methods; Dewatering techniques		4 ore
4. Urban tunnels: Introduction; Subway Stations, Underground parking; Bored and open-face tunneling below cities; Introduction to the design of underground structures		6 ore
Reading list for the lecture:		
<ol style="list-style-type: none"> 1. Tuneluri si metropolitane, curs, Anghel Stanciu, Mircea Aniculaesi, Oana Elena Colt, Editura Politehniun, 2016 2. Bilotta E, Handbook on Tunnels and Underground Works, CRC Press/Balkema,2022 (https://rexresearch1.com/TunnellingLibrary/HandbookTunnelsUndergdWorksV1.pdf) 3. Raymond Sterling and Surbana Jurong Consultants, Planning and Designing Successful Underground Facilities: A summary of lessons learned from worldwide projects, Surbana Jurong Consultants Pte Ltd, Singapore, 2022 (https://www.acuus.org/wp-content/uploads/2023/01/Lessons-Learned-Summary-Documents-April-2021.pdf) 4. J B Burland - Design and construction of deep basements including cut-and-cover structures, The Institution of Structural Engineers, 2004 5. A. Gilbertson- Concrete Basements, Published by MPA The Concrete Centre, 2012. 6. M. Puller - Deep Excavations A Practical Manual, Thomas Thelford, 2003 		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
Concrete Basements – case studies, geotechnical and structural design	Problem solving, results interpretation, case studies, discussions	4 ore
Deep Excavations – geotechnical design, structural design, case studies		5 ore
Soil drainage and dewatering – Case Studies of Dewatering, Design of the dewatering system		2 ore
Urban tunnels – Case Studies; Design of Urban Tunnels		3 ore
Reading list for the seminar / laboratory / project:		
<ol style="list-style-type: none"> 7. Tuneluri si metropolitane, curs, Anghel Stanciu, Mircea Aniculaesi, Oana Elena Colt, Editura Politehniun, 2016 8. Bilotta E, Handbook on Tunnels and Underground Works, CRC Press/Balkema,2022 (https://rexresearch1.com/TunnellingLibrary/HandbookTunnelsUndergdWorksV1.pdf) 9. Raymond Sterling and Surbana Jurong Consultants, Planning and Designing Successful Underground Facilities: A summary of lessons learned from worldwide projects, Surbana Jurong Consultants Pte Ltd, Singapore, 2022 (https://www.acuus.org/wp-content/uploads/2023/01/Lessons-Learned-Summary-Documents-April-2021.pdf) 10. J B Burland - Design and construction of deep basements including cut-and-cover structures, The Institution of Structural Engineers, 2004 11. A. Gilbertson- Concrete Basements, Published by MPA The Concrete Centre, 2012. 12. M. Puller - Deep Excavations A Practical Manual, Thomas Thelford, 2003 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Vp	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)		65%
		- formative assessment test (tests during the semester)		
		- summative assessment test (final assessment)	100%	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test		35%
10.6 Passing requirements				
The student must demonstrate the ability to solve simple problems in key areas such as: earth pressure, calculation of settlement and the influence zone of the designed structure, dimensioning of underground structures, etc. Theoretical knowledge will be analysed based on a quiz and short-answer questions demonstrating a deep understanding of the core principles of design and the technologies involved in carrying out underground works				

The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.

Date of completion: September 2025

Lecture instructor(s):

Şef lucr.univ.dr.ing. Mircea ANICULĂESI

Seminar/laboratory/project/practical session instructor(s):

Şef lucr.univ.dr.ing. Mircea ANICULĂESI

Date of departmental approval:

September 2025

ANICULĂESI

Head of Department,
Şef lucr.univ.dr.ing. Oana-Elena COLȚ

Date of faculty council approval:

September 2025

Dean,

Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. The learning outcomes are consistent with level 7 of the National Qualifications Framework (CNC) and are differentiated according to the type of master's degree programme. Thus, for research master's programmes, they will include knowledge, skills, responsibility and autonomy defined in such a way as to enable the graduate to carry out independent scientific research activities. (<https://www.aracis.ro/wp-content/uploads/2025/07/Standard-specifice-masterat.pdf>).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)		Fundații în condiții speciale / Special Foundations					
2.1.2. Course code		CE416					
2.2 Lecture instructor(s)		Șef lucr.univ dr.ing. Mircea ANICULĂESI					
2.3 Seminar/laboratory/project/practical session instructor(s)		Șef lucr.univ dr.ing. Mircea ANICULĂESI					
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	VP	2.7 Course type ⁵	DO

3. Estimated total time

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar	1	3.3b laboratory	0	3.3c project	0	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar	14	3.6b laboratory	0	3.6c project	0	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										10	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										8	
Assessment ⁸										3	
Other activities:											
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites

4.1 Curriculum prerequisites ¹¹	Is not the case
4.2 Learning outcomes prerequisites	Geotechnics – CE306, Foundations – CE312

5. Requirements

5.1 for the lecture ¹²	On-site: Whiteboard and video projector, desktop/laptop for numerical simulations. On-line: TUIASI's Google Meet platform, desktop/laptop for presentations and numerical simulations, graphic tablet for annotations.
5.2 for the seminar ¹³	On-site: Whiteboard. On-line: TUIASI's Google Meet platform, desktop/laptop for presentations and numerical simulations, graphic tablet for annotations.

6. General objective of the course

The course "Foundations in Special Conditions" primarily aims to apply the knowledge acquired by students in geotechnics in geotechnical design of engineering structures in special site conditions. The course presents various ground improvement techniques and methods to address challenges caused by the unique behaviour of foundation soil, such as low compressibility, low shear strength, expansive soils, collapsible and liquefiable soils. Another objective is to know the factors that can influence the stability of a slope including the influence of an engineering structures on the stability and measures that can be taken to conserve or to increase the safety of the slope and for the engineering structure.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Understands the behaviour of a structure on a natural or artificial slope and know how to design the foundation on slopes. - Explains the importance of correctly identifying the behaviour of a soil characterized as difficult for foundation. - Identifies ground improvement methods suitable for each type of soil classified as difficult for foundation design.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - Recognizes types of soils with special behaviour and methods that could be used to improve their performance. - Recognize the necessary types of laboratory tests required to proper identification of the difficult soils. - Identifies the factors, natural and human induces in slopes instability and the methods that can be used to improve the stability according to the type of soil instability (slides, topples, creep, rock fall etc.) - Apply formulas, nomograms, and tables to solve simple, but fundamental, geotechnical engineering problems.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students and relevant case studies. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class.

During the seminary sessions, the teaching methods combine a case of study with problems solving. Both the activities in the lecture and seminary are complemented by interactive discussions to clarify concepts and ensure an in-depth understanding of the geotechnical design in difficult soil conditions.

9. Content

9.1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Stability issues on natural urban slopes: Relevant geotechnical issues of construction on urban slopes; soil investigations; safety factors computation; landslides monitoring; footings on slopes; mitigation measures	Interactive lecture, debates, explanations	8 hours
9.1.2. Difficult soils foundation: Collapsible soils; expansive soils; soils with liquefaction potential or sensitivity to frost and thaw; organic soils; recent soil deposits	Interactive lecture, debates, explanations	6 hours
9.1.3. Soil improvement: Permanent soil improvement with and without adding materials; Surface soil compaction: over	Interactive lecture, debates, explanations	6 hours

excavation and replacement design; Deep densification; Surface soil stabilization; Deep mixing and grouting		
9.1.4. Soil drainage and dewatering: Construction dewatering; Permanent ground water control; Dewatering methods; Dewatering techniques	Interactive lecture, debates, explanations	2 hours
9.1.5. Deep excavations: Excavation methods; Types of earth lateral support; stability analysis	Interactive lecture, debates, explanations	6 hours
Reading list for the lecture:		
1. DEPARTMENTS OF THE ARMY, THE NAVY AND THE AIR FORCE - Dewatering and groundwater control, ARMY TM 5-818-5 (available online at: https://www.nrc.gov/docs/ML1127/ML112760717.pdf)		
2. Malcolm Puller [2003], Deep excavations A practical manual, ICE Publishing (available online at: https://pdfcoffee.com/2003-deep-excavations-a-practical-manual-puller-pdf-free.html)		
3. Jie Han,[2015], Principles and Practices of Ground Improvement, John Wiley & Sons, Inc, (available online at: https://download.e-bookshelf.de/download/0003/6105/85/L-G-0003610585-0007035848.pdf)		
4. Zeevaert L., [1983], Foundation engineering for difficult subsoil conditions, Van Nostrand Reinhold Company Inc. (available online at: https://www.academia.edu/43121449/FOUNDATION_ENGINEERING_FOR_DIFFICULT_SUBSOIL_CONDITIONS)		
5. Kempfert H-G; Gebreselassie B. [2006], Excavations and Foundations in Soft Soils, Springer (available online at: https://istasazeh-co.com/wp-content/uploads/2022/04/Excavation-and-Foundation-in-Soft-Soils.pdf)		
6. I. Lungu, N. Boți, A. Stanciu – Probleme speciale de geotehnică și fundații, Editura Junimea, Iași, 2002		
9.2a Seminar	Work methods ¹⁷	
Landslides – case studies, slope stability analysis, stabilization methods and technologies	Discussions, debates, exercises and problem solving.	4 hours
Collapsible soils – structural pressure, supplementary settlement calculation and identification of the loess group	Discussions, debates, exercises and problem solving.	3 hours
Expansive soils – Calculation of the anticipated heave in terms of swell pressure	Discussions, debates, exercises and problem solving.	3 hours
Soil improvement – surface soil compaction soil, soil cushion design	Discussions, debates, exercises and problem solving.	2 hours
Deep excavation – retaining wall design	Discussions, debates, exercises and problem solving.	2 hours
Reading list for the seminary:		
1. Jie Han,[2015], Principles and Practices of Ground Improvement, John Wiley & Sons, Inc, (available online at: https://download.e-bookshelf.de/download/0003/6105/85/L-G-0003610585-0007035848.pdf)		
2. NP 125:2010 - Normativ privind fundarea construcțiilor pe pământuri sensibile la umezire		
3. NP 126-2010: Normativ privind fundarea construcțiilor pe pământuri cu umflări și contracții mari		
4. NP 124:2010-Normativ Privind Proiectarea Geotehnica a Lucrărilor de Susținere		
5. I. Lungu, N. Boți, A. Stanciu – Probleme speciale de geotehnică și fundații, Editura Junimea, Iași, 2002		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Verificare pe parcurs	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	25%	70%
		- formative assessment test (tests during the semester)	75%	
		- summative assessment test (final assessment)	0	
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities - assessment test		30%

10.6 Passing requirements

The final exam is the part focused on problem-solving and synthesis of knowledge. The student needs to demonstrate the ability to correctly answer questions on the theoretical knowledge on recognizing a difficult soil condition and how to solve the problem associated with that specific condition, to demonstrate the ability of using and cite relevant standards, codes, and technical literature specific to foundation design in problematic soils.

The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.

Date of completion: September 2025

Lecture instructor(s):

Şef lucr.univ dr.ing. Mircea ANICULĂESI

Seminar/laboratory/project/practical session instructor(s):

Şef lucr.univ dr.ing. Mircea ANICULĂESI

Date of departmental approval:

September 2025

Head of Department,

Şef lucr.univ dr.ing. Oana Elena COLȚ

Date of faculty council approval:

September 2025

Dean,

Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Elaborarea proiectului de diplomă Diploma project completion						
2.1.2. Course code	CE417						
2.2 Lecture instructor(s)							
2.3 Seminar/laboratory/project/practical session instructor	Șef lucr.dr.ing. Ioana-Sorina Ențuc						
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DS

3. Estimated total time (hours per semester)

3.1 Number of hours per week	4	3.2 lecture		3.3a seminar		3.3b laboratory		3.3c project	4	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	56	3.5 lecture		3.6a seminar		3.6b laboratory		3.6c project	56	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										15	
Additional research in the library, on specialised electronic platforms, and in the field										15	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										14	
Assessment ⁸										2	
Other activities:											
3.7 Total number of individual study hours ⁹	44										
3.8 Total number of hours per semester ¹⁰	100										
3.9 Number of ECTS credits	4										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	NA
4.2 Learning outcomes prerequisites	Building Materials 1,2, Strength of Materials 1,2, Statics and stability of Constructions 1,2, Reinforced Concrete, Reinforced and Prestressed Concrete, Structural Dynamics, Civil Constructions, Earthquake Engineering, Computer Aided Design, Steel Constructions 1,2, Technology of Constructions 1,2, Foundations, Timber Structures

5. Requirements

5.1 for the lecture ¹²	-
5.2 for the project ¹³	Computing technique, software packages

6. General objective of the subject

The diploma project aims to demonstrate the skills acquired by the student during the 4 years of bachelor studies by applying them in a final paper. This project must highlight the ability to analyse and synthesize information, as well as the technical and methodological skills required in solving a problem related to the design of a building structure. The diploma project represents proof of the graduate’s level of professional training and reflects the knowledge and skills acquired during the academic studies such as application of theoretical and practical knowledge, demonstration of technical skills and development of communication skills.

7. Learning outcomes¹⁴

Knowledge	<p>The student:</p> <ul style="list-style-type: none"> - will integrate and apply theoretical knowledge, practical skills, and methodologies acquired during the study program to solve complex, real-world problems - identifies, selects, and organizes information from diverse sources, including technical, normative, and literature reviews. - defines project objectives, design and check requirements and product specifications, and executes a design plan - verifies and validates project results against industry standards, numerical simulations, or practical using.
Skills	<p>The student:</p> <ul style="list-style-type: none"> - evaluates, selects and optimally uses different materials that go into the construction elements. - uses specific software for complete the structural analysis and technical drawings; - critically evaluates quantities, processes, equipment, procedures, and products in the civil engineering area using specific evaluation instruments and methods.
Responsibility and autonomy	<p>The student:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

Teaching strategies for completing diploma projects focus on teacher-led, student-centred instruction. Key strategies involve structuring the process into clear steps, facilitating ongoing formative assessment, and providing opportunities for collaborative, real-world applications. Students will identify what they need to know to solve the problem, creating a living document that guides their research. During the project completion it will be utilize feedback sessions, which help students develop critical thinking skills and improve their own work.

9. Content

9.2c Project	Work methods ¹⁸	Observations, allotted time
DRAFT FRAMEWORK FOR CONTENT OF THE DIPLOMA PROJECT THESIS - SPECIALIZATION CIVIL ENGINEERING		
1. THE TITLE OF THE PROJECT: must reflect the content of the solved problems from the project entitled	Interactive presentation of the activities and feedback sessions	2
2. CONTENT OF THE DIPLOMA PROJECT: 2.1 Technical report: 2.1.1 The requirements of building function; 2.1.2 Information about the site: Location of building; Zoning in terms of actions; earthquake, wind, snow, frost depth, etc.; Geotechnical conditions: features; foundation soil, bedding, presence of aggressive water, etc. 2.1.3 Describe the superstructure; 2.1.4 Description of the infrastructure; 2.1.5 Description of structural elements; 2.1.6 Description of the claddings; 2.1.7 Operating conditions; 2.1.8 Norms underlying the project; 2.1.9 Safety rules; 2.1.10 Describe the content of the personal part of the project. 2.2 Design report: 2.2.1 Preliminary design; 2.2.2 Thermal evaluation; 2.2.3. Assessment of loads. 2.2.4 The structural design (modelling, computer program, etc.). 2.2.4 The design of the foundations; 2.3 Construction technology and management: 2.3.1 Description of a work technology; 2.3.2 Presentation of the work scheduling elements and the site organization for a construction component; 2.3.3 Elaboration an economic documentation for a construction component of the building.		34
3. CONTENTS OF THE DRAWING PARTS: (Minimum 8 drawing parts - at least 3 for architectural part and at least 5 for structural part): Architectural plans (plans, characteristic sections, front view, lateral view); Structural details (foundation plan and details of foundations; plans and details for vertical structural elements; plans and details for horizontal linear structural elements; plans and details for horizontal surface structural elements)		20

Reading list for the project:

All the references at the indication of the diploma project coordinator, depending on the chosen topic.

NP 005-2022, Normativ privind proiectarea și verificarea construcțiilor din lemn

CR 0-2012 Cod de Proiectare. Bazele Proiectării construcțiilor, Ed. Matrix ROM, București 2012

CR 1-1-3/2012 Cod de proiectare. Evaluarea acțiunii zăpezii asupra construcțiilor, Ed. Matrix ROM, București 2012

CR 1-1-4/2012 Cod de proiectare. Evaluarea acțiunii vântului asupra construcțiilor, Ed. Matrix ROM, București 2012

CR6 - 2013 Cod de proiectare pentru structuri din zidărie. Exemple de calcul

NP 112/2014 - Normativ privind proiectarea fundațiilor de suprafață

P100-1/2013, Cod de proiectare seismică, Partea I – Prevederi de proiectare pentru clădiri

SR EN 1993-1-1/2006 Eurocod 3: Proiectarea structurilor din oțel. Partea 1-1: Reguli generale și reguli pentru clădiri

SR EN 1993-1-8/2006 Eurocod 3: Proiectarea structurilor din oțel. Partea 1-8: Proiectarea îmbinărilor

SR EN 1992-1-1/2004 – Eurocod 2. Proiectarea structurilor de beton

SR EN 1995 - 2005 / EUROCODE 5 - Proiectarea structurilor din lemn

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method	10.3 Percentage of final grade
10.4 Colloquium			
10.5d Project	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva	100% (min. 6)
10.6 Passing requirements The graphic representation of the elements of an existing construction through relief and the use of a graphics program for civil, industrial and agricultural constructions Dimensioning of structural elements subjected to standard loads or combination, specific to civil, industrial and agricultural constructions, using specialized calculation programs. Elaboration/application of the site organization project for a simple construction object of civil, industrial and agricultural constructions. Making at least 8 drawings of which at least 5 plans with structural details.			
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Seminar/laboratory/project/practical session instructor(s): Șef lucr.dr.ing. Ioana-Sorina ENȚUC

Date of departmental approval:
September 2025

Head of Department,
Șef lucr.dr.ing. Ioana-Sorina ENȚUC

Date of faculty council approval:

Dean,

September 2025

Prof.univ.dr.ing. Andrei BURLACU

Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Practica pentru elaborarea proiectului de diplomă Diploma project practice			
2.1.2. Course code				CE418			
2.2 Lecture instructor(s)							
2.3 Seminar/laboratory/project/practical session instructor(s)				Șef lucr.dr.ing. Ioana-Sorina Ențuc			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DS

3. Estimated total time (hours per semester)

3.1 Number of hours per week	5	3.2 lecture		3.3a seminar		3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	70	3.5 lecture		3.6a seminar		3.6b laboratory		3.6c project		3.6.d	70
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes											
Additional research in the library, on specialised electronic platforms, and in the field											
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios											
Assessment ⁸											
Other activities:											
3.7 Total number of individual study hours ⁹											
3.8 Total number of hours per semester ¹⁰		70									
3.9 Number of ECTS credits		2									

4. Prerequisites

4.1 Curriculum prerequisites ¹¹	NA
4.2 Learning outcomes prerequisites	Building Materials 1,2, Strength of Materials 1,2, Statics and stability of Constructions 1,2, Reinforced Concrete, Reinforced and Prestressed Concrete, Structural Dynamics, Civil Constructions, Earthquake Engineering, Computer Aided Design, Steel Constructions 1,2, Technology of Constructions 1,2, Foundations, Timber Structures

5. Requirements

5.1 for the lecture ¹²	-
5.2 for the project ¹³	Computing technique, software packages

6. General objective of the subject

The diploma project practice aims to highlight the ability to analyse and synthesize information, as well as the technical and methodological skills required in solving a problem related to the design of a building structure. The diploma project represents proof of the graduate’s level of professional training and reflects the knowledge and skills acquired during the academic studies such as application of theoretical and practical knowledge, demonstration of technical skills and development of communication skills.

7. Learning outcomes¹⁴

Knowledge	<p>The student:</p> <ul style="list-style-type: none"> - will integrate and apply theoretical knowledge, practical skills, and methodologies acquired during the study program to solve complex, real-world problems - identifies, selects, and organizes information from diverse sources, including technical, normative, and literature reviews. - defines project objectives, design and check requirements and product specifications, and executes a design plan - verifies and validates project results against industry standards, numerical simulations, or practical using.
Skills	<p>The student:</p> <ul style="list-style-type: none"> - evaluates, selects and optimally uses different materials that go into the construction elements. - uses specific software for complete the structural analysis and technical drawings; - critically evaluates quantities, processes, equipment, procedures, and products in the civil engineering area using specific evaluation instruments and methods.
Responsibility and autonomy	<p>The student:</p> <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of engineering.

8. Teaching strategies

Teaching strategies for diploma project practice focus on teacher-led, student-centred instruction. Key strategies involve structuring the process into clear steps, facilitating ongoing formative assessment, and providing opportunities for collaborative, real-world applications. Students will identify what they need to know to solve the problem, creating a living document that guides their study. During the project practice it will be utilize feedback sessions, which help students develop critical thinking skills and improve their own work.

9. Content

9.2d Practice	Work methods ¹⁸	Observations, allotted time
<p>DRAFT FRAMEWORK FOR CONTENT OF THE DIPLOMA PROJECT THESIS - SPECIALIZATION CIVIL ENGINEERING</p> <p>1. THE TITLE OF THE PROJECT: must reflect the content of the solved problems from the project entitled</p>	Interactive presentation of the activities and feedback sessions	2
<p>2. CONTENT OF THE DIPLOMA PROJECT:</p> <p>2.1 Technical report: The requirements of building function; Information about the site: Location of building; Zoning in terms of actions; earthquake, wind, snow, frost depth, etc.; Geotechnical conditions: features; foundation soil, bedding, presence of aggressive water, etc. Describe the superstructure; Description of the infrastructure; Description of structural and non-structural elements; Norms underlying the project; Safety rules;</p> <p>2.2 Design report: Preliminary design; Thermal evaluation; Assessment of loads and combination. The structural design (modelling, computer program, etc.). The design of the foundations;</p> <p>2.3 Construction technology and management: Description of a work technology; Presentation of the work scheduling elements and the site organization for a component; Elaboration an economic documentation for a construction component of the building.</p>		34
<p>3. CONTENTS OF THE DRAWING PARTS</p> <p>Minimum 8 drawing parts - at least 3 for architectural part and at least 5 for structural part: Architectural plans (plans, characteristic sections, front view, lateral view); Structural details (foundation plan and details of foundations; plans and details for vertical structural elements; plans and details for horizontal linear structural elements; plans and details for horizontal surface structural elements)</p>		20

Reading list for the project:

All the references at the indication of the diploma project coordinator, depending on the chosen topic.
NP 005-2022, Normativ privind proiectarea și verificarea construcțiilor din lemn
CR 0-2012 Cod de Proiectare. Bazele Proiectării construcțiilor, Ed. Matrix ROM, București 2012
CR 1-1-3/2012 Cod de proiectare. Evaluarea acțiunii zăpezii asupra construcțiilor, Ed. Matrix ROM, București 2012
CR 1-1-4/2012 Cod de proiectare. Evaluarea acțiunii vântului asupra construcțiilor, Ed. Matrix ROM, București 2012
CR6 - 2013 Cod de proiectare pentru structuri din zidărie. Exemple de calcul
NP 112/2014 - Normativ privind proiectarea fundațiilor de suprafață
P100-1/2013, Cod de proiectare seismică, Partea I – Prevederi de proiectare pentru clădiri
SR EN 1993-1-1/2006 Eurocod 3: Proiectarea structurilor din oțel. Partea 1-1: Reguli generale și reguli pentru clădiri
SR EN 1993-1-8/2006 Eurocod 3: Proiectarea structurilor din oțel. Partea 1-8: Proiectarea îmbinărilor
SR EN 1992-1-1/2004 – Eurocod 2. Proiectarea structurilor de beton
SR EN 1995 - 2005 / EUROCODE 5 - Proiectarea structurilor din lemn

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method	10.3 Percentage of final grade
10.4 Colloquium			
10.5d Practice	Participation in project activities, ability to conduct research/ documentation, and application of knowledge in project work	- project work - project completion - project viva	100% (min. 6)
10.6 Passing requirements The graphic representation of the elements of an existing construction through relief and the use of a graphics program for civil, industrial and agricultural constructions. Dimensioning of structural elements subjected to standard loads or combination, specific to civil, industrial and agricultural constructions, using specialized calculation programs. Elaboration/application of the site organization project for a simple construction object of civil, industrial and agricultural constructions. Making at least 8 drawings of which at least 3 for architectural part and 5 plans with structural details.			
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.			

Date of completion: September 2025

Seminar/laboratory/project/practical session instructor(s): Șef lucr.dr.ing. Ioana-Sorina ENȚUC

Date of departmental approval:
September 2025

Head of Department,
Șef lucr.dr.ing. Ioana-Sorina ENȚUC

Date of faculty council approval:
September 2025

Dean,
Prof.univ.dr.ing. Andrei BURLACU

Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)	Educație antreprenorială – antreprenoriat inovativ 1 Entrepreneurial education – innovative entrepreneurship 1						
2.1.2. Course code	CE420						
2.2 Lecture instructor	Senior Lecturer Claudiu Romila, PhD						
2.3 Seminar/laboratory/project/practical session instructor	Senior Lecturer Claudiu Romila, PhD						
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DFA

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	1	3.3a seminar		3.3b laboratory	2	3.3c project	1	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	14	3.6a seminar		3.6b laboratory	28	3.6c project	14	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										31	
Additional research in the library, on specialised electronic platforms, and in the field										19	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										33	
Assessment ⁸										4	
Other activities:											
3.7 Total number of individual study hours ⁹	83										
3.8 Total number of hours per semester ¹⁰	125										
3.9 Number of ECTS credits	5										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not applicable
4.2 Learning outcomes prerequisites	Not applicable

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> • Computer, video projector, blackboard, specific teaching materials • Students will respect the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iași
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> • Equipment, specific laboratory techniques, computing technology, software packages • The work is carried out after the teaching/verification of theoretical knowledge

6. General objective of the course

The general objective of the Entrepreneurial Education – Innovative Entrepreneurship 1 course is to introduce the fundamental concepts of the entrepreneurial ecosystem and to cultivate the creative capacity of the student to identify gaps in the construction market. The course aims to transform technical knowledge into innovative potential by exploring the relationship between engineering, creativity, and market needs, preparing the student for the structured development of business initiatives.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - identifies the core attributes of an innovative entrepreneurial mindset, distinguishing between traditional business management and innovation-driven venturing; - recognizes the psychological and professional traits of a civil engineer as an intrapreneur or entrepreneur, specifically focusing on resilience, risk assumption, and value creation; - defines the fundamental structures of a sustainable business model (such as the Business Model Canvas) specifically adapted for engineering firms; - outlines the economic indicators used to evaluate the feasibility of a startup, including ROI (Return on Investment), break-even points, and NPV (Net Present Value); - classifies different types of innovation (incremental, radical, architectural, and disruptive) and explains their specific impact on construction workflows.
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - calculates key financial metrics (e.g., Break-even point, Cash flow projections, and ROI) to justify the investment in new construction equipment or software; - constructs a detailed Business Model Canvas (BMC) that aligns technological innovation with market demand and revenue sustainability; - develops a risk mitigation strategy that identifies potential financial, legal, and environmental bottlenecks in a project's lifecycle; - uses data analytics and AI tools to forecast market trends and optimize resource allocation within a theoretical startup project; - employs design thinking methodologies to create human-centered solutions for complex engineering problems, such as sustainable urban housing or smart infrastructure.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects the principles, norms, and ethical values in the correct and timely execution of professional tasks; - integrates into workgroups and applies networking and efficient work techniques within multidisciplinary teams across various hierarchical levels; - manifests critical thinking and rigor in the performance of tasks; - stays permanently informed and documented in their specific field of activity by appropriately using effective learning methods and techniques; - develops professional projects in the field of engineering

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class and will conclude with a short application to consolidate the knowledge taught.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modelling), as well as action-based methods, such as exercises, practical activities, problem-solving.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
1. Introduction to entrepreneurship	Interactive lecture, debates, explanations	4 hours
2. Recognizing opportunities and generating ideas. Feasibility analysis of the project idea		4 hours
3. Forms of business organization		4 hours
4. Leadership and entrepreneurship		4 hours
5. Strategic planning - strategic vision, business mission, competitive advantage		4 hours
6. Business management and marketing		4 hours
7. Social entrepreneurship		4 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. Sorin-Gabriel ANTON et al., „Antreprenoriat – înființarea, finanțarea și managementul noilor afaceri, Editura Universității Alexandru Ioan Cuza Iași”, 2018; 2. Corneliu MUNTEANU et al., „Marketing – Principii, practice, orizonturi”, Editura Sedcom Libris, 2008; 3. Panaite NICA et al. – ”Managementul organizației – concept și practici”, Editura Sedcom Libris, 2014; 4. Richard Swedberg, ”The Social Science View of Entrepreneurship: Introduction and practical Applications”, in Entrepreneurship: The Social Science View, Oxford: Oxford University Press, 2000 		

5. Peter Boettke and Christopher Coyne, „Context Matters: Institutions and Entrepreneurship”, in Entrepreneurship, vol.5, 2008-2009
6. David Audretsch and D. Erdem, „Factors Affecting Entrepreneurial Activity”, in Handbook of Entrepreneurial Research, eds. S.Alvarez et al., Springer, 2005
7. Donald F. Kuratko, „Entrepreneurship: Theory, Process, and Practice. Cengage Learning”, 2017;
8. Israel M.Kirzner, „The entrepreneurship Process”, in Entrepreneurship: The Social Science View, Oxford: Oxford University Press, 2000.

9.2 Laboratory	Work methods ¹⁸	Allotted time
1. Generating business ideas	Interactive lecture, debates, explanations	4 hours
2. Strategic planning - strategic vision, competitive advantage		2 hours
3. Business Model Canvas		8 hours
4. Human resource planning of the newly started business		4 hours
5. Planning of technological and material resources in the newly started business		4 hours
6. Strategies for expanding a company		4 hours
7. Business specific legislation elements		2 hours

Reading list for the seminar / laboratory / project:

1. Heidi M. Neck, Patricia G. Greene, Candida G. Brush, „Teaching Entrepreneurship: A Practice-Based Approach”, Edward Elgard, 2014
2. Alexandria Valerio, Brent Parton, Alicia Robb, „Entrepreneurship Education and Training Programs around the World: Dimensions for Success”, The World Bank – 2014
3. Alain Fayolle, Heinz Klandt, „International Entrepreneurship Education: Issues and Newness”, Edward Elgard, 2006
4. Alan L. Carsrud, Malin Brannback, „Understanding the Entrepreneurial Mind, Springer”, 2009

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	-	40% (min. 5)
		- formative assessment test (tests during the semester)	-	
		- summative assessment test (final assessment)	100%	
10.5b Laboratory	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - assessment test (laboratory colloquium)		60% (min. 5)
10.6 Passing requirements				
The student must be familiar with the fundamentals of the innovative entrepreneurship concept, legislative frameworks, and the notions regarding the initiation, development, management, and protection of a business.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): Senior Lecturer Claudiu Romila, PhD

Seminar/laboratory/project/practical session instructor(s): Senior Lecturer Claudiu Romila, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Date of faculty council approval:

Dean,

September 2025

Professor Andrei BURLACU, PhD

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2025-2026

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Educație antreprenorială – antreprenoriat inovativ 2 Entrepreneurial education – innovative entrepreneurship 2			
2.1.2. Course code				CE421			
2.2 Lecture instructor(s)				Senior Lecturer Claudiu Romila, PhD			
2.3 Seminar/laboratory/project/practical session instructor(s)				Șef Senior Lecturer Claudiu Romila, PhD			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	C	2.7 Course type ⁵	DFA

3. Estimated total time (hours per semester)

3.1 Number of hours per week	3	3.2 lecture	2	3.3a seminar		3.3b laboratory		3.3c project	1	3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	42	3.5 lecture	28	3.6a seminar		3.6b laboratory		3.6c project	14	3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										11	
Additional research in the library, on specialised electronic platforms, and in the field										9	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										13	
Assessment ⁸										4	
Other activities:											
3.7 Total number of individual study hours ⁹	33										
3.8 Total number of hours per semester ¹⁰	75										
3.9 Number of ECTS credits	3										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	Not applicable
4.2 Learning outcomes prerequisites	Not applicable

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> • Computer, video projector, blackboard, specific teaching materials • Students will respect the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iași
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> • Equipment, specific laboratory techniques, computing technology, software packages • The work is carried out after the teaching/verification of theoretical knowledge

6. General objective of the course

The general objective of the Entrepreneurial Education – Innovative Entrepreneurship 2 course is to develop an innovative entrepreneurial mindset by understanding the civil engineer's role as a generator of economic and social value, capable of identifying technological opportunities and designing sustainable business models within the current context of the construction industry.

7. Learning outcomes¹⁴

Knowledge	<p>The student / graduate:</p> <ul style="list-style-type: none"> - knows the fundamental concepts of innovative entrepreneurship, including types of innovation, product life cycles, and their specific role in the construction field; - understands the operational mechanisms of the construction industry and the impact of economic, technological, and environmental factors on the development of innovative products and services; - identifies business opportunities and creates a business plan; - understands innovation management principles applied to the design, execution, and post-occupancy of constructions; - is familiar with digital tools and emerging technologies (e.g., BIM, AI, 3D printing); - understands the importance of the circular economy, green and blue economies, sustainability, and ethics in implementing innovative entrepreneurial initiatives..
Skills	<p>The student / graduate:</p> <ul style="list-style-type: none"> - identifies and evaluates innovative business opportunities within the construction sector; - develops and justifies a business plan for an innovative product or service; - applies innovation management principles to the development of technological and programming solutions in the field of construction; - conducts market analyses, product design, and project management within technological entrepreneurship; - identifies risk and success factors for business plans; - collaborates effectively in multidisciplinary teams.
Responsibility and autonomy	<p>The student / graduate:</p> <ul style="list-style-type: none"> - respects the principles, norms, and ethical values in the correct and timely execution of professional tasks; - integrates into workgroups and applies networking and efficient work techniques within multidisciplinary teams across various hierarchical levels; - manifests critical thinking and rigor in the performance of tasks; - stays permanently informed and documented in their specific field of activity by appropriately using effective learning methods and techniques; - develops professional projects in the field of engineering

8. Teaching strategies

The teaching activities will include interactive lectures and debates based on PowerPoint presentations that will be made available to students. The presentations contain images and diagrams, so that the information could be easily understood and assimilated. Each lecture will begin with a brief review of the concepts covered in the previous class and will conclude with a short application to consolidate the knowledge taught.

The teaching approach uses discovery-based learning models, facilitated by direct and indirect exploration of reality (experiments, demonstrations, modelling), as well as action-based methods, such as exercises, practical activities, problem-solving.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
1. The entrepreneurial process. Developing successful business ideas	Interactive lecture, debates, explanations	4 hours
2. The ethics of doing business		4 hours
3. Local and global sustainability - challenges and opportunities		4 hours
4. The circular economy		4 hours
5. The Blue Economy & Green economy		4 hours
6. Eco-entrepreneurship and Ecopreneurs		4 hours
7. Social entrepreneurship		4 hours
Reading list for the lecture: <ol style="list-style-type: none"> 1. Alain Fayolle - Handbook of Research in Entrepreneurship Education: Contextual perspectives, Edward Elgard, 2010 2. Richard G. Lowe, „On the Professional Code of Ethics and Business Conduct in the Workplace”, 2016 		

3. Sandhu, Sukhbir, Mckenzie, Stephen, Harris, Howard (Eds.), „Linking Local and Global Sustainability”, Springer, 2014
4. Peter Lacy, Jessica Long, Wesley Spindler, „The Circular Economy Handbook: Realizing the Circular Advantage”, Palgrave Macmillan UK, 2020
5. Edward B. Barbier, Anil Markandya, „A New Blueprint for a Green Economy”, Routledge, 2013
6. Peter Dauvergne, Jane Lister, „Eco-Business. A Big-Brand Takeover of Sustainability”, MIT Press, 2015
7. Muhammad Yunus, Karl Weber, „Building Social Business: The New Kind of Capitalism That Serves Humanity's Most Pressing Needs”, PublicAffairs, 2011.

9.2 Project	Work methods ¹⁸	
1. Introduction to entrepreneurship	Interactive lecture, debates, explanations	2 hours
2. Developing local sustainable communities		2 hours
3. Macro-environment analysis		2 hours
4. Identifying and capitalizing on market opportunities		2 hours
5. Strategic planning - strategic vision, competitive advantage		2 hours
6. Developing and capitalizing on a business		2 hours
7. Business financing. Financial indicators		2 hours
Reading list for the seminar / laboratory / project:		
1. Woodrow W. Clark, II, „Global Sustainable Communities Handbook”, Butterworth-Heinemann, 2014;		
2. Sorin-Gabriel ANTON și colectiv, “Antreprenoriat – înființarea, finanțarea și managementul noilor afaceri, Editura Universității Alexandru Ioan Cuza Iași”, 2018;		
3. Donald F. Kuratko, „Entrepreneurship: Theory, Process, and Practice. Cengage Learning”, 2017;		
4. Kjell Skogen, Jarle Sjøvoll, „Creativity and Innovation: Preconditions for Entrepreneurial Education”, Tapir Academic Press, 2010.		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Test	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual or group assignments – which must be completed during the week between lectures, preparation of a report, case study)	25%	60% (min. 5)
		- formative assessment test (tests during the semester)	25%	
		- summative assessment test (final assessment)	50%	
10.5b Project	Ability to work in a team. Ability to apply acquired knowledge in practice in different contexts. Capacity for analysis, personal interpretation, originality, and creativity	- completion of laboratory worksheets (all laboratory sessions must be completed, with only one missed session allowed to be retaken) - assessment test (project colloquium)		40% (min. 5)
10.6 Passing requirements				
The student must be familiar with the fundamentals of the innovative entrepreneurship concept, legislative frameworks, and the notions regarding the initiation, development, management, and protection of a business.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructor(s): Senior Lecturer Claudiu Romila, PhD

Seminar/laboratory/project/practical session instructor(s): Senior Lecturer Claudiu Romila, PhD

Date of departmental approval:
September 2025

Head of Department,
Senior Lecturer Ioana-Sorina Ențuc, PhD

Formular PO.DID.04 L-F2 E3R0

¹ Bachelor's/ Master's degree.² 1-4 for bachelor's degree, 1-2 for master's degree.³ 1-8 for bachelor's degree, 1-4 for master's degree.⁴ Exam (E), test (T) – from the curriculum.⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).⁷ The lines below refer to individual study; the total is indicated in section 3.7.⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.⁹ Sum of the values from the previous lines, referring to individual study.¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.¹¹ Courses that must be completed beforehand or equivalent courses.¹² Blackboard, projector, flipchart, specific teaching materials, etc.¹³ Computing equipment, software packages, experimental setups, etc.¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).¹⁵ Chapter and paragraph titles.¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.¹⁷ Practical demonstration, exercise, experiment.¹⁸ Case study, demonstration, exercise, error analysis, etc.

Tip activitate	10.1 Criterii de evaluare	10.2 Metode de evaluare		10.3 Pondere din nota finală
10.4 Colocviu	Completitudinea și corectitudinea cunoștințelor. Coerența logică, fluența, forța de argumentare. Capacitatea de analiză, de interpretare personală, originalitatea, creativitatea. Gradul de asimilare a limbajului de specialitate și capacitatea de comunicare. Capacitatea de a valorifica abilitățile dobândite. Capacitatea de a prelucra datele și problemele enunțate.	- observarea sistematică a studenților (teme individuale/ de echipă - temele trebuie efectuate în săptămâna dintre cursuri, pregătirea unui referat - studiu de caz).	25%	100% (min. 5)
		- test de evaluare formativ (verificări pe parcursul semestrului).	25%	
		- test de evaluare sumativ (examen final scris).	50%	
10.5 Seminar	Capacitatea de aplicare în practică a cunoștințelor învățate. Capacitatea de analiză, de interpretare personală, originalitatea, creativitatea.	- participarea activă la activități; - test de evaluare.		-
10.6 Condiții de promovare				
Rezultatul evaluării finale la o disciplină rezultă prin considerarea punctajelor și ponderilor alocate fiecărei activități din cadrul disciplinei. Se vor acorda note întregi de la 10 la 1, nota 5 certificând dobândirea rezultatelor învățării minimale aferente unei discipline și acordarea creditelor de studii aferente acesteia.				

Data completării: Septembrie 2025

Titular/ titulari de curs: Șef lucr.dr.ing. Claudiu Romila

Titular/ titulari de aplicații: Șef lucr.dr.ing. Claudiu Romila

Data avizării în departament:
Septembrie 2025

Director de departament
Șef lucr.univ. dr.ing. Ioana-Sorina Ențuc

Data aprobării în Consiliul Facultății:

Decan,

Septembrie 2025

Prof.univ.dr.ing. Andrei BURLACU

¹ Licență/ Masterat.

² 1-4 pentru licență, 1-2 pentru masterat.

³ 1-8 pentru licență, 1-4 pentru masterat.

⁴ Examen (E), verificare (V) – din planul de învățământ.

⁵ DOB – disciplină obligatorie, DOP – disciplină opțională, DFA – disciplină facultativă;

⁶ Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.5, 3.6abc).

⁷ Liniiile de mai jos se referă la studiul individual; totalul se completează la punctul 3.7.

⁸ Între 2 și 6 ore. Acestea reprezintă ore didactice și nu se includ în studiul individual.

⁹ Suma valorilor de pe liniile anterioare, care se referă la studiul individual.

¹⁰ Suma dintre numărul de ore de activitate didactică directă (3.4) și numărul de ore de studiu individual (3.7); trebuie să fie egală cu numărul de credite alocate disciplinei (punctul 3.9) x 25 de ore pe credit.

¹¹ Se menționează disciplinele obligatorii a fi promovate anterior sau echivalente.

¹² Tablă, vidoproiector, flipchart, materiale didactice specifice etc.

¹³ Tehnică de calcul, pachete software, standuri experimentale, etc.

¹⁴ Rezultatele învățării prezentate sub formă de cunoștințe, aptitudini, responsabilitate și autonomie specifice disciplinei. Acestea vor fi corelate cu rezultatele învățării pe domenii fundamentale și domenii de licență (Anexa 2 din Standarde specifice ARACIS, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). Pentru programele de masterat, rezultatele învățări sunt aferente nivelului 7 din CNC.

¹⁵ Titluri de capitole și paragrafe.

¹⁶ Discuții, dezbateri, prezentare și/sau analiză de lucrări, rezolvare de exerciții și probleme.

¹⁷ Demonstrație practică, exercițiu, experiment.

¹⁸ Studiu de caz, demonstrație, exercițiu, analiza erorilor etc.

COURSE SYLLABUS

Academic year 2027 - 2028

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Civil Engineering and Building Services
1.3 Department	Structural Mecanics
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor
1.6. Study programme	Civil Engineering

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				BIM – Digitalizarea proiectelor de constructii / BIM – Digitalization of construction projects			
2.1.2. Course code				CE422			
2.2 Lecture instructor(s)				Senior lecturer Gabriela Covatariu, PhD eng.			
2.3 Seminar/laboratory/project/practical session instructor(s)				Senior lecturer Gabriela Covatariu, PhD eng.			
2.4 Year of study ²	4	2.5 Semester ³	7	2.6 Assessment method ⁴	Vp	2.7 Course type ⁵	DL/DC

3. Estimated total time (hours per semester)

3.1 Number of hours per week	2	3.2 lecture	1	3.3a seminar		3.3b laboratory	1	3.3c project		3.3.d practical sessions
3.4 Total number of hours in the curriculum ⁶	28	3.5 lecture	14	3.6a seminar		3.6b laboratory	14	3.6c project		3.6.d
Workload distribution ⁷										No. of hours
Study based on textbook, course material, reading list and notes										11
Additional research in the library, on specialised electronic platforms, and in the field										10
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										1
Assessment ⁸										
Other activities:										
3.7 Total number of individual study hours ⁹			22							
3.8 Total number of hours per semester ¹⁰			50							
3.9 Number of ECTS credits			2							

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	
4.2 Learning outcomes prerequisites	

5. Requirements

5.1 for the lecture ¹²	<ul style="list-style-type: none"> Applied activities in physical format, at the faculty headquarters: computer technology, software packages, experimental stands, etc. Students will comply with the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iasi
5.2 for the seminar / laboratory / project ¹³	<ul style="list-style-type: none"> Applied activities in physical format, at the faculty headquarters: computer technology, software packages, experimental stands, etc. The deadlines for the submission of the papers are established by the tenured professors and are sent to the students at the beginning of the semester <p>Students will comply with the Code of Student Rights and Obligations and the Regulations provided by the Charter of the "Gheorghe Asachi" Technical University of Iasi</p>

6. General objective of the course

Currently, the construction industry is facing great technological and institutional changes and challenges. These include globalization, specialization, and virtual collaboration. In this course, students will become familiar with the BIM concept and BIM software environments. The course aims to present how to implement new technologies in construction projects in order to streamline processes and improve the flow of information in a construction project, which are the necessary requirements for a successful collaboration in a project, to build BIM information models and the standards to be followed for it.

7. Learning outcomes¹⁴

Knowledge	<p>The Student/Graduate will:</p> <ul style="list-style-type: none"> - Understanding of basic BIM concepts, collaborative work methods and the role of information in construction projects. - Familiarize yourself with the formats and data structures used in BIM processes: IFC, BCF, IDS, COBie, RVT. - Familiarize yourself with ISO 19650 international standards as well as buildingSMART concepts (bSDD, MVD).
Skills	<p>The Student/Graduate will be able to:</p> <ul style="list-style-type: none"> - Apply BIM tools and technologies - Define the need for information and documents within a BIM construction project
Responsibility and autonomy	<p>Student/Graduate:</p> <ul style="list-style-type: none"> - respects the principles, norms and values of ethics in the correct and timely execution of professional tasks, by approaching a rigorous, efficient and responsible work strategy in decision-making for problem solving; - integrates into the working group and applies techniques of relationship and efficient work in multidisciplinary teams, on various hierarchical levels; - he/she is permanently informed and documented in his/her own field of activity through the appropriate use of effective methods and techniques of lifelong learning; - develops professional projects in the field of engineering.

8. Teaching strategies

In the teaching activity, participatory lectures and debates will be used based on Power Point presentations that will be made available to students on the *edu.tuiasi.ro* platform. The presentations contain images, sketches, videos, so that the information is easy to understand and assimilate.

The teaching method is also based on models of learning by discovery facilitated by direct and indirect exploration of reality (experiment, demonstration, modelling), but also on action-based methods, such as exercise, practical activities and problem solving.)

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1. Introducere in BIM. De ce BIM? Avantajele lucrului în colaborare folosind sistemul BIM. Fluxul de lucru BIM.	Interactive lecture, debates, explanations	4 hours
9.1.2. Nivele de maturitate BIM. LOD. LOIN		1 hours
9.1.3. Roluri ale diverselor părți în BIM. Competențe		2 hours
9.1.4. Standarde în BIM. Formate de fișiere. Mediu de colaborare a datelor(Common Data Environment CDE)		3 hours
9.1.5. Unelte și tehnologii BIM. Programe utilizate în BIM		4 hours
<p>Reading list for the lecture:</p> <ol style="list-style-type: none"> 1. I. Saks R., Eastman C., Lee G., Teicholz – <i>BIM Handbook: A guide to Building Information Modeling for Owners, Managers Designers, Engineers, Contractors and Facility Managers</i>, 2nd edition, John Wiley & sons Inc., 2018 2. Holzer D. – <i>The BIM Managers’s Handbook: Guidance for Professionals in Architecture, engineering and Construction</i>, John Wiley & sons Inc., 2016 3. Enyon J. – <i>Construction Manager’s BIM Handbook</i>, John Wiley & sons Inc., 2016 4. Kensek K.M., Noble D.E. – <i>Building Information Modelling. BIM in current and future practice</i>, John Wiley & sons Inc., 2014 		

5. Standarde internationale BIM (ISO 19650-1, ISO 19650-2, ISO 19650-3).		
9.2a Seminar	Work methods ¹⁶	Observations, allotted time
9.2.1 Crearea modelelor BIM. Colaborarea in modele BIM	Interactive lecture, debates, explanations, practice work	6 hours
9.2.2 Modelarea ciclului de viață al construcțiilor		4 hours
9.2.3 Studii de caz		6 hours
Reading list for the seminar / laboratory / project:		
<ol style="list-style-type: none"> 1. <i>Software documentation - Smartbuilding compatible, OpenBIM platform</i> 2. Saks R., Eastman C., Lee G., Teicholz – <i>BIM Handbook: A guide to Building Information Modeling for Owners, Managers Designers, Engineers, Contractors and Facility Managers</i>, 2nd edition, John Wiley & sons Inc., 2018 		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade (recommended to be in agreement with the number of hours allocated)
10.4 Final tests	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of assimilation of specialised terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (individual assignments – which must be completed during the week between lectures, preparation of a report, case study)	100%	70%
		- presentation of the project by all the students		
		- formative assessment test (tests during the semester)		
10.5b Laboratory	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in the activities		30%
		- assessment test		
10.6 Passing requirements				
The student will answer a test and participate in the development of a study on a topic chosen from a list of proposed topics. The study will be held in front of colleagues, then answering the questions. The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion:
September 2025

Lecture instructor(s): Senior lecturer Gabriela Covatariu, PhD eng

Seminar/laboratory/project/practical session instructor(s): Senior lecturer Gabriela Covatariu, PhD eng

Date of departmental approval: Head of Department,
Senior lecturer Vasile-Mircea VENGHIAC, PhD eng

Date of faculty council approval: Dean,
Prof. Andrei BURLACU, PhD eng.

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) × 27 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.

COURSE SYLLABUS

Academic year 2028-2029

1. Programme information

1.1 Higher Education Institution	“Gheorghe Asachi” Technical University of Iași
1.2 Faculty	Faculty of Civil Engineering and Building Services
1.3 Department	Civil and Industrial Engineering
1.4 Field of study	Civil Engineering
1.5 Level of study ¹	Bachelor’s degree
1.6. Study programme	Inginerie civilă (în limba engleză)/ Civil Engineering - ICE

2. Course information

2.1.1 Course title – (in Romanian) (in English, according to the Diploma supplement)				Orașe inteligente. Concepte și structuri pentru clădiri Smart Cities. Building Concepts and Structures			
2.1.2. Course code				CE423			
2.2 Lecture instructor(s)				Prof.univ.dr.ing. Fideliu PĂULEȚ-CRĂINICEANU Conf.univ.dr.ing. Ionuț-Ovidiu TOMA			
2.3 Seminar/laboratory/project/practical session instructor(s)				Prof.univ.dr.ing. Fideliu PĂULEȚ-CRĂINICEANU Conf.univ.dr.ing. Ionuț-Ovidiu TOMA			
2.4 Year of study ²	4	2.5 Semester ³	8	2.6 Assessment method ⁴	Vp	2.7 Course type ⁵	DL

3. Estimated total time (hours per semester)

3.1 Number of hours per week	2	3.2 lecture	1	3.3a seminar	1	3.3b laboratory		3.3c project		3.3.d practical sessions	
3.4 Total number of hours in the curriculum ⁶	28	3.5 lecture	14	3.6a seminar	4	3.6b laboratory		3.6c project		3.6.d	
Workload distribution ⁷										No. of hours	
Study based on textbook, course material, reading list and notes										6	
Additional research in the library, on specialised electronic platforms, and in the field										8	
Preparation for seminar/laboratory/project session, assignments, papers, and portfolios										8	
Assessment ⁸										3	
Other activities:											
3.7 Total number of individual study hours ⁹	22										
3.8 Total number of hours per semester ¹⁰	50										
3.9 Number of ECTS credits	2										

4. Prerequisites (if applicable)

4.1 Curriculum prerequisites ¹¹	N/A
4.2 Learning outcomes prerequisites	Hurban communities’ problems understanding. Civil Engineering role in society.

5. Requirements

5.1 for the lecture ¹²	Computer/laptop, video-projector, black/white board, camera, microphone, internet. Students must comply to the University’s rights and obligations of “Students Code” and requirements from <<“Gheorghe Asachi” Technical University of Iasi Chart>>.
5.2 for the seminar / laboratory / project ¹³	Computer/laptop, video-projector, black/white board, camera, microphone, internet. It is advisable that the students use their own devices (laptop / smart phones) or the computers from laboratories. At the semester start, all students are instructed on the evaluation terms and timelines of assignments.

6. General objective of the course

The general objective of the course is to base in the students a thinking system on the Civil Engineering domain's integration in Smart City concept in the context of the 4.0 Industrial Society and the transition to 5.0 Industrial Society. The Industrial Revolution 4.0 have brought in almost all human activities digitalization and automation (through vectors as: Artificial Intelligence and Machine Learning, Internet of Things, Big data, Robotics and automation, Cloud computing, Cyber-physical systems, Digital twins). The newer 5.0 Society will mean new challenges as: human-centric design, human–AI collaboration, sustainability and resilience.

7. Learning outcomes¹⁴

Knowledge	The student / graduate: <ul style="list-style-type: none"> - explains the basic elements of industrial revolutions 4.0 and 5.0; - identifies the outcomes that are or could be parts of a Smart City; - applies the principles of traditional building systems to Smart City requirements; - evaluates his/her role as a member of a Smart City program implementation team.
Skills	The student / graduate: <ul style="list-style-type: none"> - uses digital tools to analyze data referring to Civil Engineering elements in a Smart City; - uses monitoring data from constructions; - plans monitoring regarding construction structures; - adopts and adapts existing solutions for Smart City building development; - operates digital communication tools for integration in Smart City projects teams.
Responsibility and autonomy	The student / graduate: <ul style="list-style-type: none"> - complies with ethical principles, norms, and values in completing professional tasks correctly and on time, by adopting a rigorous, efficient, and responsible work strategy in decision-making and problem-solving; - integrates into workgroups and applies effective relationship-building and teamwork techniques in multidisciplinary teams across different hierarchical levels; - continually seeks information and updates knowledge in their field of activity by using appropriate and effective lifelong learning methods and techniques; - develops professional projects in the field of Civil Engineering and application for Smart City integration.

8. Teaching strategies

The strategy in teaching is mainly based on presentations (available to students) in Power Point and other presentations software if needed, direct internet sites explorations and AI prompts. Everything is due to be interactive and debates are encouraged.

At the start of each lecture, a short remainder from previous lecture is sustained.

During classes, students are involved in exploring the new terms and concepts using their own critical thinking in relation to AI answers. Students are using their laptops / phones / tablets / laboratory's PC for making their way to the teaching understanding.

9. Content

9. 1. Lecture ¹⁵	Teaching strategies	Time allocation
9.1.1-2. The history of industrial revolutions. Concepts that define a Smart City.	Interactive lecture, debates, explanations, AI prompts	2 hours
9.1.3-4. The challenges of the actual society: environment, climatic changes, new energy, new materials etc.	Interactive lecture, debates, explanations, AI prompts	2 hours
9.1.5-6. Advanced technologies of the Industrial Revolution 4.0.	Interactive lecture, debates, explanations, AI prompts	2 hours
9.1.7-8. Examples of actual Smart Cities in the world.	Interactive lecture, debates, explanations, AI prompts	2 hours
9.1.9-10. Civil Engineering domain. A history of Smart Cities.	Interactive lecture, debates, explanations, AI prompts	2 hours
9.1.11-12. Actual steps in Civil Engineering, toward implementing latest technologies.	Interactive lecture, debates, explanations, AI prompts	2 hours

9.1.13-14. The future of Civil Engineering in the context of Smart Cities and Industrial Revolution 5.0.	Interactive lecture, debates, explanations, AI prompts	2 hours
Reading list for the lecture: - Teaching material in Google Classroom: classroom.google.com/c/ODQwNDQ5OTgwMjEy - The World Economic Forum, www.weforum.org - Smart Cities Dive, www.smartcitiesdive.com - Velaga, K. S., Guo, Y., & Yu, W. (2025). Edge AI for Smart Cities: Foundations, Challenges, and Opportunities. Smart Cities, 8(6), 211. https://doi.org/10.3390/smartcities8060211		
9.2 Seminar	Work methods ¹⁶	Observations, allotted time
9.2.1-8. Discussions/debates on topics revealed during Lectures 1-7. Preparing and presenting of the student's Report no.1: A point of view on "Smart Cities paradigm's concepts and their application in actual/known cities".	Discussions/debates, use of presentation means, internet, AI	7 hours
9.2.9-14. Discussions/debates on topics revealed during Lectures 8-14. Preparing and presenting of the student's Report no.2: A point of view on "Civil Engineering domain in the Smart Cities paradigm and their application in actual/known cities".	Discussions/debates, use of presentation means, internet, AI	7 hours
Reading list for the seminar / laboratory / project: - Teaching material in Google Classroom: classroom.google.com/c/ODQwNDQ5OTgwMjEy - AI (for debates and assignments) e/g.: Google Gemini, gemini.google.com; Perplexity, www.perplexity.ai; Chat GPT, chatgpt.com; Claude, claude.ai; - New Atlas, newatlas.com.		

10. Assessment

Assessment category	10.1 Assessment criteria	10.2 Assessment method		10.3 Percentage of final grade
10.4 Continuous assessment	Completeness and accuracy of knowledge Logical coherence, fluency, and strength of argumentation Capacity for analysis, personal interpretation, originality, and creativity Level of command of specialized terminology and communication skills Ability to apply acquired skills Ability to process data and solve the problems presented	- systematic observation of students (preparation and presentation of two reports, active participation in debates and interactions)	100%	50%
10.5a Seminar	Ability to apply acquired knowledge Capacity for analysis, personal interpretation, originality, creativity	- active participation in debates and interactions		50%
10.6 Passing requirements The minimum learning results required to pass are: - application of the principles of traditional building systems to Smart City requirements; - use of monitoring data from constructions; - operate digital communication tools for integration in Smart City projects teams; - comply with ethical principles, norms, and values in completing professional tasks correctly and on time.				
The final grade for a course is determined by taking into account the scores and weightings assigned to each course activity. Whole-number grades from 10 to 1 will be awarded, with a grade of 5 certifying the achievement of the minimum learning outcomes required for the course and the awarding of the corresponding ECTS credits.				

Date of completion: September 2025

Lecture instructors:

Prof.univ.dr.ing. Fideliu PĂULEȚ-CRĂINICEANU

Conf.univ.dr.ing. Ionuț-Ovidiu TOMA

Seminar/laboratory/project/practical session instructors:

Prof.univ.dr.ing. Fideliu PĂULEȚ-CRĂINICEANU

Conf.univ.dr.ing. Ionuț-Ovidiu TOMA

Date of departmental approval:

Head of Department,

September 2025

Șef lucr.univ. dr.ing. Vasile-Mircea VENGHIAȘ

Date of faculty council approval:

Dean,

September 2025

Prof.univ.dr.ing. Andrei BURLACU

¹ Bachelor's/ Master's degree.

² 1-4 for bachelor's degree, 1-2 for master's degree.

³ 1-8 for bachelor's degree, 1-4 for master's degree.

⁴ Exam (E), test (T) – from the curriculum.

⁵ DOB – compulsory course, DOP – elective course, DFA – optional course;

⁶ It is equal to 14 weeks x the number of hours indicated in section 3.1 (similarly for 3.5, 3.6abc).

⁷ The lines below refer to individual study; the total is indicated in section 3.7.

⁸ Between 2 and 6 hours. These represent teaching hours and are not included in individual study.

⁹ Sum of the values from the previous lines, referring to individual study.

¹⁰ Sum of direct contact hours (3.4) and individual study hours (3.7); this must equal the number of credits allocated to the course (section 3.9) x 25 hours per credit.

¹¹ Courses that must be completed beforehand or equivalent courses.

¹² Blackboard, projector, flipchart, specific teaching materials, etc.

¹³ Computing equipment, software packages, experimental setups, etc.

¹⁴ Learning outcomes presented as knowledge, skills, responsibility, and autonomy specific to the course. These should be correlated with the learning outcomes in fundamental and bachelor's degree fields (Annex 2 of ARACIS Specific Standards, www.aracis.ro/wp-content/uploads/2025/04/Standarde-specifice-programe-de-studii-universitare-de-licenta_aprilie-2025.pdf). For master's programmes, learning outcomes correspond to level 7 of the National Qualifications Framework (CNC).

¹⁵ Chapter and paragraph titles.

¹⁶ Discussions, debates, presentation and/or analysis of works, exercises and problem solving.

¹⁷ Practical demonstration, exercise, experiment.

¹⁸ Case study, demonstration, exercise, error analysis, etc.