

Transilvania University of Braşov, Romania

Study program: Civil, Industrial and Agricultural Constructions

Faculty: Civil Engineering

Study period: 4 years

1st Year

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Mathematical analysis I | AM01 | 4 | 2 | 1 | - | - |

Course description (Syllabus): 1. Sequences and Series of Real Numbers. 2. Functions of a Real Variable. 3. Functions of Several Real Variables. 4. Indefinite Integrals. 5. Definite Integrals. 6. Area of a Bounded Region. Arc length of a Plane Curve. Volume of Solid. 7. Improper Integrals. 8. Line Integrals and Green's Theorem. 9. Double Integrals. 10. Surface Integrals. 11. Triple Integrals

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|---------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Linear Algebra, Analytical and Differential Geometry | ALGAD01 | 4 | 2 | 2 | - | - |

Course description (Syllabus): Vector spaces. Euclidean spaces. 2. Linear transformations. Eigenvalues and eigenvectors. Bilinear forms and quadric forms. 3. The vector space of free vectors. 4. Plane and straight line in space. 5. Transformations of coordinates. Translation and rotation. 6. Conics. 7. Quadrics. 8. Generated surfaces. 9. Plane curves. 10. Curves in R^3 . 11. Surfaces.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Computer programming and programming languages I | PCLP01 | 4 | 1 | - | 2 | - |

Course description (Syllabus): IBM-PC compatible computer knowledge, physical and functional.

Forming algorithmic thinking, understanding the issues of domain specific engineering and translate them into format appropriate for their proper resolution by computer. Computing facilities offered by learning environment MS Excel.

| Course title | Code | No. of credits | Number of hours per week | | | |
|----------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Descriptive Geometry | GD01 | 4 | 2 | 2 | - | - |

Course description (Syllabus): This course introduces fundamental principles in developing graphical solutions to engineering problems. It develops the ability to visualize spatial relationships; develop sequential thinking; set patterns of analysis; and spatial visualization through problem-solving. **Topics include:** Basic Concepts of 3-Dimensional Descriptive Geometry: Points; Projection Planes; Orthographic Projection; Views; Auxiliary View. Lines in 3-Dimensional Geometry: Intersecting lines; Skewed lines; Parallel lines; Perpendicular lines; True Length of a line. Planes in 3-Dimensional Geometry: Points and lines on a plane; Dip of a plane; Spatial Relations of Lines and Planes. The methods of the descriptive geometry: Method of replacing projection planes; method of revolution. Solids and Surfaces: Basic techniques for locating points, piercing points, and tangent planes for common solids (prism, pyramid, cone, cylinder, sphere); Development of surfaces; Intersection of geometric surfaces and solids. Descriptive Geometry Applied to Civil Engineering Problems: Roof geometry; Earthworks geometry.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Mechanics I | MECC01 | 5 | 2 | 2 | - | - |

Course description (Syllabus): Mechanics is a science of nature; it studies the mechanical movement laws of macroscopic bodies and is has to answer to such many questions as: for which reasons does a body move and how does it do this?. Mechanics of Rigid Bodies: This course deals solely with the mechanics of rigid bodies. A rigid body is a body which does not deform under the influence of forces. In all real applications, there is always deformation, however, many structures exhibit very small deformations under normal loading conditions, and rigid body mechanics can be used with sufficient accuracy in those cases. Also, the principles of rigid body mechanics are some of the building blocks needed for the mechanics of deformable bodies. The mechanics of rigid bodies is sub-divided into two areas, statics and dynamics, with dynamics being further subdivided into kinematics and kinetics. Statics is the study of bodies in equilibrium. This means there are no unbalanced forces on the body, thus the body is either at rest or moving at a uniform velocity.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Chemistry | CH01 | 3 | 2 | - | 1 | - |

Course description (Syllabus): Fundamental concepts of chemistry related to the structure (chemical composition, chemical and physical bonding) and properties (physical and chemical) of materials (lime, plaster, cement, metals and alloys, polymers, ceramics, composites) with applications in civil engineering domain; Developing the skills to correlate and integrate the theoretical knowledge of chemistry with/in experimental and numerical applications, including solutions concentrations, chemical reactions, water hardness, metals and corrosion etc.

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Foreign language I – English | LSE01 | 2 | 1 | 1 | - | - |

Course description (Syllabus): The course covers the core language and skills that the students need to communicate successfully in all technical and industrial specializations. It is for students with a basic knowledge of general English who now require an elementary course in English for specific purposes.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Physics | FIZ02 | 4 | 2 | 1 | 1 | - |

Course description (Syllabus): 1. Introduction: Dimensional analysis. The least squares method. 2. Cinematic: trajectory, speed and acceleration. 3. Dynamics of the material point. The principles of dynamics. Momentum. 4. Ideal oscillations, damped and forced. The resonance phenomenon. Resonance effects for buildings, bridges, etc. 5. Waves. Classification. Flat and spherical waves. Seismic waves. Properties. Applications. 6. Thermodynamics - introductory notions. Temperature. 7. Principles of thermodynamics. Consequences. Entropy. The laws of ideal and real gas. 8. Thermal properties of bodies. Thermal transfer through conduction, convection and radiation. 9. Electromagnetism. Electrostatic field. The laws of Ohm, Joule and Kirchhoff. Magnetic field. Magnetic induction, force electromagnetic and Lorenz force. Electromagnetic waves. 10. Geometric optics. Optical devices: Optical diopter, mirrors, lenses, optical prisms and telescopes. Applications of optical devices in measurements, topometry and building surveying.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Mathematical analysis II | AM02 | 4 | 2 | 2 | - | - |

Course description (Syllabus): 1. Sequences and Series of Real Numbers. 2. Functions of a Real Variable. 3. Functions of Several Real Variables. 4. Indefinite Integrals. 5. Definite Integrals. 6. Area of a Bounded Region. Arc length of a Plane Curve. Volume of Solid. 7. Improper Integrals. 8. Line Integrals and Green's Theorem. 9. Double Integrals. 10. Surface Integrals. 11. Triple Integrals

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Building Materials | MC02 | 5 | 3 | - | 2 | - |

Course description (Syllabus): This course provides an introductory overview of the various building materials used in construction. After receiving an introduction into fundamental principles of manufacturing techniques, physical and mechanical characteristics, students learn about practical use in civil engineering domain. We are focusing on the following build materials: rocks, mineral binders (such as clay, plaster, lime and cement), aggregates, mortar, concrete, ceramics, glass, steel, wood, bitumen, insulating materials, finishing materials and composites.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Topography | TOP02 | 4 | 2 | - | 2 | - |

Course description (Syllabus): The course aims to familiarize the students with the notions of topography, having as final objectives two main aspects: -understanding of a topographic plan, including the requirements for its drawing (content, significant details, projection and reference system) and the limits of the content of a plan (errors, accuracy, precision).

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Engineering drawing and computer graphics I | DTI02 | 3 | - | - | 3 | - |

Course description (Syllabus) : The course of the TECHNICAL AND INFORMATIC DESIGN, through its content and level of problem approach, falls within the category of specialized disciplines and it is useful for those who will study and will continue to work in the field of constructions. The technical drawing is the activity of representation on a single plane, according to certain norms and conventions of the objects in the three-dimensional space using the techniques and methods of the descriptive geometry. The technical concept is the only means of representing a conceptual or technical idea and is the main means of linking conceiving and realizing the engineering works. In the course are presented, in accordance with the standards and norms in force, aspects regarding the graphic representation of the resilience plans and the architecture for the civil and industrial buildings.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Strength of Materials 1 | RM02 | 5 | 3 | 2 | - | - |

Course description (Syllabus): The course covers the following topics; stress and strain concepts, axial load, statically indeterminate axially loaded members, thermal stress, torsion, angle of twist, statically indeterminate torque-loaded members, bending, eccentric axial loading of beams, transverse shear, shear flow in build-up members, stress and strain transformation, statically indeterminate shafts. Simple techniques are presented to analyze deformation/strains as well as forces/stresses in linear elastic structures under mechanical loading. Course Objectives: 1. To provide the basic concepts and principles of strength of materials. 2. To give an ability to calculate stresses and deformations of objects under external loadings. 3. To give an ability to apply the knowledge of strength of materials on engineering applications and design problems.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Mechanics II | MECC02 | 5 | 2 | 2 | - | - |

Course description (Syllabus): Kinetics is a part of mechanics that describe the motion of the bodies without reference to the forces which either modify the motion or are generated as a result of the motion. Kinetics is often called the geometry of motion just for the specific reason: it is a study of the motion from the only geometric point of view. Kinematic principles are often applied to the analysis of machine members to determine positions, velocities, or accelerations at various parts of the machines' operation. Dynamics is the most general part of mechanics. Dynamics

is the study of bodies which are not in equilibrium, thus there is acceleration. Dynamics studies body movements taking into account the forces that act upon them.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Foreign language II – English | LSE02 | 2 | 1 | 1 | - | - |

Course description (Syllabus): The course covers the core language and skills that the students need to communicate successfully in all technical and industrial specializations. It is for students with a basic knowledge of general English who now require an elementary course in English for specific purposes

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Practice topography (30 hours/semester) | PT02 | 2 | - | - | - | - |

Course description (Syllabus): The aim of the practice is to make student see the whole process of a surveying job, to evaluate the amount of physical work, to understand responsibilities and risks.

2nd Year

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Special mathematics | MS03 | 4 | 2 | 2 | - | - |

Course description (Syllabus): 1. Differential equations. 2. Symmetric Systems. First Order Partial Differential Equations. 3. Vector Analysis. 4. Complex analysis. 5. Fourier Series. 6. Partial Differential Equations. 7. Laplace Transforms

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Strength of the materials II | RM03 | 7 | 3 | 2 | - | - |

Course description (Syllabus): Deflection of beam: Area moment, conjugate beam, deflection due to shear, bending of unsymmetrical beams, curved beams, shear flow, shear center, stresses in open sections, theories of failure, buckling, energy methods, laboratory investigation.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Statics and stability of constructions I | SSC03 | 6 | 3 | 2 | - | - |

Course description (Syllabus): The purpose of this course is to study the methods of analysis of reactions, efforts and displacements of statically determined beam structures subjected to external loads. There are studied beam systems, frames, trusses and arches subjected to fixed or mobile forces, displacements and thermal loads. The equilibrium of these systems is expressed using equilibrium equations and the virtual work principle.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Hydraulics | HDR03 | 5 | 2 | 2 | - | - |

Course description (Syllabus): The course aims learning by students of the concepts and basic laws of hydraulics with applications in civil engineering . Addressing to the students who specialize in civil, industrial and agricultural buildings also buildings for railways, roads and bridges, the course detail knowledge of hydraulics to solve engineering problems of buildings in contact with water, as part of civil buildings, bridges, urban and hydraulic structures. Topics include: Physical properties of fluids; Fluid static; Hydraulic Law; Pascal's law; Pressures forces on plane and curved surfaces; Archimedes' Principle. Uplift; Laws of hydrodynamics; Steady flow in pipelines - energy losses; Steady effluent flow;

Steady uniform flow in open channels; Energy study of open surface flow; Gradually varied unsteady flow- backwater curves; The hydraulic jump; Hydraulic calculation of spillways and energy dissipators; Hydraulic calculation of small bridges; Groundwater flow fundamentals; Wells and drains calculation.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Engineering drawing and computer graphics II | DTI03 | 4 | - | - | 4 | - |

Course description (Syllabus): The course of the TECHNICAL AND INFORMATIC DESIGN, through its content and level of problem approach, falls within the category of specialized disciplines and it is useful for those who will study and will continue to work in the field of constructions. The technical drawing is the activity of representation on a single plane, according to certain norms and conventions of the objects in the three-dimensional space using the techniques and methods of the descriptive geometry. The technical concept is the only means of representing a conceptual or technical idea and is the main means of linking conceiving and realizing the engineering works. In the course are presented, in accordance with the standards and norms in force, aspects regarding the graphic representation of the resilience plans and the architecture for the civil and industrial buildings.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Engineering geology | GEO03 | 2 | 1 | - | 1 | - |

Course description (Syllabus): The course presents general notions in geology (mineralogy, petrology, tectonics, hydrogeology, rock mechanics etc.). The aim is to be able to know and evaluate geological risks for construction.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Foreign language III – English | LSE03 | 2 | 1 | 1 | - | - |

Course description (Syllabus): The course covers the core language and skills that the students need to communicate successfully in all technical and industrial specializations. It is for students who have completed Level I, or have an elementary knowledge of general English, and now require a pre-intermediate course in English for specific purposes.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------------|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Building thermotechnics | TERM04 | 3 | 2 | 1 | - | - |

Course description (Syllabus): General notions of thermotechnics; thermal transfer; construction elements of the buildings; heat losses of a building; heat gains of a building; the annual energy need for heating a building; energy certificate of building; technical solutions for building a house with reduced energy consumption and a passive house.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Statics and stability of constructions II | SSC04 | 6 | 3 | 2 | 1 | - |

Course description (Syllabus): The purpose of this course is to study the methods of analysis of reactions, efforts and displacements of statically undetermined beam structures subjected to external loads. There are studied beam systems, frames, trusses and arches subjected to fixed or mobile forces, displacements and thermal loads. These systems are studied using the force method and the displacement method.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Computer programming and programming languages II | PCLP04 | 4 | 1 | - | 3 | - |

Course description (Syllabus): This course is an introduction in Scilab programming. It describes the basic elements such as usage of variables in Scilab, fundamental commands, syntax and terminologies. At the laboratory, students are writing simple programs for scientific computations using functions, matrix operations and plotting graphics.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| The theory of elasticity and plasticity | TEP04 | 4 | 2 | 1 | - | - |

Course description (Syllabus): Ability to formulate and solve plane problems of elasticity and plate bending problems. Familiarity with variational methods. Familiarity with formulation of problems of plasticity and solution methods. Understanding of notion of limit load.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Reinforced concrete and prestressed concrete I | BAP04 | 5 | 3 | 2 | - | - |

Course description (Syllabus): The subject presents the current norms (Eurocode 2) regarding the calculation of concrete and reinforced concrete elements at the ultimate limit state and serviceability limit state. Knowledge is also presented in terms of the behaviour of concrete elements under the action of various loads. A separate chapter is dedicated to constructive solutions regarding the composition of reinforced concrete.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Roads for communications | CCOM04 | 4 | 2 | - | 1 | - |

Course description (Syllabus):The course of ROAD COMMUNICATION, through its content and level of problem approach, falls within the category of General Technical Culture disciplines and is useful for those who will continue to study and work in the field of road and those who only have this branch of construction, helping to better match the specialties. In this paper, design elements related to the characteristics of roads and streets, industrial parks and platforms are made available to those interested. There are presented, in accordance with the standards and norms in force, aspects regarding the design in the plan, long and transverse profile, curve and vertical systematization.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Foreign language IV – English | LSE04 | 2 | 1 | 1 | - | - |

Course description (Syllabus): The course covers the core language and skills that the students need to communicate successfully in all technical and industrial specializations. It is for students who have completed Level I, or have an elementary knowledge of general English, and now require a pre-intermediate course in English for specific purposes.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Technological practice (60 hours/semester) | PTH04 | 2 | - | - | - | - |

Course description (Syllabus): The discipline, within 60 hours, aims to enable the student to appreciate the execution of a building from technical and quality point of view, to understand the technological organization and works mechanization, to know building site organization and management. Verification of accumulated knowledge is done through oral exam - presentation by the student of the activity carried out on the building site.

3rd Year

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Dynamics of structures and elements of earthquake | DS05 | 6 | 3 | 2 | 1 | - |

Course description (Syllabus): The course covers the following topics; modeling discrete single-degree and multiple-degree vibratory systems and calculate the free and forced response of these systems. Calculate the mode shapes and frequencies for the free response of vibratory systems and use modal methods to calculate the forced response of these systems. Calculation of civil structures at earthquake with the simplified level forces method and the modal analysis method. **Course Objectives:** 1. To provide the basic concepts and principles of dynamics of structures. 2. To give an ability to calculate the mode shapes and frequencies for the free response of vibratory systems and use modal methods to calculate the forced response of these systems.

3. To give an ability to apply the knowledge of dynamics of structures on engineering applications and design problems.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Geotechnical engineering | GT05 | 5 | 3 | - | 2 | - |

Course description (Syllabus): The course outlines three main aspects: 1. presentation of physico - mechanical properties of soils and rocks (water content and movement of groundwater, porosity, density, state of compaction, plasticity and respectively compressibility, shear strength); 2. the foundation soil calculation: the calculation of settlements, of the load-bearing capacity, stability of slopes, active and passive pressure; 3. the practice of geotechnical works (field and laboratory investigations, support, land improvement, water management, piles etc.)

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Timber construction | CL05 | 4 | 2 | - | 2 | - |

Course description (Syllabus): Wood used for buildings: advantages and disadvantages; classifications of timber structures and of timber elements; physical and mechanical properties of timber; calculus and dimensioning of timber elements according to Romanian code NP-005/2003 and Eurocode 5 (Design of timber structures) for different types of actions; types of timber jointing – constructive solutions; principals of making timber framing systems for roofs; protection and consolidating of timber elements; constructive solutions for timber structures.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Reinforced concrete and prestressed concrete II | BAP05 | 5 | 2 | - | 2 | - |

Course description (Syllabus): The discipline presents the current norms (Eurocode 2) regarding the behaviour and calculation of prestressed concrete elements under different loads. There are presented: the basic principles of prestressing, precompression methods, precompression force determination, tension states due to prestressing and external loads for different elements, constructive composition rules.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Civil buildings I | CC05 | 4 | 2 | 1 | - | - |

Course description (Syllabus): This course has as a general objective the identification and knowledge of the constructional structure of the assemblies, subassemblies and constructive elements of different categories of constructions, as well as the understanding of their structural and functional role.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-----------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| General economy | EG05 | 2 | 1 | - | - | - |

Course description (Syllabus): Fundamental principles of economic theories; the notion of property and its role in the functioning of the economy; market, competition and economic balance; specific markets; production process and factors of production; consumer behavior; significant aspects of the international economic environment

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Composite construction materials and elements | MEC05 | 2 | 1 | 1 | - | - |

Course description (Syllabus): This course provides an introductory overview of the composite materials, providing some of their properties such as physical, mechanical and chemical as well as their field of use. There is also described the ways to assimilate the main types of composite materials used in construction.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Special concrete and composite materials | BSMC05 | 2 | 1 | 1 | - | - |

Course description (Syllabus): general knowledge about component materials, matrices used in composites, technologies of obtaining, physical and mechanical characteristics, fields of use for: concrete with superior characteristics to classical one (high-performance and ultra-high performance concrete, concrete with superplasticizers, lightweight concrete, fireproof concrete); composite materials (fiber-reinforced concrete, concrete with polymers, composite materials used to repair and rehabilitate structures, materials used in the thermal and acoustic rehabilitation of buildings, special waterproofing materials, special materials used for interior and exterior finishes).

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Basics of fire safety in construction | SI05 | 2 | 2 | - | - | - |

Course description (Syllabus): Course contents: Introduction to the points at issue, basic terminology and material fire – technical quality. Building fire – technical characterization. Legislative demands and technical norms in fire safety. Building objects dissection on fire sectors. Escape ways design and dimensioning, escape ways types, escape ways principles, evacuation lifts. Fire dangerous building space – distance, fire water- supply system, fire extinguishers. Building constructions fire protection, fire dissection constructions resistance, construction protection. Area planning documentation from fire protection point of view, building fire safety documentation. Specifics in building solution and meeting places on concrete examples. Escape ways design and dimensioning in residential buildings and buildings designed for accommodation, civil buildings, non- production buildings, production objects, storage objects. Simplified building fire protection project elaboration applied on studio creation with accent on escape ways dimensioning.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Urbanism and landscaping | UAT05 | 2 | 2 | - | - | - |

Course description (Syllabus): Introducing the students to the essential elements that define the basics of the Urban and Territorial Planning. Studying the connections between Spatial development, Social Environment, Natural Environment and Geography. Understanding the evolution of the Urban Concepts during the history. Elements of regional planning and development regarding the Romanian Geography and Landscape. The course defines theoretical topics for applied Urban Planning, and essential subjects for understanding the relations between the spatial organization of the localities and the projecting process involved for the local, regional or territorial development fields.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Reinforced concrete structures | SBA06 | 4+2 | 3 | - | - | 3 |

Course description (Syllabus): The course presents the theoretical knowledge regarding the dimensioning of building elements in the field of civil engineering, identification of building materials and types of structures in constructions. The use of calculation methods specific to the types of structures and the methods of sizing the components of a civil, industrial and agricultural construction for the purpose of drawing up a specific technical documentation. Students' initiation in the essential elements that define the structures of reinforced concrete strength in reinforced concrete

structures, behavior in the elastic and postelastic field, the ductility of the elements of reinforced concrete structure, constructional requirements for plane plates, floors, structures in frames from reinforced concrete.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Civil buildings II | CC06 | 3+2 | 2 | - | - | 3 |

Course description (Syllabus): The aim of this course is to acquire the general knowledge regarding the design calculation and verification of the building elements specific to the ones with structural walls of masonry, as well as those regarding the calculation of the energy consumption required for the heating of a building. **Project description** :General knowledge on load assessment, design calculation and verification of building elements specific to masonry buildings, as well as calculation of the higrrotermic design of buildings. It also transforms the obtained results into technical documents of the project for civil, industrial and agricultural constructions (drawings).

| Course title | Code | No. of credits | Number of hours per week | | | |
|-----------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Steel constructions I | CMT06 | 4 | 2 | - | 2 | - |

Course description (Syllabus): For Steel Structures are presented introductory notices for the compositions of different steel grades, as well as a description of their behavior at high temperatures, corrosion, aging, fatigue, etc. There are presented the imperfections that occur in the execution of metal constructions, as well as how they are evaluated in dimensioning calculations, and in the design of the steel structures. The second part of the course deals with the calculation, composition and behavior of metallic elements at simple strains (stretching, compression, torsion, bending, shearing) according to Eurocode 3.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Foundations | FD 06 | 4+2 | 3 | - | - | 3 |

Course description(Syllabus):The foundations are structural elements witch must ensure the reception and transmission to ground of actions provided by construction in exploitation safety conditions. For this, the choice system suitable foundation is very important and must not to conduct to register of an additional request status in the other structural elements or the ground under foundations. The contain of course starting from definition and the role of foundations in structural composition of a construction, hypothesis and models of calculation, general rules of design, followed of presentation, the calculation and composition in detail of shallow and deep foundations. So, are presented aspects regarding the calculation of the ground supporting, the methods of water evacuation , the calculation, sizing and composition of retain walls, followed of the presentation, the calculation and composition in detail of shallow foundations (rigid, elastic, isolated, continue), of deep foundations (on piles, on caissons). The theoretical aspects concerning the works of ground supporting, the calculation, sizing and composition of the retain walls, of shallow and deep foundations are solved by means applicative works. **Project description:** The main objective of this project is to introduce the students into the classical methods for the design of both shallow foundations (retaining walls, continuous foundations, isolated foundations – precast or cast-in-place etc.) and deep foundations (precast piles). After completing this project, the student will understand the design principles, the geotechnical approach and the places where to search the information he need to complete the future tasks in this domain.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-----------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Finite element method | MEF06 | 3 | 2 | - | 2 | - |

Course description (Syllabus): The purpose of this course is to study the basics of the finite element method for structural analysis. There are introduced simple finite elements for plane elasticity, plate bending and three dimensional elasticity problems. The theory is completed by solving simple structures using educational FEM software.

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Technology of construction works I | TLC06 | 2 | 2 | - | 1 | - |

Course description (Syllabus): "Technology of construction I" prepare an individual for learning basic concepts related to various procedures and techniques used in civil engineering domain. We are focusing on: indices of analyzing the efficiency of technological methods, mechanization of loading-unloading operations, preparatory and auxiliary earthworks technologies, formwork technology.

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Practice (90 hours/semester) | PS06 | 4 | - | - | - | - |

Course description (Syllabus): Within 90 hours, students will attend and observe various technical processes for building elements on site. In order to correlate with the studied subjects in the third year, it is recommended to observe the earthworks works, to build foundations of different types, formwork for beams, poles and structural walls of reinforced concrete, as well as the realization of their reinforcement and the casting of the concrete. It is also recommended to follow the construction works of the steel structures.

4th Year

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Technology of construction works II | TLC07 | 5 | 2 | 2 | - | - |

Course description (Syllabus): "Technology of construction II" is a continuation of "Technology of construction I" course. It treats additional chapters such as: reinforcement, concrete, masonry, prefabricated assembly, finishing, flooring and insulation works. It also provides notions of technological design.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-----------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Steel construction II | CM07 | 4+2 | 3 | - | - | 3 |

Course description (Syllabus): Particular problems regarding the analysis and design of steel structure in seismic areas; structures for industrial buildings: configuration, analysis and design; structures for multistory buildings: configuration, analysis and design; Joints design - applying Eurocode design procedures. Application topics: Single-storey industrial buildings, building with (without) cranes.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Special reinforced concrete structures | SSBA07 | 3+2 | 2 | - | - | 2 |

Course description (Syllabus): The course presents the theoretical knowledge of constructions from field of special structures. Are presented the constitutive elements of the resistance structures related to: silos, bunkers, liquid tanks, water towers, chimneys. Initiating students into the essential elements that define resistance structures. Evaluating, selecting and optimizing the use of the various materials that make up building elements.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-----------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Computer aided design | PAC07 | 5 | 2 | - | 2 | - |

Course description (Syllabus): Advanced finite elements for design structures, use of the matrix displacement method in the stability and geometric nonlinear analysis of plate and shell structures, use of optimization methods in the design of structures, advanced structural engineering software's.

| Course title | Code | No. Of credits | Number of hours per week | | | |
|-------------------------------------|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Non-linear design for constructions | ECNC07 | 5 | 2 | - | 2 | - |

Course description (Syllabus): This course is an introduction to the nonlinear computation of solids and structures using matrix formulations. It describes fundamental elements of the nonlinear behaviour of structures, such as the sources of nonlinearity, equilibrium paths, stability, solution methods and engineering applications.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Civil buildings III | CC07 | 5 | 2 | - | - | 2 |

Course description (Syllabus): It contains the main issues regarding the conception, designing and composition of structures for civil buildings. So, are presented the general and detail aspects concerning the conception, designing and composition of civil buildings with strength structure, type: frames, supporting walls, mixt (dual) and special. For each structural type, are defined the structural elements, role, criteria of exigency, methods of calculation, sizing and composite components. The approaching aspects of conception, designing and composition of civil buildings structures are in accordance with the technical norms concerning fulfillment of criteria of strength, stiffness, stability, ductility and durability. The applicative part of discipline is focused on conception and composition of a civil building with strength structure of reinforced concrete frames, or supporting walls, or mixt, or special, as the case, and the calculation, sizing and composite for the indicated structural element/elements.

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Organizing construction work | ORG07 | 4 | 2 | - | 2 | - |

Course description (Syllabus): The course is addressed of Civil, Industrial and Agricultural Constructions students of 4th year, when they have accumulated the knowledges of basis and detail regarding the composition of construction in general and afferent execution technologies. In this context, the course contain the main aspects concerning the organization and planning of construction works from simple processes to technological chains, watching a logical order of operations, the determination of works amounts, during the execution of works, and the number of workers for each operation. By means of this dates are achieved the execution graphs for works (Critical path, etc), for workforce (Gant, etc), the provisioning and consumption graphs, etc. Also, the course contain basis elements regarding sizing of site management objects with the afferent technological links. The applicative part reflect the theoretical aspects and is focused on organization and planning of the works for a physical status of works or for a part/construction, after case.

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Constructions sustainability | SC07 | 4 | 2 | - | 2 | - |

Course description (Syllabus): European and national environmental legislation, relationships between sustainability requirements and resources used in construction projects, sustainable building materials, eco-labels, environmental impact on the life cycle assessment of a construction product, calculation of the CO2 emissions for all phases of the construction processes, concepts related to recycling and reuse, international systems for voluntary certification (LEED, BREEAM, etc.), energy efficiency of buildings, sustainable design.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Environmental engineering | IM07 | 2 | 1 | 1 | - | - |

Course description (Syllabus):The Environmental Engineering shall make available to prospective builder engineers, theoretical and practical knowledges concerning the current state of the environment, as regards:the impact of human society on the quality of the environmental factors (air, water, soil, underground, biodiversity, including the health of the population);shall inform on the latest techniques and performance, with low environmental impact, available at

the present time, to be used in the anthropogenic activities, including in construction engineering; the organization of activities related to the protection and monitoring of environmental factors, at national and international level; legislation in force relating to the protection of the environment. All such knowledge about the environment leading to an understanding of the concept of "sustainable development" which consists, in essence, in the preservation of the existing natural, in order to ensure the welfare of both present and future generations.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Renewable energy sources | SR07 | 2 | 1 | 1 | - | - |

Course description (Syllabus): general knowledge regarding greenhouse effect, energy savings, wind energy systems, solar basics and thermal solar heating systems, combustion of biomass and biogas, heat pump applications, renewable energy management (tax structures, costs for energy production, cost analyses, environmental issues).

| Course title | Code | No. of credits | Number of hours per week | | | |
|------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Steel structures | SM08 | 5 | 2 | - | 2 | - |

Course description (Syllabus): Beam Column Interaction Formulae, Design Procedure. Built up columns, Structural systems buildings-single storey and multi storey, Envelope industrial construction: types of roofing, roof purlins, roof skylights, steel frame, and types of walls closing; Structural systems; types of bracing for single and multi-storey buildings, Cold formed steel structures, Seismic design of steel structures.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Composite steel-concrete constructions | COB08 | 5 | 2 | - | 2 | - |

Course description (Syllabus): Course contents: Introduction: types of actions, material properties, load disposition, design requirements. Composite steel-concrete beams: Cross-sectional characteristics, cross-section classification, elastic resistant moment, plastic resistant moment, shear force design. Composite columns: design methods, simplified design method for the axial loaded columns, simplified design method under bending moment. Composite floors: design of floors, loading conditions, deflection control, usual-height floors, slim-floors. Design of beam-to-column joints: Classification of connections, types of connections, component method for finding the resistance and stiffness.

| Course title | Code | No. of credits | Number of hours per week | | | |
|----------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Constructions safety | SGC08 | 3 | 2 | 1 | - | - |

Course description (Syllabus): The CONSTRUCTION SAFETY course, through its content and level of problem approach, falls into the category of General Technical Culture disciplines and is useful to those who will study and will continue to work in the field of construction, helping to better relate the specialties. Through the safety of a building, we understand the ability of a structure to maintain the proper use of the construction as intended for its design throughout its lifetime, taking into account that the overall purpose of the design is to ensure, with an acceptable probability that the structure projected will behave satisfactorily throughout its intended lifetime. During the course are presented, in accordance with the standards and norms in force, aspects regarding the design and calculation of the residences of buildings.

| Course title | Code | No. of credits | Number of hours per week | | | |
|----------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Industrial buildings | CI08 | 4 | 2 | - | 2 | - |

Course description (Syllabus): the course presents general knowledge regarding industries and different industrial buildings: overview, history, concepts, types of buildings, descriptions and general use of them. Specific information regarding the location of industries into the territory, regarding the general plan of an industrial enterprise, industrial

transportation systems (roads, railways, lifting and transportation equipment in halls); calculus and interpretation of the technological processes; constructive elements of an industrial hall: roof framing, horizontal and vertical bracing systems, walls, portals, beams, openings, natural lighting and ventilation, etc.; modular coordination, halls' security.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---------------------------------|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Agro-zootechnical constructions | CAGZ08 | 3 | 2 | - | 1 | - |

Course description (Syllabus): The RURAL CONSTRUCTION course, through its content and level of problem approach, falls within the category of General Technical Culture disciplines and is useful for those who will continue to study and continue to work in the field of construction, helping to better correlate between specialities. Agricultural constructions are a distinct category of construction, with a pronounced productive character, with a special functionality compared to civil or industrial buildings, determined by the specific technical and environmental conditions. The large diversity of animal or bird species raised or maintained in these constructions, of products harvested or obtained by preparation or semi-preparation, of chemicals for soil fertilization, which must be stored in maximum safety conditions, make these constructions have special constructive and functional characteristics. In the course are presented, in accordance with the standards and norms in force, aspects regarding the design and calculation of the residentiality structures of the agro-industrial buildings.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|--------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Maintenance, repair and consolidation technology | TLRC08 | 3 | 2 | - | 1 | - |

Course description (Syllabus): The course has as a starting point the materials and types of structures used in the field of civil engineering and, in particular, of rural constructions. The accent is put on the methods and technologies of rehabilitation of the structures of masonry and reinforced concrete

| Course title | Code | No. of credits | Number of hours per week | | | |
|-------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Building services | IC08 | 3 | 2 | 1 | - | - |

Course description (Syllabus): 1. Water supply sources, water quality and quality required for different uses. 2. Interior installations for hot and cold water for consumption. Materials and equipment. 3. Interior installations for fire combating. 4. Installations for accumulation of water (reservoirs) and increasing the pressure. 5. Interior installations for domestic sewerage. Materials and equipment. 6. Interior Installations for heating. Distribution. Constructive solutions and schemes. 7. Physical properties of fuel gas. Pressure. Density. Viscosity. 8. Materials and equipment for fuel gases. Pipes and fittings, pressure regulators, devices for measuring and recording flow. 9. Interior installations for natural gas. Constructive solutions and schemes. Pipe sizing.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Construction machinery and equipment | MIC08 | 3 | 2 | 1 | - | - |

Course description (Syllabus): Obtaining the basic knowledge of the machinery and equipment specific to activities in the field civil and industrial constructions, railway, and road and bridge construction as well as determining their performances for the purpose of the most judicious use. Estimating their productivity and determining the complex of machines needed to obtain the most profitable activities necessary for the construction works. Choosing the optimal type of equipment and cups, blades as well as the machines that compete on the job.

| Course title | Code | No. of credits | Number of hours per week | | | |
|--------------------------|------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Constructions management | MC08 | 4 | 2 | - | 2 | - |

Course description (Syllabus): management methods, the content of the economic documentation, the evaluation of the stages of the investment process, the way of monitoring a construction work execution by fulfilling the quality criteria, cost and time. In this respect, there are presented aspects regarding: company management, time management, cost, risk, human resources, supply, construction activity organising, investment process (stages, participants), investment project development phases, public auctions, economic documentation for construction works, prices forming.

| Course title | Code | No. of credits | Number of hours per week | | | |
|-----------------------------|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Diploma specialised project | EPD08 | 4 | - | - | - | 4 |

Course description (Syllabus): This discipline aims to acquire and deepen the technical knowledge necessary for civil engineering design, starting from the pre-dimensioning of the constructive elements, to the statics and dynamics of the structure analysis, but also to the elaboration of the technical-economic documentation

| Course title | Code | No. of credits | Number of hours per week | | | |
|--|-------|----------------|--------------------------|---------|------------|---------|
| | | | course | seminar | laboratory | project |
| Practice – diploma project (60 hours/semester) | PRD08 | 2 | - | - | - | - |

Course description (Syllabus): During a 60-hour period, the design and completion of the diploma project is pursued by completing all the steps necessary for the elaboration of such documents, taking into account, of course, the knowledge gained during the four years of study, as well as the requirements of the economic environment. 1st year