Study Programme	Mechanical Engineering
Qualifications awarded	First degree
Professional title	Bachelor (appl.) in Civil Engineering
Number of ECTS credits	180
Level of qualification according to the National Qualification Framework and the European Qualifications Framework	VS-1 (NQF) First cycle (EQF)
Field of study	Engineering and technology
Mode of study	Full-time
Language of instruction	Serbian
Work-based learning	In the College laboratories equipped with state-of-the-art equipment; In business systems whose main activities are relevant to the needs of this study programme.
Head of the study programme	Đorđe Đuričić, PhD

Programme objectives

The main objective of the study programme is to provide students with professional knowledge and skills necessary for work in civil engineering. They will have learnt how to put the knowledge acquired in different disciplines (mathematics, physics, mechanics, etc.) to practice, as well as how to prepare documents, presentations, calculations and simulations using common software tools. Students will have developed creative and critical thinking skills necessary for the analysis of engineering problems.

Programme outcomes

General outcomes:

- students develop skills necessary for the successful application of the knowledge acquired in other disciplines (mathematics, physics, mechanics, etc.);
- students develop professional competencies in different fields of civil engineering that will help them solve practical problems in real-world settings;
- students acquire both theoretical and practical knowledge on different methods and procedures that they can apply to practice;
- students can work successfully both individually and as team members.

Specific outcomes:

- students develop their understanding of manufacturing and thermal engineering;
- students are able to make connections between knowledge acquired in different fields in order to ensure a multidisciplinary approach to solving specific problems;
- students can successfully apply the acquired theoretical knowledge to production design, planning and management;
- the knowledge of foreign languages and information technology will help students

improve the quality of their future work;
- students acquire the knowledge of international and national standards and regulations relating to production engineering;
- students acquire knowledge and develop their understanding of thermal technology;
- students can solve discipline-specific practical problems using knowledge acquired in different vocation-related subject areas, taking into account environmental protection and sustainable development;
- students can solve problems relating to designing, testing and maintenance of thermo-technical installations drawing on the acquired knowledge and gained experience, as well as foreign language proficiency and IT skills;
- students can understand professional literature, standards and other relevant information and use them when solving specific tasks in the field of thermal technology;
- students can apply occupational safety principles in order to reduce the risk of work-related injuries and diseases of workers;
- upon the completion of this study programme, students will have acquired the foundations for further education at specialist and higher-degree studies;
- upon the completion of this study programme students can qualify for the licence for responsible contracting engineers, granted by the Serbian Chamber of Engineers).

Undergraduate Vocational Studies:
CIVIL ENGINEERING

1	Mathematics 1
2	Physics
3	Construction Mechanics
4	Technical Drawing and Descriptive Geometry
5	Construction Materials
6	Mathematics 2
7	Informatics Fundamentals
8	Geodesy
9	Strength of Materials
10	English
11	Russian
12	Hydraulic Engineering
13	Building Construction
14	Statics of Structures 1
15	Concrete Structures 1
16	Occupational Safety
17	Visual Presentation Techniques
18	Soil Mechanics and Foundation Engineering
19	Sewage and Water Supply System Installation
20	Roads
21	Concrete Structures 2
22	Reconstruction, Addition and Adaptation of Space
23	Statics of Structures 2
24	Finishing Works
25	Organizing Construction Processes and Construction Mechanization
26	Metal Structures
27	Masonry and Timber Structures
28	Design Fundamentals
29	Construction Systems
30	Modern Construction Materials
31	Construction Technology
32	Computing in Civil Engineering
33	Construction Project Management
34	Bridges
35	Environmental Protection
31	Final Thesis

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Bridges

Teacher: Furtula B. Boško, Teaching associate: Stojanović B. Trifko

Course status: Elective

Number of ECTS credits: 4

Prerequisites: Concrete Structures 1

Course aims: Introducing students to the fundamentals of the construction of bridges and providing them with fundamental knowledge about concrete bridges. This course will provide students with knowledge about basic elements of road and railroad bridges, with a brief overview of other types of bridges such as pedestrian, industrial, movable bridges. Modern constructive systems used in bridge construction are analysed. Special attention is paid to the preparation of a general plan of a bridge.

Learning outcomes: Developing skills required for proper execution and constructive design of bridges. Developing skills necessary for successful cooperation in the process of design, calculation and execution of the construction of reinforced concrete and pre-stressed concrete structures.

Syllabus

Theoretical instruction:

Introduction – definition, classification, historical overview of bridges and conceptual design of bridges. Selection of bridge construction site. Collecting data about site and soil. Defining bridge span. Loading. Classification of bridges. Culvert construction. Classification, characteristics and use of structures (slab span, box girder, rigid frame and arch). Bridge architecture. Constructive elements (pedestrian walkways, railing, insulation, drainage, dilatation, transversal stifenning, horisontal girders). Main girders and bridge decks. Decks. Arched girders. Columns. Bearing. Static calculation. Scaffolds and formwork. Assembly and prefabricated bridges. Bridge approaches (abutment, wing wall, approach embankment). Pre-stressed concrete bridges. Bridge construction under special conditions. Bridge construction.

Practical teaching:

Auditory exercises, tasks relating to theoretical subject matter, survey preparation.
Visiting construction sites.

Literature:

1. Mijat Trojanović, Betonski mostovi II, Građevinska knjiga, Beograd, 1961.
2. Mijat Trojanović, Mostovi od prenapregnutog betona, Građevinska knjiga, Beograd, 1961.
3. Veselin Kostić, Betonski mostovi, Građevinska knjiga, 1952.
4. Nebojša Mojsilović, Betonski mostovi – priručnik za vežbe, Naučna knjiga, 1986.

Number of active teaching classes: 75				Other classes:
Lectures: 45	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Audio-visual, dialogue, monologue

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	50
Practical classes			
Colloquia	25		
Seminar papers	20		

Assessment methods:

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Building Construction

Teacher (Surname, middle initial, name): Milivojević Lj. Dejan

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: none

Course aims: Acquiring knowledge on structure systems, separate structural assembly elements, their role, materials. Developing skills for the proper selection of materials, the most suitable structural assembly for the adopted concept design. Learning about modern methods of processing structural assemblies, their joints, sealing and insulation, traditional timber roofs, eave covers and gutters, roof ridge details, aired and unaired roofs, building physics elements.

Learning outcomes: The ability to analyse/systematise elements and assemblies in building construction and to find optimal solutions to structural assembly issues.

Syllabus

Theoretical instruction:

General introduction – history of structural systems and building construction materials. Foundations, soil types, foundation types. Sealing buildings, main impacts of water and moisture, sealing materials and methods. Structural assembly elements of a building: columns, beams, arches. Structural assembly elements of a building: floor joists, walls and flat roofs; massive and skeletal building structures; designing openings: windows, doors; ventilation and smoke exhaust systems. Vertical transportation systems: escalators, elevators, stais, reinforced concrete staircase. Tradional timber roof structures: single roofs, double roofs, trussed roofs. Traditional and modern timber roof structures: glued laminated timber, timber truss, curved truss, trigonit girder truss, etc. Roof covers and insullation. Building physics elements. Fundamentals of ecological and bioclimatic architecture. Fundamentals of prefabrication.

Practical teaching:

structural assemblies: massive, skeletal and mixed; selecting structural layout of buildings for the given base; variations of the selected layouts; selecting massive structures; graphical assignment; foundations; designing a projects/graphical presentation of the selected layout; sealing; the impact of water under pressure; the impact of moisture; sealing methods; graphical assignment; openings – external and internal; windows, shades, project-graphical assignment using the given data; reinforced concrete staircase: calculating stair parametres; tread and riser processing, railings; static schemes; reinforced concrete staircase: designing interior staircase with two flights of stairs and a landing; graphical assignment; traditional timber roofs; designing roof structures – project – base - cross-sections using the given base and data; traditional timber roofs: eave details – covering and gutters; ridge details; aired and unaired roofs, details.

Literature:

1. Mittag Martin, Građevinske konstrucije, 18. izdanje, Građevinska knjiga, Beograd, 2003.
2. Grupa autora: Atlas krovnih konstrukcija – kosi krovovi, Građevinska knjiga, Beograd, 1990.
3. Nestorović Miodrag, Konstruktivni sistemi, Arhitektonski faklultet, Beograd, 2000.
4. Milivojević Dejan, Zgradarstvo 1, Akademska misao, Beograd, 2014.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Auditory exercises, consultations, fieldwork, mentorship, literature review

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	40
Practical classes	10		

Colloquia	15+15		
Seminar papers			
Assessment methods:			

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Computing in Civil Engineering

Teacher (Surname, middle initial, name): Zejak R. Radomir; Teaching associate: Đuričić V. Đorđe

Course status: Compulsory

Number of ECTS credits: 4

Prerequisites: none

Course aims: By mastering this course, students acquire basic knowledge about using computers for the analysis of civil engineering structures.

Learning outcomes: Mastering fundamental principles of structure modelling. Stress and strain calculation using state-of-the-art software packages. Drawing details of reinforcement bars and steel. Cost and bill of quantity calculation.

Syllabus

Theoretical instruction:

Subject of study. Software packages for stress-strain analysis of structures.
Using finite element method in civil engineering. Software packages.
Calculation models, element types, enetring data about structural support geometry, materials and loadings.
Using TOWER software package for complex structures composed of linear and surface elements. Spatial structures.
Foundation and soil modelling. Modifying parametres for structural computation.
Analysis of computation results. Example of residential facility.
Using TOWER software package for dimensioning of steel strutures.
ARMCAD software package. Basic tools.
Using ARMCAD software package.
METAL STUDIO software package. Basic tools.
Using METAL STUDIO software package.
NORMA BASE software package. Basic tools.
Using NORMA BASE software package.

Practical teaching:

Students work with computers and use software packages on their own. Preparation of a semestral assignment.

Literature:

1. Instructions for using the following software packages: TOWER, ARMCAD, METAL STUDIO, NORMA BASE

Number of active teaching classes: 75				Other classes:
Lectures: 1x15=15	Practical classes: 4x15=60	Other teaching forms:	Study research work:	

Teaching methods: Auditory exercises, practical work demonstration using computers, workshops, semestral assignments, written exam

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Written exam	50
Colloquium 1	15		
Colloquium 2	15		
Seminar papers	**15**		

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Concrete Structures 2

Teacher: Furtula Boško; Teaching associate: Stojanović B. Trifko

Course status: Compulsory

Number of ECTS: 5

Prerequisites: Concrete Structures1 and Statics of Structures 1

Course aim:
Introducing students to fundamentals of calculations and design of structures, reinforcement and refurbishment of damaged structures, as well as to the design of concrete, reinforced concrete and pre-stressed concrete structures.

Course outcomes:
Developing skills required for the proper execution, modelling and dimensioning of reinforced concrete and pre-stressed concrete structures. Developing cooperative skills necessary for the design, calculation and execution of reinforced concrete and pre-stressed concrete structures.

Syllabus:

Theoretical instruction:
Calculation of reinforced concrete cross-sections based on limit states of load-bearing capacity. Cross-sections without cracks. Interaction diagrams for dimensioning reinforced concrete cross-sections. Design and calculation of columns and walls. Calculation of slender reinforced concrete structures. Design and calculation of framework structures. Local stresses. Joints in reinforced concrete structures. Short elements. Calculation of reinforced concrete cross-sections according to usability limit states. Concrete deformations caused by changing weather conditions. Stress-strain relationships in concrete over time. Basic assumptions and different bill of quantity models. Calculation of stress and dilatation over time in reinforced concrete cross-sections with and without cracks. Limit state of cracks. Limit state of strain. Pre-stressed structures. Materials. Pre-stress systems. Pre-stress losses. Influences on structures. Dimensioning. Limit states of load-bearing capacity and usability. Introducing forces into structures and design specifics.

Practical instruction:
Auditory exercises, tasks relating to the subject matter delivered through lectures, and preparation of surveys. Visits to construction sites.

Literature:

1. Grupa autora: Beton i armirani beton prema BAB 87, knjiga 1 i 2, Građevinska knjiga Beograd, 1991.
2. Radosavljević Ž., Bajić D. Armirani beton, knjiga 3, Građevinska knjiga, Beograd, 1988.
3. Aćić M., Pakvor A., Perišić Ž., Teorija armiranobetonskih i prethodno napregnutih konstrukcija, Građevinski fakultet, Građevinska knjiga, Beograd, 1986.
4. Đurđević Mihailo, Prethodno napregnuti beton, Građevinski fakultet, Beograd, 2009.
5. Eurocode 2-EN 2 za betonske konstrukcije - prevod

Number of active teaching classes: 60	Lectures: **15x2=30**	Practical classes: **15x2=30**

Teaching methods: audio-visual, monologue

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	55
Practical classes			
Colloquium 1	25		
Colloquium 2	15		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Concrete Structures 1

Teacher: Furtula Boško; Teaching associate: Stojanović B. Trifko

Course status: Compulsory

Number of ECTS: 7

Prerequisites: Mechanics and Strength of Materials

Course aim:
Introducing students to calculation methods for the design of reinforced concrete structures. Mechanical, physical and reological properties of materials making up reinforced concrete. Dimensioning procedures based on the Limit state theory and Classical theory. Introducing students to basic elements of reinforced concrete structures: columns, beams, plates, framework structures, and teaching them how to recognize constructive systems.

Course outcomes:
Developing skills required for the execution of concrete and reinforced concrete structures, including their modelling and dimensioning. Developing cooperative skills necessary for the design, calculation and execution of concrete and reinforced concrete structures.

Syllabus:

Theoretical instruction:
Definition and concept of concrete and reinforced concrete. Properties of materials. Advantages and shortcomings of reinforced concrete structures. Reinforcement rules. Behaviour of reinforced concrete cross-sections under increasing loading. Calculation of static pressure. Security concept. Stress-strain relationship. Fundamental principles of calculation. Calculation of reinforced concrete cross-sections based on allowable stresses. Calculation of reinforced concrete cross-sections based on limit states of load-bearing capacity. Cross-sections with cracks. Calculation of reinforced concrete cross-sections based on tensioning stresses for limit transversal force impacts and torsional moment. Construction and calculation of beam elements. Construction and calculation of surface elements – plates. Floor structures. Inspection of structures. Reinforcement processes. Refurbishment of columns, beams, plates and walls.

Practical instruction:
Auditory exercises, tasks relating to the subject matter delivered through lectures, and preparation of surveys. Visits to construction sites.

Literature:

1. Grupa autora: Beton i armirani beton prema BAB 87, knjiga 1 i 2, Građevinska knjiga Beograd, 1991.
2. Radosavljević Ž., Bajić D. Armirani beton, knjiga 3, Građevinska knjiga, Beograd, 1988.
3. Aćić M., Pakvor A., Perišić Ž., Teorija armiranobetonskih i prethodno napregnutih konstrukcija, Građevinski fakultet, Građevinska knjiga, Beograd, 1986.
4. Dušan Najdanović, Betonske konstrukcije, Orion Art, Beograd, 2004.
5. Dušan najdanović, Milosavljević Branko, Zbirka rešenih zadataka iz betonskih konstrukcija.
6. Eurocode 2-EN 2 za betonske konstrukcije - prevod

Number of active teaching classes: 75	Lectures: **15x3=45**	Practical classes: **15x2=30**

Teaching methods: audio-visual, monologue

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	55
Practical classes			
Colloquium 1	25		
Colloquium 2	15		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Construction Materials

Teacher: Markićević M. Jelena; Teaching associate: Arsović D. Dragoslav

Course status: Compulsory

Number of ECTS: 6

Prerequisites: none

Course aim:
Acquiring fundamental knowledge about construction materials, i.e. knowledge about: material properties, testing methods, quality criteria they are supposed to satisfy. Learning about raw materials, technological processes of producing construction materials and their usage.

Course outcomes:
Developing the ability to apply the acquired knowledge to practice through proper selection and use of construction materials aimed at improving the quality, efficacy and duration of facilities.

Syllabus:

Theoretical instruction:
Introduction. Structure of materials. Basic properties of construction materials. Testing materials. Non-destructive testing methods. Defining characteristics of metals. Building stone. Ceramic materials. Aggregate. Inorganic (mineral) binding agents (construction plaster, construction lime, calcined lime, cement). Mortar (properties of fresh and hardened mortar, defining their composition and types). Metals (iron and its alloys, ferrous metals, metal corrosion). Polymers and plastic mass. Special-purpose materials.

Practical instruction:
Auditory exercises. Computational tasks and analyses of results of laboratory testing in compliance with the subject matter delivered through lectures.
Laboratory exercises: testing and control of specific properties of construction materials in compliance both with valid standards and subject matter delivered through lectures.

Literature:

1. Mihailo Murovljev, Građevinski materijali, Naučna knjiga, Građevinski fakultet, Beograd, 2000.
2. Mihailo Murovljev, Građevinski materijali, zbirka rešenih ispitnih zadataka, GROS knjiga, Beograd, 1994.
3. Sekula Živković, Građevinski materijali, zbirka rešenih testova, GROS knjiga, Beograd, 1994.
4. M. Murovljev, I. Stoiljković, S. Živković, D. Jevtić, T. Kovačević, M. Krasulja, Praktikum za vežbe iz građevinskih materijala, Građevinski fakultet, Beograd, 2003.

Number of active teaching classes: 60	Lectures: **15x2=30**	Practical classes: **15x2=30**

Teaching methods: dialogue, monologue, practical work demonstrations

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	55
Practical classes	15		
Colloquium 1	15		
Colloquium 2	15		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first degree studies

Course title: Construction Mechanics

Teacher: Dragiša D. Mićić, Teaching Associate: Dragoslav D. Arsović

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim: Students master the principles of classical Newtonian mechanics.

Course outcomes: By mastering mechanics, students acquire the necessary foundation for successful studying of other mechanics-related courses (Resistance of Materials, Machine elements, etc.).

Syllabus:

Theoretical instruction:

STATICS: Subject of study. Axioms of statics. Mechanical binding and binding reactions. Force. Sum of forces in plane or space. Types of systems of forces in plane and space. Moment of force and concurrent forces. Main vector, main moment. Conditions for equilibrium of forces. Flat bearers and their types. Static diagrams (axial forces, transversal forces, pitching moment). Lattice bearers and calculation methods. Rolling friction, sliding friction and rope friction.

KINEMATICS: Subject of study. Kinematics of points: motion of points. Trajectory of point, speed and acceleration depending on method of determining motion of point. Straight-line and curved uniform and non-uniform motion. Harmonious oscillations. Diagrams of motion of points. Absolute and relative motion. Kinematics of rigid bodies. Rotation around fixed axis. Motion in a straight line. Current direction of rotation (current rotation, speed and acceleration). Speed and acceleration plan along straight line. Mechanisms: piston and coulisse mechanism.

DYNAMICS: Subject of study. Newton's laws. Basic rasks in dynamics: the force is given and motion is to be determined; motion is given and the force is to be determined. Lof a point - laws and theorems. Fixed material point. D'Alambert's principle.

Practical instruction:

There is no practical instruction.

Computational tasks: Performing tasks relating to theoretical instruction. Graphical assignments – calculation (homework): 1. Bonds and binding reactions. 2. Static diagrams of flat carriers. 3. Static diagrams of shafts in space.

Literature:

1. Velibor Jovanović, Mehanika-Statika, VPTŠ, Užice, 2005.
2. Velibor Jovanović, Mehanika – kinematika i dinamika sa urađenim zadacima, VPTŠ, Užice, 2001.
3. Velibor Jovanović, Statika – zbirka rešenih zadataka, VTŠ Užice, 1996.
4. Lazar Rusov, Statika, Privredni pregled, Beograd.
5. Dragan I. Milosavljević, Kinematika, Kragujevac.
6. Miloš Kojić, Dinamika (Teorija i primeri), naučna knjiga, Beograd.
7. Dragiša Mićić, Mehanika-Statika, Užice, 2014.

Number of active teaching classes: 60				Other classes:
Lectures: 2*15=30	Practical classes: 2*15=30	Other forms of instruction:	Research study:	

Teaching methods: Audio-visual; board and chalk

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Attendance at lectures	Up to 10	Exam	Up to 50
Attendance at practical classes	Up to 10		
Activity during lectures and practical classes	Up to 10		

Graphical assignments	Up to 20		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Construction Project Management

Teacher: Markićević M. Jelena; Teaching associate: Arsović D. Dragoslav, Andrijašević B. Aleksandar

Course status: Compulsory

Number of ECTS: 4

Prerequisites: none

Course aim:
Acquiring knowledge about basic categories and concepts of construction project management.

Course outcomes:
Developing skills necessary for applying the acquired knowledge in order to find optimal solutions in modern construction practice.

Syllabus:

Theoretical instruction:
Introduction. Investment projects, specificities and classification of construction projects, participants in project implementation, different approaches to project management, consulting services, defining a project (preparing technical documentation), construction project implementation management, trial production management, organizing project management, construction company organization model, construction regulations, computer-aided project management (MS Project).

Practical instruction:
Auditory exercises include the analysis of practical examples relating to the theoretical subject matter in this field and providing students with skills required for independent participation in construction project management.

Literature:

1. Branislav Ivković, Željko Popović, Upravljanje projektima u građevinarstvu, Beograd, Nauka, 1994.
2. Petar Đuranović, Upravljanje građevinskim projektima, NJP Pobjeda, Podgorica, 1995.
3. Petar Đuranović, Menadžment u građevinarstvu, NJP Pobjeda, Podgorica, 1996.
4. Law on planning and construction in the Republic of Serbia and other regulations relating to the subject matter of this course

Number of active teaching classes: 60	Lectures: **15x2=30**	Practical classes: **15x2=30**

Teaching methods: dialogue, monologue

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures and practical classes	10	Final exam	50
Seminar paper	20		
Colloquium 1	10		
Colloquium 2	10		

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Construction Technology

Teacher: Furtula B. Boško, Teaching associate: Stojanović B. Trifko
Andrijašević B. Aleksandar

Course status: Compulsory

Number of ECTS credits: 4

Prerequisites: Construction Materials

Course aims: Acquiring knowledge about basic categories and concepts relating to construction technology; learning about different types of work and methods used by civil engineers in practice.

Learning outcomes: The ability to use the acquired knowledge in order to find optimal solutions in modern construction practice and implement them on construction sites.

Syllabus

Theoretical instruction:

Course subject matter. Technology of masonry works, plastering, reinforcement works and carpentry works. Formwork and scaffolding systems, traditional wooden formwork, steel formwork and scaffolds. Concrete works (production plants, transporting and handling concrete, construction of typical types of structures, maintenance of concrete, special concrete laying processes and specific precast concrete technologies, accelerated curing, special types of concrete, quality control and projects). Prestressing. Technological process of construction. Assembly construction (assembly technology, assembly joints). Precasting. Precasting methods using movable and immovable moulds. Constructive systems of prefabricated buildings in assembly construction.

Practical teaching:

Auditory and graphical exercises imply the analysis of practical examples relating to theoretical subject matter. Working individually, students prepare a survey about a technological process of construction for a specific example.

Literature:

1. Otović, S., Tehnologija građenja armirano betonskih konstrukcija, Beograd, 1988.
2. Muravljev, M., Osnovi teorije i tehnologije betona, GK, Beograd, 1991.
3. Delević, K., Engi, Ž., Rešeni problemi iz organizacije i tehnologije građenja
4. Petrović, M., Montažne armirano-betonske konstrukcije, Izgradnja, Beograd, 1981.

Number of active teaching classes: 75				Other classes:
Lectures: 45	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Audio-visual, dialogue, monologue

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures and practical classes	5	Written exam	50
Practical classes		Oral exam	25
Colloquia	25		
Seminar papers	15		

Assessment methods:

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Constructive Systems

Teacher (Surname, middle initial, name): Furtula B. Boško, Teaching associate: Stojanović B. Trifko

Course status: Elective

Number of ECTS credits: 5

Prerequisites: none

Course aims: Acquiring knowledge necessary for selecting, designing, constructing and maintaining constructive systems in architecture.

Learning outcomes: The ability to select, design, construct and maintain constructive systems depending on the materials used. Mastering a systematic approach to the selection of constructive systems and construction technology under the given conditions.

Syllabus

Theoretical instruction:

Introduction. Concept of constructive systems. Overview of evolution of constructive systems. Classification of constructive systems. Fundamental designing principles. Load-bearing capacity. Stability. Usability. Durability. Constructive system selection principles. Facility-constructive system relationship. Linear and surface systems – force transfer. Construction methods. Building constructive systems. Industrial facilities. Long-span structure supports. Presentation of specific facilities. Calculation principles.

Practical teaching:

Auditory exercises, tasks relating to theoretical subject matter, and preparation of a survey. Visiting construction sites.

Literature:

1. Nestorović, M., Konstruktivni sistemi – principi konstruisanja i oblikovanja, Arhitektonski fakultet u Beogradu, Plato, Beograd, 2000.
2. Zloković, Ć. Konstruktivni sistemi, Tehničar 3, Građevinska knjiga, Beograd, 1984.
3. Balgč, E., Prostorne krovne konstrukcije – njihove pojedinosti – njihovo izvođenje, prvi deo, Građevinska knjiga, Beograd, 1979.
4. Dančević, D., Konstruktivni sistemi u visokogradnji, Niš, 1978.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Dialogue, monologue, demonstration of practical work

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures and practical classes	5	Exam	50
Survey defense	15		
Colloquia	15+15		
Seminar papers			

Assessment methods:

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Design Fundamentals

Teacher: Milivojević Lj. Dejan; Teaching assistant: Stojanović B. Trifko

Course status: Elective

Number of ECTS credits: 5

Prerequisites: none

Course aims: Site analysis: man-made and natural factors, solar insolation, caloric values, topography, wind rose, traffic, infrastructure, urban design parametres, conceptual design of a building based on the site analysis results and urban design parametres.
Developing students' competency to perform the structural, dimensional and construction analysis of residential facilities; workplace concept, typical units, typical organization. Typology of residential facilities: collective, multi-family and single-family buildings. Different ways of grouping separate spatial units, starting from an apartment organization to a whole building design: basic façade composition principles – shape and materials.

Learning outcomes: Preparation of a conceptual design for a single-family residential facility, starting from urban design conditions to producing an architectural solution including all plans and a spatial model.

Syllabus

Theoretical instruction:

Introduction to architectural design: phases of producing technical documentation. Site analysis: morphological and climatic. Urban design parametres. Concept of HOUSING, and its sociological, psychological, historical and medical implications. Concepts of collective and individual housing. Individual housing typology: courtyard houses, terraced houses, detached houses, semi-detached houses. Architectural apartment layout analysis. Workplace; typical units. Typical organizations. Apartment: two-dimensional analysis of hygienic zone. Apartment: dimensional analysis; food preparation, dining, services. Apartment: dimensional analysis, leisure, rest, daily activities.
Grouping residential units - shape parameter, urban design and other parametres.
Presenting national and international architectural documentation.

Practical teaching:

Inroducing students to the task: a rest house project design. Introducing students to the site – site analysis. Conceptual design of the house on the site, orientation, traffic, etc. Conceptual design of the house: circulation diagram and interior organisation. Sketches: bases, cross-sections, etc. Sketches: form coordination – all plans. Adopting conceptual design. Elaboration of conceptual design. Discussion and assessment of the project.

Literature:

1. Milenković, Branislav, Uvod u arhitektonsku analizu, Građevinska knjiga, Beograd, 1990.
2. Rakočević Milan, 24 časa arhitekture – uvod u arhitektonsko projektovanje, Orion Art, Beograd, 2003.
3. Grupa autora, Tehničar-4 – deo o projektnom elaboratu, Građevinska knjiga, Beograd, 1990.
4. Uslovi i tehnička normativa za projektovanje stambenih zgrada i stanova.
5. Neufrert, E., Arhitektonsko projektovanje, Građevinska knjiga, beograd, 1990.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Auditory exercises, dialogue, consultations, fieldwork, mentorship, literature review

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	30
Practical classes	40		

Colloquia	20		
Seminar papers			
Assessment methods:			

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: English

Lecturer: Marinković M. Ivana

Course status: Elective

Number of ECTS: 5

Prerequisites: None

Course aim: Acquiring the necessary level of General English knowledge, as well as of English for Specific Purposes; further development of language skills – speaking, reading, writing; providing students with skills required for spoken and written communication about topics relating to civil engineering.

Course outcomes: Application of acquired knowledge and skills in various situations. Ensuring continuous English language learning after high school. Acquiring the satisfactory level of foreign language proficiency.

Syllabus:

Theoretical instruction:

The English language (BE/AE). Nouns (plural). Articles (types and use). Pronouns (personal, possessive, relative, reflexive). Relative clauses. Adjectives (comparison). Verbs (types, tenses).

English for Specific Purposes – mastering specialized vocabulary through specialized texts (civil engineering, construction materials, history of civil engineering, prefabrication, concrete, etc.).

Risk assessment in the workplace.

Practical instruction: -

1. Thompson A.J, Martinet A.V., 1994. A Practical English Grammar; Oxford, Oxford University Press
2. Murphy R.,1990., English Grammar in Use, Cambridge University Press
3. Student's Grammar (practice material by Dave Willis), 1991., Collins Cobuild
4. Skripta strucnih tekstova,Ljiljana Kovacevic,2007.
5. Advanced Learner's Dictionary of Current English, 1998., Oxford University Press
6. M. Horvatovic, M. Vuletić, English for Civil Engineers, Naučna knjiga, Beograd, 1991.
7. E. Čavić, English in Architecture, Naučna knjiga, Beograd, 1992.
8. Praktikum (opšti deo), Bezbednost i zdravlje na radu, TEMPUS JPHES 158781, 2011.
9. Leksikon građevinarstva, Građevinska knjiga, Beograd, 1962.

Number of active teaching classes: 60				Other classes:
Lectures: 2*15=30	Practical classes: 2*15=30	Other forms of instruction:	Research study:	

Teaching methods: Monologue, dialogue, combined method

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points:**	**Final exam**	**Points:**
Activity during lectures	20	Exam	50
Practical classes			
Colloquia	30		
Seminar papers			

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: ENVIRONMENTAL PROTECTION

Teacher (Surname, middle initial, name): Aksentijević M. Snezana; Teachnig associate: Tomić D. Milena

Course status: Elective

Number of ECTS credits: 4

Prerequisites: no

Course aims: to introduce students to the concept and content of the environment, the causes and consequences of pollution, the environmental protection system, terminology, legal regulations and environmental standards.

Learning outcomes: Training students for preventive and operational action, multidisciplinary approach to environmental issues, which will enable them to comprehensively, specifically and independently solve problems in their field of expertise.

Syllabus

Theoretical instruction: Environment - concept, content, ecosystem. Ecological factors. Water, air, soil, living world. Endangering and pollution of living and working environment - global pollution, water pollution, air pollution, soil degradation. Waste, types of waste. Construction works (rough construction and craft works) and materials (natural, artificial, constuction, decorative). Specific types of pollution and hazards (noise, vibration, dust, physical hazards, hazardous substances, low/high temperature – waste management (planning, organisation, waste classification, waste minimisation options), management of chemical substances, waste water. Emergency situations and how to cope with them. Tools for improving environmental protection - cleaner production, energy efficiency. Importance of healthy living and working environment. Legislation, international and national standards.

Practical teaching: Practical examples that support theoretical subject matter in this field. Working on their own, students prepare an elaborate which includes solving specific problems.

Literature:

1) A. Kostić, Inženjering zaštite životne sredine, Hemijski fakultet, Beograd, 2007.
2) D. Marković, Š. Đarmati, I. Gržetić, D. Veselinović: Fizičko-hemijski osnovi zaštite životne sredine, Knjiga
3) Izvori zagađivanja, posledice i zaštita, Univerzitet u Beogradu, 1996.
4) D. Pešić, Rečnik ekologije i zaštite životne sredine, Građevinska knjiga, Beograd, 2006.
5) P. Jovanović, Zaštita životne sredine, VTŠ, Aranđelovac, 2006.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Lectures, exercises, assignments, projects, consultations.

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**10**	Exam	50
Practical classes	**10**		
Colloquia	**2x10**		
Seminar papers	**10**		

Assessment methods:

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Finishing Works

Teacher (Surname, middle initial, name): Milivojević Lj. Dejan; Teaching associate: Papić V. Miloš

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: none

Course aims: Basic systematization of finishing works, solving tasks relating to designing details, preparing descriptions for priced bills of quantity, norms, regulations and construction methods.

Learning outcomes: The ability to design details, prepare priced bills of quantity. Introduction to procedures and dynamics of finishing works.

Syllabus

Theoretical instruction:

Rough works, craftworks; earthworks and masonry; concrete and reinforced concrete works + underground insullation; carpentry + light prefabricated structures – covering; insullation + sheet-metal works; carpentry + doors and windows + sunshade installation; locksmith works; review of learnt material; facade works + covering with stone + plastering-painting works; terrazzo works + flooring; sanitary rooms and fittings; introducing students to semestral assignments; mounting structural assemblies – selection of structural system; staircase design, roof structures.

Adjusting structural and architectural solutions, defining openings; elaboration of main project; designing specific facade details, covering details, inter-floor structures.

Literature:

1. Đorđević Dušanka, Izvođenje radova u visokogradnji, Izgradnja, Beograd, 2001.
2. Milivojević Dejan, Zgradarstvo 1, Akademska misao, Beograd, 2014.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Auditory exercises/dialogue, consultations, fieldwork, mentorship, literature review

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	40
Practical classes	20		
Colloquia	15+15		
Seminar papers			

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first degree studies

Course title: Geodesy

Teacher: Aleksić D. Velimir

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim: Students master fundamental principles of measurement, as well as processing and using of obtained measurements when designing and constructing buildings.

Course outcomes: Students can work individually and as part of a team both in an office and in the field.

Syllabus:

Theoretical instruction:

Coordinate system, ratio, types of errors and evaluation of accuracy of measurements.Trigonometric, polygonal and linear networks, levelling networks. Angle measurement and instruments for measuring angles. Direct and indirect length measurement. Methods for determining height differences, levelling instruments, general and precise levelling. Determining coordinates of polygnal and linear networks. Detail survey. Geodetic and cartographic works and documentation necessary for constuction of buildings. Cartometry. Survey markers. Photogrammetry. Digitalisation. Spatial information systems in civil engineering. Introduction to data processing in geodetic applications. Introduction to specific activities on construction sites. Introduction to modern geodetic technology.

Practical instruction:

Introducing students to measuring instruments, hands-on training in the use of instruments in the college laboratory and in the field, measurement data processing, preparation of geodetic surveys.

Literature:

1. V. Aleksić, Geodezija (udžbenik), Građevinsko-arhitektonski fakultet, Niš, 2006.
2. V. Aleksić, Geodezija (praktikum), Poljoprivredni fakultet, Beograd, 2003.
3. V. Aleksić, Geodezija (zbirka zadataka), Poljoprivredni fakultet, Beograd, 2003.

Number of active teaching classes: 60				Other classes:
Lectures: 2*15=30	Practical classes: 2*15=30	Other forms of instruction:	Research study:	

Teaching methods: Dialogue and auditory methods.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	50
Practical classes	10		
Fieldwork classes	10		
Seminar paper	20		

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Hydraulic Engineering

Teacher (Surname, middle initial, name): Zlatković M. Danijela

Course status: Compulsory

Number of ECTS credits: 6

Prerequisites: no

Course aims: Introducing students to the construction of hydraulic structures, and providing them with knowledge on water.

Learning outcomes: Providing students with a foundation for successful studying of other profession-specific courses.

Syllabus

Theoretical instruction: Brief historical overview of the development of fluid mechanics, construction of hydraulic structures and construction of flow-through structures. Fundamental laws on fluid mechanics. Hydrostatics. Hydraulics. Practical hydrostatic tasks. Practical hydraulic tasks. Flow under pressure. Open-channel flow. Fluid flow through porous media (underground waters). Oscilatory motion of fluids. Cavitation. Fluid flow through openings. Overflowing. Hydrology. Water industry. Dams. Reservoars. Multipurpose use of water resources. Water springs. Civilian water supply systems. Industrial water supply. Water treatment facilities. Irrrigation of cultivated land. Hydro power plants, thermal power plants, nuclear power plants. Water transport. Water basin arrangement. Erosion control. Flood protection facilities. Flood control reservoars. Retension. Embankments. Riverbank protection facilities. Water flow regulation. Excess water drainage. Drainage. Waster water collection, drainage and treatment. Waste water treatment facilities. Water flow pollution protection. Water regime management. Monitoring.

Practical teaching: Organising visits to hydraulic structures – dams, reservoars, flow regulation facilities, water supply systems, sewage systems, hydro power stations.

Literature:

1. Hidrotehnika**,** Mirjana Đurđević, AMG Knjiga, 2008
2. Hidrogeologija - primena u graditeljstvu, A. Bacani, T.Vlahović, AMG Knjiga, 2012
3. Osnovi hidromehanike teorija i zadaci, Nedim Suljić, AMG Knjiga, 2014

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Auditory exercises, consultations, colloquia.

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**20**	Exam	50
Practical classes			
Colloquia	**30**		
Seminar papers			

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Informatics Fundamentals

Teacher: Ivković V. Nebojša, Teaching associate:Knežević M. Dragana, Forst J. Đorđe

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim:

- Students will acquire advanced knowledge and will be trained to use:
- MS Word
- Adobe Photoshop
- MS Excel
- MS Power Point

Course outcomes:

- Students are trained to create and edit complex forms of written documents using MS Word programme:
  - Using sections (creating sections, working with sections, section properties)
  - Using section breaks in documents, together with header and footer
  - Changing the orientation of certain pages of a document
  - Using different number of columns on a single page and in a document as a whole
  - Designing styles (adding and removing text styles, saving and using them…)
  - Multilevel lists
  - Creating content (automatically and manually, adjusting text using TAB key)
  - Indexing
  - Bookmarks
  - Hyperlinks
  - Electronic forms
  - Circular letters
  - Preparing documents for double-sided printed (margins, page numbers)…
- Digital image processing using Adobe Photoshop, for documents prepared using MS Word.
- Spreadsheet design and different ways of automatic data processing applied to complex practical examples using nested functions in MS Excel programme. Advanced forms of graphic illustration of data processed using MS Excel. Using macros to create reports based on the processed data, imported from another information system.
- Creating advanced presentations in MS PowerPoint by inserting different forms of animations on slides.

Syllabus:

Theoretical instruction:	**Practical instruction:**
1. MS Word	1. MS Word
2. Adobe Photoshop	2. Adobe Photoshop
3. MS Excel	3. MS Excel
4. MS Power Point	4. MS Power Point

Literature:

1. Alati grafičkog dizajna, Damnjan Radosavljević, Visoka poslovno-tehnička škola, Užice, 2014.
2. Excel 2007 Biblija, John Walkenbach, Mikro knjiga
3. Word 2016, Korak po korak, Joan Lambert, CET
4. PowerPoint 2010, Zvonko Aleksić, Kompjuter biblioteka

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other forms of instruction:	Research study:	

Teaching methods::

During lectures, the theoretical part of the subject matter is illustrated by examples from practice. In the computer laboratory, students perform tasks relating to the theoretical instruction.			
Knowledge evaluation (maximum number of points: 100)			
Pre-exam obligations	**Points:**	**Final exam**	**Points:**
Lecture attendance	10	Written exam	45
Attendance at practical classes	25	Oral exam	
Seminar paper	20		

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Masonry and Timber Structures

Teacher (Surname, middle initial, name): Zejak R. Radomir, Teaching associate: Đuričić V. Đorđe

Course status: Elective

Number of ECTS credits: 5

Prerequisites: none

Course aims: This course provides students with fundamental knowledge about masonry and timber structures, as well as with their design, use and maintenance fundamentals.

Learning outcomes: Mastering basic principles of design and calculations of masonry and timber structures. Testing stability and usability of masonry and timber structures.

Syllabus

Theoretical instruction:

Introduction. Different aspects of using masonry structures, types of walls. Types of building components and their installation. Types of binding agents in mortar. Retaining and non-retaining walls. Physical, mechanical and reological properties of walls and ceilings. Construction conditions and calculation methods for masonry structures. Calculations for masonry structures. Vertical and horizontal influences. Masonry construction technology. Laws, regulations and standards. Wood as building material. Wood properties: physical, chemical and technical. Influences, allowable stresses and limiting states (of load capacity and usability).
Binding agents. Carpentry exercises. Connections and extensions with binding agents.
Glued laminated timber – production, calculation basics. Spatial stability of facilities with structural supports made of monolithic or glued laminated timber. Assembly, protection and maintenance of timber facilities. Laws, regulations and standards.

Practical teaching:

Performing tasks relating to delivered theoretical subject matter, and preparation of a survey about key issues.

Literature:

1. Murovljev, M. Stevanović, B., Zidane i drvene konstrukcije zgrada, Građevinski fakultet, Beograd.
2. Zidane konstrukcije, knjiga 5, Građevinski fakultet, Beograd, 1995.
3. Evrokod 6, Proračun zidanih konstrukcija
4. Skenderović, B., Kekanović, M., Građevinski materijali – struktura-osobine-tehnologija-korozija, AGM knjiga, Beograd.
5. Gojković, M., Drvene konstrukcije, Građevinski fakultet, Beograd, Naučna knjiga, Beograd, 1985.
6. Ilić, S., Klasični drveni krovovi, IRO Građevinska knjiga, Beograd
7. Other available literature and the Internet

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Dialogue, monologue, demonstration of practical work using computers, calculation results analysis

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures and practical classes	5	Exam	50
Practical classes	15		
Colloquia	15		
Seminar papers	**15**		

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Mathematics 1

Teacher: Ljubica Ž. Diković, Tecahing Assistant: Mitrašinović R. Dubravka

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim: Providing students with mathematical knowledge in the field of linear algebra, vector algebra and analytical geometry, which will support their study of other profession-related courses.

Course outcomes: Students will be able to use the acquired general mathematical knowledge independently in other general and vocational courses, as the theoretical and/or practical basis.

Syllabus:

Theoretical instruction:

The concept of a determinant and its characteristics, the concept of a minor and algebraic cofactor. Methods for computing determinants. Systems of linear equations. Cramer's rule. Solution discussion. Special cases of systems of linear equations. Different types of use.

Scalar and vector quantities. Vector operations. The orthogonal projection of a vector onto an axis. Linear dependence of vectors. Conditions for collinearity and coplanarity of vectors. Vector decomposition. The scalar and vector products of vectors and their properties. The mixed product of three vectors and its properties. Using the mixed product to calculate the volume of a parallelepiped, tetrahedron and prism. Cartesian coordinate system. The rectangular Cartesian coordinate system. Orths. Cayley tables. The algebraic approach to the scalar, vector and mixed product. Different types of use.

Point. The distance between two points. The midpoint of a line. Dividing a line into segments in a given ratio. Plane. The equation of a plane perpendicular to a vector and passing through a point. The segmental form of a plane equation. The equation of a strand of a plane through the line of intersection of two planes. The distance from a point to a plane. The angle between two planes. Conditions for perpendicular and parallel planes. The intersection point of three planes. Straight line. General, vector, canonical and parametric forms of the equations of a straight line. The equation of a straight line passing through two points. The distance from a point to a plane. The angle between two straight lines. Conditions for perpendicular and parallel straight lines. The shortest distance between non-intersecting straight lines. Straight lines and planes. Different types of use.

Polynomials. Polynomial division. Zeros of polynomials and Vieta's formulas. Basu's theorem. The use of Basu's theorem.

Practical instruction:

Students perform the tasks relying upon the theoretical lectures; the theoretical knowledge is used to solve practical problems and tasks.

Literature:

1. Lj. Diković, Zbirka rešenih zadaaka iz MATEMATIKE 1, ISBN 978-86-6021-093-9, COBISS.SR 217969420, Naučna KMD, Beograd, 2015.
2. Lj. Diković, Praktikum iz MATEMATIKE 1, ISBN 978-86-83573-51-6, COBISS.SR 208860172, VPTŠ Užice, 2014.
3. LJ. Diković, MATEMATIKA 1, Zbirka zadataka sa elementima teorije, udžbenik broj ISBN 978-86-83573-08-0, VPTŠ Užice, 2008.
4. Marković R., Marković O., Matematika, udžbenik broj ISBN 86-80695-43-2, Učiteljski fakultet i Viša tehnička škola, Užice, 1996.
5. Nikolić O. i grupa autora, Matematika za više tehničke škole, ISBN 86-387-0610-3, Savremena administracija, Beograd 2000.

Number of active teaching classes: 60				Other classes:
Lectures: 2x15=30	Practical classes: 2x15=30	Other forms of instruction:	Research study:	
Teaching methods: Ex cathedra, group work, interactive methods.				
Knowledge evaluation (maximum number of points 100)				
Pre-exam obligations	**Points**	**Final exam**	**Points**	
Class attendance	Up to 20	Oral exam	Up to 30	
Colloquia	Up to 50			

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Mathematics 2

Teacher: Ljubica Ž. Diković

Course status: Compulsory

Number of ECTS: 6

Prerequisites: Passed exam in Mathematics 1

Course aim: Mastering the mathematical knowledge in the field of differential and integral calculus, which will serve as the basis for the study of other general and profession-related courses.

Course outcomes: Developing students' ability to use the acquired higher mathematical knowledge independently in other general and vocational courses, as the theoretical and/or practical basis.

Syllabus:

Theoretical instruction:

Functions of a real variable. Review of basic functions.

Arrays. Boundary values of an array.

Boundary values of functions. Left-hand and right-hand boundary values of functions. Infinitely small and infinitely large functions. Continuity of a function at a point and over an interval. Some important limits.

Derivatives of functions. Derivative of the sum, difference, product and quotient of two functions. Geometric definition of a derivative. Kinematic definition of a dervative. Equations of the tangent and normal to a curve. Derivative of a complex function. Differential of a function. Applying a differential to approximate calculations of functions. Relationship between derivative and differential. Derivatives and higher order differentials. Roll's, Lagrange's and Cauchy's theorem. L'Hôpital's rule. Using derivatives for further study of graphs and flows of functions. Extreme values of functions. Inflection points. Convex and concave.

Indefinite integrals. Difference between differential and integral calculus. Decomposition method. Replacement method. Method of integration by parts. Recursive formulas. Integration of rational functions.Integration of trigonometric functions. Definite integrals. Newton-Leibniz formula. Methods of calculating specific integrals. Improper integrals. Using specific integrals to calculate the surface area of a flat figure and to detrmine the arc length. Examples of use in a specific field of study. First-order differential equations.

Practical instruction:

Students perform the tasks relying upon the theoretical lectures; the theoretical knowledge is used to solve practical problems and tasks.

Literature:

1. Marković R., Marković O., Matematika, udžbenik broj ISBN 86-80695-43-2, Učiteljski fakultet i Viša tehnička škola, Užice, 1996.
2. Ljaško I. i grupa autora, Zbirka zadataka iz matematičke analize, Naša knjiga, Beograd, 2007.
3. Novaković M. i grupa autora, Zbirka rešenih zadataka iz matematičke analize 1, ISBN 978-86-7892-320-3, FTS, Novi Sad, 2011.

Number of active teaching classes: 60				Other classes:
Lectures: 2x15=30	Practical classes: 2x15=30	Other forms of teaching:	Research study:	

Teaching methods: Ex cathedra, group work, interactive methods.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Class attendance	Up to 20	Oral exam	Up to 30
Colloquia	Up to 50		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first degree studies

Course title: Metal Structures

Teacher: Zejak R. Radomir, Teaching associate: Đuričić Đorđe

Course status: Compulsory

Number of ECTS: 7

Prerequisites: Strength of Materials

Course aim: Introducing students to fundamental principles of calculations, dimensioning and designing of metal structures.

Course outcomes: Students can design and construct metal structures using the acquired knowledge.

Syllabus:

Theoretical instruction:

Introducing metal structures, using steel structures. Steel types and grade designation.
Structural design calculation methods for steel structures.
Loading structures. Caculations aimed at determining behaviour of structural elements.
Dimensioning structural elements.
Steel structure elements under loading.
Sealants used for steel structures. Types and load-bearing capacity of sealants.
Rail extension. Extension fitting by screws.
Welding.
Angle connections.
Steel halls. Steel hall structure stability. Assembly, protection and maintenance of steel facilities.
Structural design calculations according to EC3.

Practical instruction:

Examples and tasks relating to theoretical instruction. Surveys about key topics.

Literature:

1. D. Đurđevac, Z. Marković, D. Bogavac, D. Tošić, Metalne konstrukcije 1 i 2.
2. B. Zarić, D. Đurđevac, B. Stipanić, Čelične konstrukcije u građevinarstvu, Građevinska knjiga, 6. izdanje, 2002.
3. D. Đurđevac, Čelične konstrukcije u zgradarstvu, Građevinska knjiga, Beograd, 1992.

Number of active teaching classes: 75				Other classes:
Lectures: 2*15=30	Practical classes: 3*15=45	Other forms of instruction:	Research study:	

Teaching methods: Dialogue and auditory methods.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures and practical classes	5	Final exam	50
Survey defense	15		
Colloquium 1	15		
Colloquium 2	15		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Modern Construction Materials

Teacher: Markićević M. Jelena; Teaching associate: Andrijašević B. Aleksandar

Course status: Elective

Number of ECTS: 5

Prerequisites: none

Course aim:

Improving and deepening students' knowledge about construction materials, i.e. knowledge about material properties, testing methods, quality criteria they are supposed to satisfy, raw materials, technological processes of producing construction materials and their usage. The emphasis is placed on the importance of the proper selection and use of construction materials aimed at improving the quality, efficacy and duration of facilities.

Course outcomes:

Developing the ability to use the acquired knowledge in order to find optimal solutions when selecting materials for modern structures.

Syllabus:

Theoretical instruction:

Fine ceramics, glass and other mineral-based materials, silicate material and products, special concrete and mortar (concrete with modified surface layers, high-strength concrete, concrete with special aggregates, micro-reinforced concrete, polymer-modified concrete and polymer concrete and mortar, special purpose mortar); ferrous metals and alloys (aluminum, copper, zink, lead; plastic mass (types of polymers, processing and production procedures, products used in civil engineering), anti-corrosion materials and systems, different types of glue.

Practical instruction:

Auditory exercises include the analysis of practical examples of standard testing of materials aimed at determining their quality; computational tasks for designing recipes and defining the composition of modern composite materials, testing optimal possibilities of using materials in modern construction.

Literature:

1. Mihailo Murovljev, Dragica Jevtić, Građevinski materijali 2, Građevinski fakultet Univerziteta u Beogradu, Beograd, 1999.
2. Mihailo Murovljev, Monografija, Specijalni betoni i malteri, Građevinski fakultet Univerziteta u Beogradu, IMK, Beograd, 1999.

Number of active teaching classes: 60	Lectures: **15x2=30**	Practical classes: **15x2=30**

Teaching methods: dialogue, monologue, practical work demonstration

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	50
Practical classes	30		
Colloquium	15		

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Occupational Safety

Teacher (Surname, middle initial, name): Marjanović M. Vesna, Teaching associate: Ivanović M. Danica

Course status: Elective

Number of ECTS credits: 5

Prerequisites: no

Course aims: Introducing students to the provisions of the Law on Occupational Safety and Health. Acquainting them with the most important dangers and hazards that can occur when performing tasks of specific jobs and the measures and means of protection that need to be implemented and applied so that the level of risk of injuries and health impairment is reduced and maintained at an acceptable level. Acquiring knowledge about occupational safety and health while performing construction works.

Learning outcomes: Knowledge of national regulations relating to occupational safety and health. The ability to identify hazards and dangers in the workplace, and by taking appropriate occupational safety and health measures, prevent, eliminate and reduce the risk of perceived dangers and hazards. Mastering occupational safety and health measures while performing construction works. Ability to plan and implement occupational safety and health measures while performing construction works.

Syllabus

Theoretical instruction: Introduction to occupational safety (concept, subject and historical development of occcupational safety). Legal framework for occupational safety and health (International law, National regulations: the Constitution of the Republic of Serbia, Law on Occpational Safety and Health). Work-related injuries, occupational ailments and work-related illnesses. Basic sources and causes of hazards and injuries at work: a) subjective causes, b) objective causes. Types and characteristics of harmful effects (harmul effects caused by psychic and psycho-physiological efforts, harmful effects related to the organization of work, harmful effects caused by other people, harmful effects caused by or arising in the process of work: physical (noise and vibrations), harmful effects of radiation (thermal, ionizing or non-ionizing, laser, ultrasonic), adverse effects of microclimate (temperature, humidity and air flow rate), inappropriate lighting, chemical hazards, dust and fumes, harmful effects caused by the use of dangerous materials and hazards (mechanical hazards occurring while using work equipment, hazards associated with workplace characteristics, hazards arising from the use of electricity; fire and explosion hazards) in the workplace and work environment, and means of protection. Occupational safety and health measures to be taken while carrying out construction works.

Practical teaching: Auditory and demonstration activities performed in specific business organisations where students can see practical examples of good and poorly organized occupational safety and health systems.
Basic characteristics of OHSAS 18001, 2007.

Literature:

1. B. Anđelković, Uvod u zaštitu, Fakultet zaštite na radu, Niš, 2005.
2. A. Ian Glendon, Sharon Clarke, Eugene McKenna, Human Safety and Risk Management, Second Edition (2006) ISBN 9780849330902
3. Zakon o bezbednosti i zdravlju na radu („Sl.Glasnik RS“, br.101/05 i 91/15).
4. Drobnjak R. i grupa autora, Bezbednost i zdravlje na radu (knjige 1 do 6) za studente Visoke poslovno-tehničke škole strukovnih studija Užice, VPTŠ, TEMPUS JPHES 158781, 2010-2012.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other teaching forms:	Study research work:	

Teaching methods: Dialogue, monologue, demonstration of practical work, work with text, literature review.

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	**10**	Exam	40
Practical classes	**10**		
Colloquia	**20**		
Seminar papers	**20**		

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Organising Construction Processes and Construction Mechanisation

Teacher: Markićević M. Jelena; Teaching associate: Arsović D. Dragoslav

Course status: Compulsory

Number of ECTS: 7

Prerequisites: none

Course aim:
Acquiring knowledge about: basic categories and principles of organizing construction processes, planning production in construction, basic types of construction machines and their optimal use.

Course outcomes:
Developing the ability to apply the acquired knowledge and skills to organizing construction processes in practice..

Syllabus:

Theoretical instruction:
Main principles of organizing construction processes, designing projects, programming construction of buildings, technical documentation, site conditions and local circumstances, supply chain and resource prices, off-site transportation, norms, cost analysis, priced bill of quantities, preparation works, site organization scheme, planning methods, network planning technique, linear programming, environmental protection, occupational safety and health in construction processes, fire protection, construction mechanization, classification of construction machines, calculation of technical performance, cost of mechanized work, selection of machines.

Practical instruction:
Auditory exercises: analysis of examples from practice in compliance with the subject matter delivered through lectures. Teaching students how to design construction organization projects and ensure optimal usage of mechanization.

Literature:

1. Petar Đuranović, Projektovanje organizacije građenja, NJP Pobjeda, Podgorica, 1995.
2. Bogdan Trbojević, Organizacija građevinskih radova, Građevinska knjiga, Beograd, 1988.
3. Bogdan Trbojević, Građevinske mašine, Građevinska knjiga, Beograd, 1989.
4. Jelena Markićević i grupa autora, Bezbednost i zdravlje na radu – knjiga 2 za studente VPTŠ – Primenjeni deo, Užice, 2011.

Number of active teaching classes: 75	Lectures: **15x3=45**	Practical classes: **15x2=30**

Teaching methods: dialogue, monologue, practical work demonstrations

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	50
Practical classes	30		
Colloquia	15		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first degree studies

Course title: Physics

Teacher: Miloje S. Ćetković, Associate: Smiljanić M. Nataša

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim: Introducing students to mechanical, wave, heat, electromagnetic, optical, atomic and nuclear phenomena. They acquire the basis for studying technical sciences and discipline-specific courses.

Course outcomes: Students develop analytical skills necessary for the successful application of fundamental natural laws, as well as for understanding and solving simple versions of different engineering issues.

Syllabus:

Theoretical instruction:

Position and role of physics and its influence on development of technical sciences. Kynematics and dynamics of a material point, rotation dynamics. Work, power, energy, laws on conservation of energy, collision theories. Garvity. Elasticity of rigid bodies. Mechanic oscullations, waves, sound. Noise. Protection from noise in the environment. Statics, fluid dynamics, surplus stress and capillarity, viscosity and viscous fluid flow. Thermal spreading, calorimetry and phase transitions. Molecular-kynetic theory. Themo-dynamics. Heat spreding. Electrostatical power, electic field. Laws of geometric optics, optical instruments. Photometry. Wave optics, stimulated radiation. Quantum nature of electromagnetic radiation. Wave properties of particles. Bohr's theory. X-radiation. Heisenberg's uncertainty principle. Atomic nucleus. Mass defect and nuclear binding energy. Radioactivity. Nuclear reactions.

Practical instruction:

The topics comply with theoretical instruction. Training students to use measurement instruments and devices.

Literature:

1. V. Vučić, D. Ivanović, Fizika I, II, III, Građevinska knjiga
2. M.Arsin, M. Ćuk, S. Milojević, M. Miloradović, J.Purić, Z. Radivojević, D. Radivojević, M. Savković, P. Todorov, Ž. Topolac, Fizika za više škole, Savremena administracija
3. M. Ćetković, Praktikum računskih i laboratorijskih vežbanja iz fizike, Priboj, 2013.
4. V. Sajfert, Fizika, Univeritet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin", Zrenjanin, 1999.
5. V. Sajfert, Praktikum iz fizike, Univeritet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin", Zrenjanin, 2002.
6. V. Sajfert, Zbirks zadataka iz fizike, Univeritet u Novom Sadu, Tehnički fakultet „Mihajlo Pupin", Zrenjanin, 2002.
7. D. Pavlović, Praktikum računskih vežbanja iz fizike, Naučna knjiga
8. V. Vučić, et al. Osnovna merenja u fizici, Naučna knjiga
9. V. Georgijević, Tehnička fizika, Zavod za izdavanje udžbenika i nastavna sredstva
10. Grupa autora, Bezbednost i zdravlje na radu, knjiga I, modul 1, Užice, 2011.

Number of active teaching classes: 60				Other classes:
Lectures: 2*15=30	Practical classes: 2*15=30	Other forms of instruction:	Research study:	

Teaching methods: Dialogue, monologue, demonstration, practical assignments.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	50
Practical classes	10		
Colloquia (2x10)	35		
Seminar papers			

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Reconstruction, Addition and Adaptation of Space

Teacher: Ćirović Ivana, Markićević M. Jelena; Teaching associate: Stojanović B. Trifko, Stefanović R. Katarina

Course status: Elective

Number of ECTS: 5

Prerequisites: none

Course aim:

Introducing students to main issues faced in reconstruction, addition and adaptation of a space. Providing them with skills required for minor and major interventions in already built facilities.

Course outcomes:

Students will be able to work on their own and design reconstruction, addition and adaptation of facilities used for different purposes, and of construction systems. Students will be familiar and able to use different materials and techniques during the process of reconstruction, addition and adaptation. They will understand the complex nature of minor and major interventions in existing facilities while changing or not changing the purpose of their use.

Syllabus:

Theoretical instruction:

Defining structural and non-structural components of existing facilities. Survey of existing conditions and project design. Reconstruction aimed at changing use of facility, as well as to solving problems caused by different influences: uneven soil compaction, earthquake effects, inadequate building or maintenance, fire or age of building itself, its structure.

Adaptation: demolition and rebuilding of partition walls; replacement of devices, equipment and installations with same-capacity ones. Treatment of floor, wall and ceiling surfaces during space adaptation. Changing structure and oraganisation of space. Adapting existing space to new standards and regulations. Adapting existing space to persons with disabilities.

Reconstruction of floors, walls and ceilings. Treatment of structural and non-structural components during reconstruction. Changing dimensions of existing openings and making new openings. Replacing installations, equipment and devices with higher-capacity ones. Installing elevators in buildings. Making roof windows. Changing structural components. Making or closing openings in structural elements. Changing use of interior and its adjustment to standards and regulations governing new use: changing residential space into public one, public into residential or public into public changing its use (e.g. changing production plant into showroom, etc.).

Standards and norms for spaces used for different purposes: residential and public facilities (hospitality, sports, business, education facilities, showrooms, traffic terminals, etc.). Minor interventions in facilities: regular interior maintenance works: painting, replacing sanitary fittings, radiators, etc.

Adding new space outside existing one, or adding new space to existing one so that they make structural, functional and aesthetic whole.

Practical instruction:

Performing a comparative theoretical analysis of architectural solutions in the processes of reconstruction, addition and adaptation of a space using relevant examples from national and international architectural practice.

Preparing a seminar paper on a given topic, as well as a conceptual design for reconstruction or addition.

Literature:

1. Neufert, E., Arhitektonsko projektovanje, Graševinska knjiga, Beograd, 1988.
2. Douglas, J. Building Adaptation, Heriot-Watt University, Edinbourgh, UK, 2006.
3. Trbojević, R., Arhitektonske konstrukcije – konstruktivni masivni sklop, Orion, Beograd, 2001.
4. Kostić, P, Arhitektonske konstrukcije 1-2, Naučna knjiga, Beograd, 1990.
5. Ilić, S., Klasični drveni krovovi, Građevinska knjiga, Beograd, 2003.
6. Martinković, K., Osnovi zgradarstva 1-7, Beograd, 1985.

7. Grupa autora, Građevinski tehničar 3, Građevinska knjiga, Beograd, 2007.
8. Periodika, Architectural Design, Domus, The Architectural Review

Number of active teaching classes: 60	Lectures: **15x2=30**	Practical classes: **15x2=30**

Teaching methods: Lectures with visual illustrations, individual research on a given topic, workshops, discussion, conceptual design for reconstruction or addition, individual consultations and corrections, design assessment with active participation of students.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	Up to 5	Written exam	Up to 55
Practical classes	Up to 10	Oral exam	-
Semestral assignment	Up to 20		
Seminar paper	Up to 10		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first degree studies

Course title: Roads

Teacher: Lučić Č. Dragan, Teaching associate: Arsović D. Dragoslav

Course status: Compulsory

Number of ECTS: 6

Prerequisites: None

Course aim: Introducing students to the preparation and necessary elements of project documentation, parts of road and railway systems, engineering facilities in civil engineering construction, earthwork methods and other activities.

Course outcomes: Students are competent enough to read and elaborate the projects of roads, railroads and tunnels, as well as to organize civil engineering construction works.

Syllabus:

Theoretical instruction:

Earthworks in road construction, embankment construction and excavation methods, earthwork volume calculation, drainage, retaining and coating walls. Road design and classification, routing, cross-section elements, urban roadways. Upper road structure, drainage and curbs. Designing upper railroad structures, railroad classification, routing, elements of upper structure, railroad maintenance. Lower structure parts, bridges, viaducts, tunnels. Airports, definition, location, elements, dimensioning principles, types of structures.

Practical instruction:

Introducing students to examples from practice (project documentation), preparation of seminar papers on topics relating to road design.

Literature:

1. J. Katanić, V. Anđus, M. Maletin, Projektovanje puteva, Beograd, 1983.
2. A. Cvetanović, Borivoje Banić, Osnove saobraćajnica, Građevinski fakultet Univerziteta u Beogradu, Internet izdanje.
3. D. Bajić, Osnove projektovanja železničkih pruga, Beograd, 1978.
4. S. Janjić, Žećezničke stanice 1, beograd, 1973.
5. M.T.Torlaković, S. Ranković, Gornji stroj železnica, beograd, 1996.
6. D. Lukić, Osnove saobraćajnica – pisana predavanja, Subotica, 2012.
7. D. Lukić, Praktikum, 2012.
8. M. Ninčić, Skripta sa predavanaj iz predmeta Saobraćajnice na Višoj tehničkoj školi u Užicu
9. Ž. Ilić, Saobraćajnice, Naučna knjiga, Beograd 2, 1986.

Number of active teaching classes: 75				Other classes:
Lectures: 2*15=30	Practical classes: 3*15=45	Other forms of instruction:	Research study:	

Teaching methods: Dialogue, monologue, practical work demonstration, work with text, literature review.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	50
Practical classes			
Colloquia (2x10)	30		
Seminar papers	10		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Russian 1

Teacher: Terzić V. Svetlana

Course status: Elective

Number of ECTS: 5

Prerequisites: None

Course aim: Teaching students how to use specialized literature related to their field of expertise; developing all language skills (reading, translation, conversation); combining lexical and grammatical structures. Increasing public awareness of the importance of civil engineering through specialized texts.

Course outcomes: Providing continuous foreign language education upon high school completion. Developing communication skills and the skills that will enable students to use specialized literature.

Syllabus:

Theoretical instruction:

Airport – parts of speech that decline; Customs – nouns (three types); Phone conversation – adjectives (hard and soft declension); At the post office – the comparative degree; Commercial letters; Hotel – the superlative degree; At the restaurant – verbs of motion; International fairs and exhibitions – adverbs of manner; The theatre life of Moscow – the imperative mood. The protection of workers - taking personal protection measures and informing workers about protection signs (the implementation of the international project TEMPUS JPHES 158781)

Practical instruction:

Grammar revision. Practicing conversation in unfamiliar situations.

Literature:

1. Marojević M., 1996, Ruski poslovni jezik, Beograd, Srpski leksikograf
2. Aleksić B., 2000, Ruski jezik za ekonomiste, Beograd, Ekonomski fakultet
3. Marojević R., 1983, Gramatika ruskog jezika, Beograd, Zavod za udžbenike i nastavna sredstva
4. Terzić S., 2006, Odabrani tekstovi iz ruskog jezika struke, VPTŠ Užice

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes: 30	Other forms of instruction:	Research study:	

Teaching methods: Monologue and dialogue-based methods.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points: 70**	**Final exam**	**Points: 30**
Activity during lectures	10	-	-
Practical classes	-	Exam	30
Colloquia	60	-	-
Seminar papers	-	-	-

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Water Supply and Sewerage System Installation

Teacher (Surname, middle initial, name): Milivojević Lj. Dejan, Teaching asscociate: Papić V. Miloš

Course status: Compulsory

Number of ECTS credits: 5

Prerequisites: none

Course aims: Acquiring fundamental knowledge relating to water supply and sewage system installation: designing specifications, preparing details for the priced bill of quantities.
In-house installations – water supply and sewage systems; designing internal distribution of pipes and connecting it with external pipework system; hydraulic calculations; rules, norms, construction methods.

Learning outcomes: The ability to design projects of home water supply and sewage system installations, as well as to prepare the priced bill of quantities for finishing works and construction specifications.

Syllabus

Theoretical instruction:

Sewage system: exterior pipework, urban sewage collection systems, conditions for their connection with internal sewage distribution of pipes; sewage pipework: internal distribution of pipes, rules of connection, types of pipes, pipe distribution methods, cascade systems, revision.
Water supply system: extrenal connections, urban network, water supply, pumps and other mechanical water supply network devices. Internal water supply network, fittings, connection with external network.
Water supply system: designing internal water supply sustem, rules, fundamentals of hydraulic calculations. Other in-house instalations: heating, air conditioning, electrical installations.

Practical teaching:

Situational plan of a building in compliance with the external network of installations; plan of internal sewage system – the basis of the semestral assignement; connection with external network - urban sewage collection systems; designing internal water supply and sewage systems, connection with external districution of pipes, hydraulic calculations.

Literature:

1. Radonjić, M. Vodovod i kanalizacija u zgradama, Građevinska knjiga, Beograd, 1983.
2. Blagojević Biljana, Kućne instalacije, Zavod za udžbenike i nastavna sredstva, Beograd, 1996.
3. Martinović Krešimir, Snabdevanje zgrada vodom i odvod otpadnih voda iz njih, Građevinska knjiga, Beograd, 1988.

Number of active teaching classes: 45				Other classes:
Lectures: 30	Practical classes: 15	Other teaching forms:	Study research work:	

Teaching methods: Auditory exercises, dialogue, consultations, fieldwork, mentorship, literature review

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	40
Practical classes	20		
Colloquia	15+15		
Seminar papers			

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first level studies

Course title: Soil Mechanics and Foundation Engineering

Teacher: Markićević M. Jelena; Teaching associate: Đurićčić Đorđe

Course status: Compulsory

Number of ECTS: 6

Prerequisites: none

Course aim:
Acquiring knowledge on materials which make up soil, as well as knowledge on the construction of foundations for different structures.

Course outcomes:
Mastering fundamental knowledge and principles of soil mechanics and foundation engineering, and developing skills required for their application to design and construction.

Syllabus:

Theoretical instruction:
Introduction to soil mechanics. Physico-mechanical properties of soil. Water in soil. Bulk density of soil. Total, effective and neutral stress on soil. Load transfer through soil. Shear resistance of soil. One-axis and three-axis experiments. Internal friction angle of soil. Cohesion. Soil pressure on structures. Methods of defining active soil pressure on retaining walls. Stability of retaining walls. Bearing capacity of soil. Calculating bearing capacity of soil, allowable bearing capacity. Introduction to construction of foundations for different structures. Types of foundations, calculation of stress on foundations. Shallow foundations made of non-reinforced concrete under centric load, dimensioning. Shallow foundations made of reinforced concrete (under centric and eccentric load). Penetration tests. Foundation footings. Foundation base plates, dimensioning and calculation. Construction of foundations of adjacent facilities. Securing foundation pits. Deep foundations. Pile foundations. Pile dimensioning. Underwater foundations and foundations built in specific conditions, using caissons. Final remarks.

Practical instruction:
Auditory exercises: tasks and examples relating to theoretical subject matter delivered through lectures. Students prepare a survey working individually, and it consists of specific tasks representing key issues.

Literature:

1. M. Maksimović, Mehanika tla, Čigoja, Beograd, 2001.
2. S. Stevanović, Fundiranje, Naučna knjiga, Beograd, 1989.
3. N. Šušić, P. Nedić, Zbirka zadataka iz fundiranja, Viša tehnička škola Užice, 2000.

Number of active teaching classes:75	Lectures: **15x3=45**	Practical classes: **15x2=30**

Teaching methods: dialogue, monologue

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	5	Exam	50
Practical classes	15		
Colloquium 1	15		
Colloquium 2	15		

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Statics of Structures 1

Teacher (Surname, middle initial, name): Milašinović D. Dragan, Teaching associate: Arsović D. Dragoslav

Course status: Compulsory

Number of ECTS credits: 7

Prerequisites: passed exams in Mechanics and Strength of Materials

Course aims: Teaching students how to analyze stress, deformation and stability of structures drawing upon the laws on the mechanics of rigid and deformable bodies.

Learning outcomes: Students will be able to calculate shear force and deformation, and they will understand spatial stability of structural supports. Helping students to understand calculation methods used for dimensioning of structural supports.

Syllabus

Theoretical instruction:

Theory of stick bending on a plane – basic equations. External and internal forces. Conditions of static equilibrium of a stick. Basic unknown variables and basic equations of flat, linear supports. Static and kinematic indeterminacy. Responses and forces in cross-sections of statically determinate structural supports. Statically determinate truss supports. Element replacement method. Applying principles of virtual motion and kinematic methods to statically determinate supports. Static and kinematic analogy of sticks and their motion. Diagrams of truss support motion. Influence diagrams and influence lines. Determining proper position and calculating extreme influence values.

Practical teaching:

Performing tasks in statics of structures in compliance with theoretical instruction.

Literature:

1. M. Đurić, O. Đurić-Perić, Statika konstrukcija, Građevinska knjiga, Beograd, 1988.
2. S. Ranković, Statika konstrukcija, Građevinski fakultet Beograd, Naučna knjiga, 1986.
3. S. Ranković, Zbirka rešenih zadataka iz statike konstrukcija, Građevinski fakultet Beograd, Naučna knjiga, 1986.

Number of active teaching classes: 75				Other classes:
Lectures: 30	Practical classes: 45	Other teaching forms:	Study research work:	

Teaching methods: Dialogue, monologue

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	50
Practical classes			
Colloquia	20		
Seminar papers	20		

Assessment methods:

Study programme: Civil Engineering

Type and Level of Studies: Undergraduate Vocational Studies

Course code and title: Statics of Structures 2

Teacher (Surname, middle initial, name): Milašinović D. Dragan; Teaching associate: Arsović D. Dragoslav

Course status: Elective

Number of ECTS credits: 5

Prerequisites: passed exams in Statics of Structures 2

Course aims: Teaching students how to analyze stress, deformation and stability of structures drawing upon the laws on the mechanics of rigid and deformable bodies.

Learning outcomes: Students will be able to calculate shear force and deformation, and they will understand spatial stability of structural supports. Helping students to understand calculation methods used for dimensioning of structural supports.

Syllabus

Theoretical instruction:

Theories of reciprocity. Statically indeterminate supports – force method, statically indeterminate variables and basic system of box and plate girders, equations. Statically indeterminate supports – approximate deformation method, statically indeterminate variables and basic system of box and plate girders, equations. Diagrams of motion of statically indeterminate supports. Influence lines of statically indeterminate supports. Static and kinematic indeterminacy.

Practical teaching:

Performing tasks in statics of structures in compliance with theoretical instruction.

Literature:

1. M. Đurić, O. Đurić-Perić, Statika konstrukcija, Građevinska knjiga, Beograd, 1988.
2. S. Ranković, Statika konstrukcija, Građevinski fakultet Beograd, Naučna knjiga, 1986.
3. S. Ranković, Zbirka rešenih zadataka iz statike konstrukcija, Građevinski fakultet Beograd, Naučna knjiga, 1986.

Number of active teaching classes: 60				Other classes:
Lectures: 30	Practical classes:30	Other teaching forms:	Study research work:	

Teaching methods: Dialogue, monologue

Knowledge evaluation (maximum 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	10	Exam	50
Practical classes			
Colloquia			
Seminar papers	40		

Assessment methods:

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies – first degree studies

Course title: Strength of Materials

Teacher: Zejak R. Radomir, Teaching associate: Đuričić Đorđe

Course status: Compulsory

Number of ECTS: 7

Prerequisites: Construction Mechanics

Course aim: Students acquire knowledge on the resistance of materials, which serves as the foundation for further study of profession-specific courses.

Course outcomes: Students master fundamental principles of mechanical behaviour of rigid, deformable, beam structures, dimensioning of structural members and the structure as a whole.

Syllabus:

Theoretical instruction:

Introdution, geometric characteristics of flat surfaces. Stress analysis. Deformation analysis. Stress-strain relationships. Shaft loadings. Axial loading. Transverse loading. Pure bending. Eccentric loading.Torsional loadings. Loading in two directions. Pure shear. Bending force. Complex stresses. Measuring movement and rotation of cross sections in statically determinate systems. Statically indeterminate systems. Stability of elastic systems.

Practical instruction:

Examples and tasks relating to theoretical instruction. The survey that students prepare individually consists of typical tasks relating to key topics.

Literature:

1. D. Rajić, Ž. Bojović, Otpornost materijala, Zavod za udžbenike, Beograd, 1993.
2. V. Brčić, Otpornost materijala, Građevinska knjiga, Beograd, 1980.
3. D. Rašković, Tablice iz otpornosti materijala, Građevinska knjiga, Beograd, 1987.

Number of active teaching classes: 75				Other classes:
Lectures: 2*15=30	Practical classes: 3*15=45	Other forms of instruction:	Research study:	

Teaching methods: Dialogue and auditory methods.

Knowledge evaluation (maximum number of points: 100)

Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures and practical classes	5	Final exam	50
Survey defense	15		
Colloquium 1	15		
Colloquium 2	15		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Technical Drawing and Descriptive Geometry

Teacher: Ćirović Ivana; Teaching associate: Stojanović Trifko

Course status: Compulsory

Number of ECTS: 6

Prerequisites: none

Course aim:

Introducing students to basic methods and rules of technical drawing. Providing students with necessary knowledge about graphical solutions to geometry problems. Developing students' ability of reading 2D technical drawings. Improving their perceptions of space and proportion. Providing knowledge in different fields of descriptive geometry: parallel projection (orthogonal, oblique and isometric). Developing spatial visualization and spatial imagination skills, as well as the ability to solve problems of different spatial relationships between three-dimensional geometric objects projected onto a two-dimensional plane, which is the basis of spatial analysis of any two-dimensional representation.

Course outcomes:

Students will be able to perceive space and objects, representations of orthogonal and oblique projection, as well as to select the appropriate technique for the required technical documentation. Students will have developed skills to identify and interpret spatial relationships of spatial shapes in two-dimensional representations, and will be familiar with their geometric structure. Students will be able to provide optimal graphical representation of spatial configurations in characteristic perspectives and views.

Syllabus:

Theoretical instruction:

Introducing students to basic methods of technical drawing. Types of lines and their use. Technical script. Graphical representation of objects in space. Developing 2D technical drawing reading skills. Basic geometric structures. Projections, views and types of basic geometric shapes (point, line, plane). Criteria for obtaining characteristic views and positions of objects aimed at direct detection of metrical properties and identification of spatial relationships between objects. The concept of visibility. Orthogonal projection. Orthogonal projection of flat shapes. Orthogonal projection of objects. Transformation. Rotation. Affinity and collineation. Rotation of plane. Orthogonal projection of objects in general positions. Flat cross-sections of objects. Penetration of two objects. Oblique projection. Isometric projection. Fundamentals of object visualization in isometric projection. Actual terrain, topographic surfaces, constant decline surfaces. Facility embankments. Cross-sections of roof structures.

Practical instruction:

Construction of regular polygons. Construction of straight lines. Orthogonal projection of point. Projection of plane. Traces of plane. Cross-section of two planes. Line-lane intersection. Inclined trihedron. Orthogonal projection of flat shapes. Orthogonal projection of objects, Transformation. Rotation. Affinity and collineation. Metrical tasks: angle of inclined straight line, actual length of straight line, distance between point and plane, actual angle between two straight lines, rotation of plane. Orthogonal projection of objects in general positions. Flat cross-sections of objects. Penetration of straight lines through objects. Penetration of two objects. Oblique projection. Isometric projection. Terrain presentation. Roofing solutions.

Literature:

1. Dulić, G., (2001). Tehničko crtanje sa čitanjem planova. Beograd. Zavod za udžbenike.
2. Rajner, T. (1994). Perspektiva i aksonometrija. Beograd. Evropsko slovo.
3. Ninčić, M. (1996). Nacrtna geometrija. Užice. Viša tehnička škola.
4. Anagnosti, P. (1976). Nacrtna geometrija. Beograd. Naučna knjiga.
5. Gagić, Lj. (2002). Nacrtna geometrija. Beograd. Građevinski fakultet.
6. Đurović, V. (1963). Nacrtna geometrija. Beograd. Naučna knjiga.
7. Pantelić, T. (1985). Tehničko crtanje. Beograd. Građevisnka knjiga.

Number of active teaching classes: 75	Lectures: **15x2=30**	Practical classes: **15x3=45**

Teaching methods: Lectures with visual illustrations, graphical drawing, individual consultations and

corrections.			
Knowledge evaluation (maximum number of points: 100)			
Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	Up to 5	Written exam	Up to 55
Practical classes	Up to 15	Oral exam	-
Colloquium	Up to 25		
Seminar paper	-		

Study programme: Civil Engineering

Type and level of studies: Undergraduate Vocational Studies

Course title: Visual Presentation Techniques

Teacher: Ćirović Ivana; Teaching associate: Đuričić V. Đorđe

Course status: Elective

Number of ECTS: 5

Prerequisites: none

Course aim:

Introducing students to basic methods of technical drawing used in the preparation of conceptual and final designs (bases, cross-sections, appearance, details). Developing and cherishing art and visual culture. Improving students' perceptions of space and proportion. Refining students' understanding of composition. Developing skills to create architectural presentations using basic computer techniques. Providing students with necessary knowledge about graphical solutions to geometry-related problems. Developing students' 2D technical drawing reading skills.

Course outcomes:

Students will be able to realize the complexity of an object or a space and select the appropriate method of representing spatial data. Students will be able to perceive space and objects, and to represent them using orthogonal projection. Students will be familiar with basic methods of technical drawing used in the preparation of a conceptual and final design (bases, cross-sections, appearance, details). Students will have acquired knowledge necessary for graphical representation of civil engineering facilities on a plane, as well as for the preparation of proper technical documentation. Students will be familiar with computer graphics basics and will know how to use input and output devices. Students will use computers to organize and process raster and vector graphics obtained by means of input devices.

Students are able to use appropriate conceptual design presentation techniques on their own.

Syllabus:

Theoretical instruction:

Introducing students to basic methods of technical drawing used in the preparation of conceptual and final designs (bases, cross-sections, appearance, details). Architectural presentations. Drawing spatial shapes. Students simultaneously explore technical and expressive possibilities of both traditional techniques and computer graphics. The role of computers in engineering design.

Practical instruction:

Students master theoretical subject matter through graphical representations of conceptual and final designs, i.e. by preparing conceptual and final design projects of civil engineering facilities using traditional drawing techniques and computers. Students are trained how to prepare the graphical part of technical documentation working on their own. Graphical representation of spatial shapes on a two-dimensional plane of a drawing. Graphical representation of objects in a space. Developing 2D technical drawing reading skills. Computer applications used for architectural presentations. Introducing students to basic software packages for drafting, designing and spatial modeling. Basic tools and methods for 2D drawing and representation of architectural structures. Software packages for the preparation of technical documentation and architectural presentations. 3D modelling tools for architectural forms. Fundamentals of the actual representation of architectural facilities.

Literature:

1. Onstott, S. (2015). AutoCAD 2014 i AutoCAD LT 2014 Osnove. Beograd
2. Dulić, G. (2001). Tehničko crtanje sa čitanjem planova, Beograd, Zavod za udžbenike
3. Rajner, T. (1994). Prspektiva i aksonometrija, Beograd, Evropsko slovo
4. Duggal, V. (2000). Cadd Primer: A General Guide to Computer Aided Design and Drafting-Cadd, CAD.
5. Yarwood, A., Palm B. S. (2016). Introduction To Autocad 2016: 2D and 3D Design. Autodesk
6. Petković, N. (2014). Master Class 1. Step by step guidebook: Learn how to design professionally ArchiCAD 18. Graphisoft.
7. Petković, N. (2014). Master Class 2. Step by step guidebook: Learn how to design professionally ArchiCAD 18. Graphisoft.

Number of active teaching classes: 60	Lectures: **15x2=30**	Practical classes: **15x2=30**

Teaching methods: Lectures with visual illustrations, workshops, presentations of conceptual designs for given topics, individual consultations and corrections.			
Knowledge evaluation (maximum number of points: 100)			
Pre-exam obligations	**Points**	**Final exam**	**Points**
Activity during lectures	Up to 5	Written exam	Up to 55
Practical classes	Up to 15	Oral exam	-
Colloquium	Up to 25		
Seminar paper	-		