Transilvania University of Braşov, Romania

Study program: Sustainable construction engineering

Faculty: Civil Engineering
Study period: 2 years (master)
Courses description per years (C= course; S = seminar; L = laboratory; P = project)

1st Year

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
BIM Concept in Civil Engineering	CBIM01	Romanian	5	2	-	-	1

Course description (Syllabus): knowledge of the use and implementation of BIM technology in the design of structures for constructions and installations; identifying BIM application methods by implementing the building IT model; developing skills in Geographic Information Systems (GIS), which provides opportunities to analyze data, explore problems, solve problems, and assess situations in a geographic and spatial context; spatial data analysis, using GIS analysis tools, adapted to the management of construction projects; applying GIS, on a case-by-case basis, for the purpose of acquiring, storing, updating, processing, analyzing and displaying information in the form of plans, maps, reports for the management of construction projects;

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Modern architectural concepts in sustainable building design	CAMPCS01	Romanian	5	2	-	-	1

Course description (Syllabus): Exploring historical / traditional ways of responding to the challenges of the relationship with the natural environment over time in relation to climatic levels and the specific particularities of different historical contexts regarding the built environment and developing the skills to participate in the development of architectural design themes and to analyze / design / interpret concepts regarding the design of an architectural object from the perspective of understanding the process that leads to its realization in relation to i) the responses of local / regional / any region of the world's traditional architecture with similar climatic levels to the challenges of relating to the natural environment and the context of the site, ii) modern architectural concepts in the design of sustainable / bioclimatic / passive constructions as reinterpretations /

resumes in the present of traditional classical solutions or as modern innovations in relation to new construction and finishing materials, iii) the characteristics and particularities that give the architectural object potential in terms of primary, functional and cultural-symbolic meanings, in order to create the premises for sustainable dialogue in practice between specialists in the field.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Evaluation of the reliability of structures in the concept of design for durability	EFSCPD01	Romanian	4	1	1	-	-

Course description (Syllabus): This course introduces the fundamental concepts of structural reliability using probabilistic methods. Key topics include the reliability (fiability) function, survival function, failure probability, and safety indices. The course also introduces the work with various software to help solving various problems involving reliability. It addresses the modeling of uncertainties in engineering problems.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Sustainable materials used in construction	MSUC01	Romanian	4	2	-	-	-

Course description (Syllabus): Courses teach how to manage projects environmentally responsibly, covering green materials, energy efficiency, waste reduction, life-cycle analysis, and regulations for healthier, resource-efficient buildings. These programs focus on practical and theoretical skills to meet industry demand for sustainable building practices. Core Concepts: Environmental sustainability, materials resource management, building lifecycles (design, build, operate, demolish), sustainable materials, composite materials, low-carbon techniques, energy efficiency, waste management.

Course title	Code	Language of instruction	No. of credits	Number of hours/week			
				C	S	L	P
Evaluation and certification of sustainable buildings	ECCS01	Romanian	4	2	1	-	-

Course description (Syllabus): The aim of the course is to present the fundamental concepts and methods related to sustainability in construction, including life-cycle approaches, sustainable materials, evaluation and certification models (such as BREEAM, LEED, CASBEE), the relevant international and national legislative context, managerial decision-making processes, and future development directions in sustainable construction.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Ethics and Academic Integrity	EIA01	Romanian	2	2	1	-	-

Course description (Syllabus): Acquiring and applying, in the professional career, the specific concepts of ethics and academic integrity; deontology and integrity in university and scientific research and the development of a culture of responsibility in terms of involvement in the joint effort to prevent, identify and combat possible academic fraud, especially plagiarism; developing the capacity to know and master the main points of view regarding academic ethics.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Practical placement I	SP01	Romanian	6	-	-	-	-

Course description (Syllabus): providing an initial overview of the processes of organization and management of various projects, including those in the construction sector; presenting the main strategies for elaboration and implementation of projects' proposals.

Course title	Code	Language of instruction	No. of credits	Number of hours/week			
				C	S	L	P
Advanced Structural Engineering with Finite Element	ASAEF 02	Romanian	5	1	-	2	-

Course description (Syllabus): This course focuses on advanced methods of nonlinear structural analysis using the Finite Element Method (FEM). It covers the evaluation of structural behavior under extreme loading conditions, including the interaction between buckling and strength. Emphasis is placed on elasto-plastic material behavior throughout all loading stages up to structural collapse. The course also examines the effects of stress redistribution, geometric local and global imperfections, and mechanical imperfections of structural elements on nonlinear structural response.

Course title	Code	Language of instruction	No. of credits	Number of hours/week			
				C	S	L	P
Composite steel and concrete structures	SMOB02	Romanian	5	2	-	-	2

Course description (Syllabus): This course will cover fundamental concepts and applications of steel-concrete composites in the design of steel buildings with emphasis on composite beams, floor systems and composite columns. It is presented the method for calculating the normal plastic resistance of a composite column and the plastic tensile resistance of a composite beam. At the end of the course, the student will have an in-depth knowledge of relevant limit states / failure mode in steel components and structures, and a familiarity with the applicable topics in the Eurocode 4 Specifications. The students will have some experience in solving design examples and looking at applications of the fundamental concepts learned in the course.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Modern structures for prestressed concrete	SMBP 02	Romanian	5	2	-	-	2

Course description (Syllabus): The course is structured in two parts: fundamental elements concerning the prestressing of concrete (historic short, tension, comparative elements between reinforced and prestressed concrete, methods of prestressing, areas of application, etc.) and basic elements regarding conception, designing and composition of modern structures of prestressed concrete. Are presented in this sense, theoretical and practical aspects concerning composition concept of each structural components and of structure in general, with exemplification on existing constructions. The applicative part represent a exemplification on an element construction for which are known initial dates and encompass two part: the written part (the theme, planning statement, notes of calculation and the drawn part (formwork plan, reinforced plan, section, details, etc.)

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Evaluation and certification of energy performance of buildings	ECPEC 02	Romanian	5	2	-	-	1

Course description (Syllabus): The content of the discipline is structured in two main parts, followed in a logical order, aiming to highlight the energy performance aspects of buildings and

related installations. The first part of the course presents the defining elements of the concept of energy performance and the content stages regarding the energy audit of buildings. The proposed energy rehabilitation measures aim to improve the energy performance of buildings and related installations, highlighting environmentally friendly solutions and the renewable energy resources used. The aspects regarding the energy certification of buildings evaluated in the initial phase and after the proposal of energy rehabilitation solutions are explicitly presented in the second part of the course. Performing an energy audit for an existing building in order to evaluate/certify energy performance is the theme of the project developed in parallel with the course.

Course title	Code	Language of instruction	No. of credits	Number of hours/week			
				C	S	L	P
Practical placement II	SP02	Romanian	6	-	-	-	-

Course description (Syllabus): providing an initial overview of the processes of organization and management of various projects, including those in the construction sector; presenting the main strategies for elaboration and implementation of projects' proposals.

Course title	Code	Language of instruction	No. of credits	Number of hours/week			
				C	S	L	P
Management in Urban Planning and Regeneration	EMPR U02	Romanian	4	2	-	-	1

Course description (Syllabus): the course provides an integrated overview of management principles applied to urban planning and regeneration processes, with a focus on sustainable development. It addresses project and investment management in construction, urban and territorial planning concepts, relevant legislation and European policies, as well as tools for analyzing urban dynamics and development indicators. The course examines strategies and instruments for urban regeneration, sustainable construction, circular economy and the reuse of the built environment. Through applied project work, students develop the ability to provide technical consultancy, coordinate multidisciplinary teams and support decision-making in the planning, rehabilitation and regeneration of urban areas and metropolitan regions.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Sustainable development in the built environment	DDMC02	Romanian	4	2	-	-	1

Course description (Syllabus): Understanding and creating premises for finding the optimal solutions for sustainable buildings, using the appropriate materials and technologies, by following the principles of sustainable development, in construction and architecture. Developing skills for analysing urban planning, Smart City - BIM, specific to contemporary constructions. Developing the capacity to evaluate the impact on the environment and territory of the constructions. Also, understanding the possibilities of technological adaptation to the climatic conditions and zoning.

2nd Year

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Strengthening construction infrastructure	CIC03	Romanian	5	2	-	-	2

Course description (Syllabus): The improvement of the foundation ground and the rehabilitation/consolidation of the construction infrastructure aims to restore the load-bearing capacities for the support layer of the foundations and substructure elements through specific technical and technological processes, depending on the designed solution(s). In order to achieve the proposed objective, the course structure describes a rational sequence of content elements, starting from the assessment of the technical condition of the construction, to the knowledge of the causes and forms of manifestation of degradation, to the identification and design of the optimal solution(s) for improvement/rehabilitation and/or consolidation. To highlight the ground-foundation interaction, the final part of the course describes in detail the elements of composition and calculation in the phase of launching at elevation and operation of open and compressed air caissons. The applied works related to the discipline refer to the design of the solution to improve the foundation ground for a future construction, respectively the design of the optimal rehabilitation/consolidation solution for the infrastructure elements of a construction, which have acquired a certain state of degradation, and the verification/restoration of the bearing capacity of the foundation ground and the foundations of an existing building, as a result of the increase in loads.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Rehabilitation and consolidation of reinforced concrete structures	RCSBA 03	Romanian	5	2	-	-	2

Course description (Syllabus): The course presents the theoretical knowledge regarding the diagnosis of degradations in the concrete structures, the design, execution and exploitation of the concrete, reinforced concrete and prestressed concrete works to which rehabilitation solutions have been applied. There will be issues regarding: degradation causes of concrete structures; degradation quantitative and qualitative assessment; basic principles for building consolidation; alternatives for strengthening concrete structures.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Rehabilitation and consolidation of timber and masonry structures	RCSLZ 03	Romanian	5	2	-	-	2

Course description (Syllabus): the course addresses the assessment, rehabilitation, and consolidation of existing timber and masonry structures within the framework of sustainable construction engineering. It focuses on understanding the structural behavior of timber and masonry buildings, identifying defects and degradation mechanisms and evaluating their impact on structural safety and durability. The course presents principles and techniques for structural rehabilitation and strengthening, including traditional and modern solutions, with attention to technical, economic and sustainability aspects. Emphasis is placed on inspection, diagnosis, design and execution coordination of rehabilitation works, enabling students to develop sound, durable, and sustainable consolidation solutions for existing buildings.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Rehabilitation and consolidation of metallic structures	RCSM0 3	Romanian	5	2	2	-	-

Course description (Syllabus): Evaluation of metallic structures; rehabilitation and retrofit of existing steel structures, seismic design of steel structures; methodologies for assessing metal structures; local interventions for structural improvement; global interventions for structural improvement.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Practical placement III	SP03	Romanian	6	-	-	-	-

Course description (Syllabus): providing an initial overview of the processes of organization and management of various projects, including those in the construction sector; presenting the main strategies for elaboration and implementation of projects' proposals.

Course title	Code	Language of instruction	No. of credits	Number of hours/ week			
				C	S	L	P
Practice for writing the dissertation	PID04	Romanian	20	-	-	-	-

Course description (Syllabus): This activity is deployed in construction specialized units, for students which follow a specialization route (1,2,3), when they follow the stages of achievement of construction/installation works, in general and the achievement of construction/installation rehabilitation works, in special or in constructions units/ research units / research laboratories / design units/services , all with concerns and realizations regarding energetic performances of buildings, for students which follow the research route (4). So, each student, no matter of followed route, are in directly contact with specific works of themes for dissertation work.

Course title	Code	Language of instruction	No. of credits	Number of hours/week			
				C	S	L	P
Development of dissertation work	ED04	Romanian	10	-	-	-	-

Course description (Syllabus): The activity of development of dissertation work is deployed under guidance of professor coordinator, chosen by each student, function of work them. The theme of dissertation work is established by graduate student and coordinator professor, based on general thematic announced to the beginning of current university year and frame content of work. The preparation of dissertation them is coordinated by professor through regular meetings with students, after an established program and whenever is necessary. The coordinator professor participate to the support of dissertation work ahead of examine committee.